Texila International Journal of Public Health
ISSN: 2520-3134
DOI: 10.21522/TIJPH.2013.11.02.Art003

Critical Assessment of Orthodox Vaccine against Local Herbal Lipid Mixture (JOHVIR) in the Treatment of Covid-19 Infection: A Comparative and Pilot Study Approach within FCT, Abuja Metropolis, Nigeria

H.F. Ajobiewe[1*], J.O. Ajobiewe[2], A.O. Salami[3], A.A. Ogundeji[3], A. Dangana[4]
[1]*PhD in Public Health Texila American University, Guyana*
[2]*Department of Medical Laboratory Sciences, Veritas University, Bwari-Abuja, Nigeria*
[3]*United States Department of Defense, Walter Reed Program Nigeria, and US Embassy Abuja Nigeria*
[4]*University of Abuja Teaching Hospital Gwagwalada, Nigeria*

Abstract

This study examined the effectiveness of Orthodox vaccine and Local remedy (JOHVIR) administration against Covid-19 Disease- A comparative study approach within FCT Abuja metropolis, Nigeria. 121 volunteers participated in this study, Chi-square calculated was higher than chi-square tabulated, when the lipids mixture was administered- indicating high level of significance (P< 0.05) as very effective anti-corona 2 remedy. Chi-square (χ^2 Cal = 38.38; χ^2 tab = 5.99) and (χ^2 Cal = 30.86; χ^2 tab = 5.99), the values were significant at 0.05% level, unisex. Those study subjects on orthodox vaccine therapy had a lot of life-threatening side effects and in some cases fatal consequences while in others there were reinfection with corona virus 2. after taking over booster doses of the vaccine: none of those on local herbal lipid remedy ever had any life-threatening side effects apart from mild headaches in some cases, we strongly suggest that cold viruses such as corona virus 2 that mutate a lot may not be effectively combated and handled by orthodox vaccine. Efforts must be geared towards the mass production and development of simple antivirals such as the lipids mixture used in this study termed "Joseleen herbal lipids mixture (JOHVIR)". As it was significantly sensitive as Covid-19 antiviral agent. Alternate simple measures such as the herbal lipids mixture could be the solution to the Covid-19 Pandemic as it prevents and neutralizes the coronavirus 2 before it penetrates the cell.

Keywords*: Vaccine, Herbal lipids mixture, Joseleen, Covid-19, Chi-square (χ^2).*

Introduction

The locally sourced lipids mixture comprises of very important semisolid medicinal oils that have been found very useful in the past for effectively curing cold viral infections. Essentially this mixture has natural Saponin, other very important phytochemicals, fatty acids such as oleic acid, stearic acid, arachidic acids and even medicinal furfural aldehydes constituents which are highly medicinal- being protein sequestrating and anti-inflammatory agents respectively [1]; [2]. The lipid base of corona virus readily solubilizes when it comes in contact with the lipids mixture termed Joseleen herbal mixture (JOHVIR) in the light of the above reasons and from basic chemistry principle of 'like dissolves like its apparent effectiveness against Covid-19 disease becomes very convincingly clear [3].

It is on record that coronavirus has caused a lot of morbidity and mortality all over the world. Despite the administration of vaccine,

Received: 03.10.2022 ***Accepted: 16.11.2022*** ***Published on: 30.06.2022***
****Corresponding Author: helenajo2000@yahoo.com***

high mortality rate is still recorded among those immunized. For instance, a research group in Israel observed that in a field study, 4460 persons in the vaccinated group became re-infected during the study period and nine persons died, translating into an infection fatality rate (IFR) of 0.2% in the vaccination group [4]. Similar trends were observed among similar category of volunteers in Abuja, Nigeria in more frightening dimensions justifying our charging immediately into action at conducting these investigations. The administration of this lipid mixture had been known for its effective curative and prophylactic properties for ages. Critical appraisal of both remedies (vaccine and lipids mixture administration to victims of COVID-19 disease) thus justifies the essence and purpose of this study.

The pitfalls and gaps in the secular management of Covid-19 pandemic by just concentrating on orthodox vaccine and ignoring or paying no serious attention to local herbal lipid mixture remedy is suggested to be responsible for its persistence in the entire current human population, this research intends to break this barrier and discover the easy and simple lasting solution that would eventually take the whole world out of the woods!

1. What are the gaps and pitfalls in the secular management of Covid-19 disease in terms of treatment options and preference (strict dependence on orthodox vaccine or trial of local lipid mixture alternative)?
2. What other alternative solutions apart from vaccine exist in the current global search for an effective remedy to Covid-19 pandemic?
3. Could lipids mixture that had been tested earlier for its efficacy/effectiveness for both curative and prophylactic properties against COVID 19 be the right choice of remedy after all?
4. Would it be out of place to examine thoroughly the levels of safety between these two types of remedies when they were independently administered to victims of Covid-19 disease?

The objective of this study is to critically examine the correlation existing between outcome of orthodox vaccine and local herbal remedy administration among infected and at-risk individuals infected with Covid-19 infection. This study is designed with the intent that it will serve as an available reference source and be of good value to researchers in this field thus add to existing literature in this subject matter. The study will assist government and health administration of the country at large in health policy formulation, administration, and implementation for better service delivery in curbing morbidity and mortality rate of Covid-19 pandemic.

Structure of Coronavirus

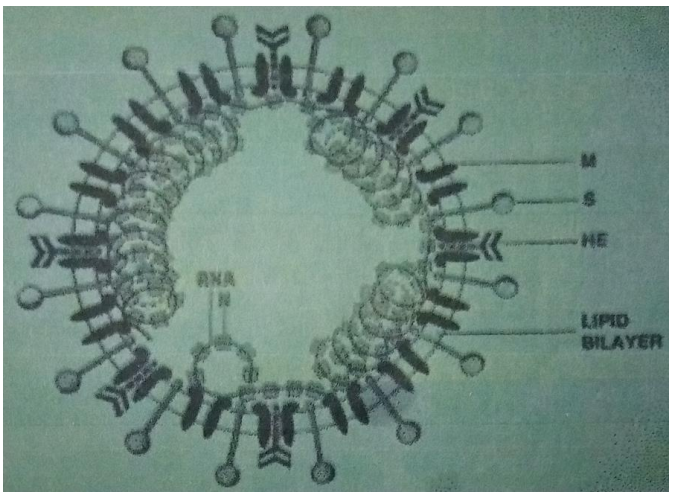

Figure 1. Structure of Corona Virus

M is Intermembrane protein (Mr 18000-220,000)

S is surface glycoprotein (Mr 27000-350000)

He is Haemagglutinin esterase (Mr 65000)

N is the Nucleocapsid (Mr 19000-60000)

RNA is the Nucleocapsid (Mr 19000-60000)

RNA is the Genomic Ribonucleic Acid which serves as mRNA for RNA polymerase [5].

Corona viruses belong to the family of Coronaviridae. The family has two antigenic groups domiciliated in both human and animals' hosts. The first antigenic group (Antigenic group I) virus type, and the hosts are respectively stated as follows; Human respiratory Corona virus, HCV 229, Porcine transmissible gastroenteritis virus, PTGEV, Canine corona virus, CCV, Feline enteric corona virus, FECV, Rabbit corona virus, RBCV, their hosts are humans, pigs, dogs, cats [5], and rabbits. In humans, pigs, and cats; the disease they mainly manifest is respiratory; while in rabbits it is immunological disorder, infectious peritonitis, nephritis, and pancreatitis. In dogs, they cause enteric infection while also in some cats, they cause hepatitis, neurologic diseases, etc. In the second antigenic group (Antigenic group II), the virus type, and the hosts are also respectively stated as follows; Human respiratory Corona virus, Porcine haemagglutinating encephalomyelitis virus HEV, mouse hepatitis virus MHV, Sialodacryo adnavirus SDAV, Bovine corona virus, BCV, Rabbit SDAV, Bovine corona virus, BCV, Rabbit corona virus, RBCV, and Turkey Corona virus. [5]. Their hosts are humans, pigs, mice, rats, turkeys. In humans, the disease they mainly manifest is respiratory; while in pigs it is respiratory, enteric, and neurologic infections; in mice it is respiratory, enteric, hepatitis and neurologic infections in rats it is mainly neurologic disease.

In cows and rabbits, they cause enteric infections while also in turkeys, they cause respiratory and enteric diseases [6]. Briefs on Coronavirus Attachment Virions bind to the plasma membrane by interaction of the S proteins in the large spikes with specific receptor glycoproteins. Virions of the antigenic group II uses the HE glycoproteins for pre-receptor interaction with the 9-O acetylated neuramic acid residues on the plasma membrane. Penetration occurs by S protein mediated fusion of the viral envelope with the plasma membrane or for some strains with endocytic membranes.[7]. The genomic RNA is translated to form polyprotein (>800kd) which is co or post translationally processed to yield multiple protein that serve as a virus specific, RNA –dependent RNA polymerase.

These may also serve other roles in viral transcription and replication processes. The RNA dependent RNA polymerase uses the positive genomic RNA strand as template for full length negative strand RNA which is replicated to form new positive strands genomic RNA. The genomic RNAs and mRNAs are capped and polyadenylated. At the 5^1 ends of each mRNA is a common leader sequence about 70 nucleotides long that is encoded by the 3^1 ends of the negative strand template. The genome length and the sub genomic, negative strand RNAs each have a sequence complimentary to the leader sequence at the 3^1 ends. With just few exceptions, each polycistronic mRNAs is translated to yield only the polypeptide encoded at the 5^1 ends of the mRNA. For instance, mRNA 6 encodes the M protein. The N protein and newly formed genomic RNA assemble in the cytoplasm to form helical nucleocapsid [8].

Characteristics of Corona Viruses Coronaviruses are:

1. irions are 80-220nm in diameter.
2. Pleomorphic but roughly spherical in shape. The nucleocapsid is helical with diameter of 10-20nm Molecular weight-ratio is approximately 400 x10 Buoyant density is 1.23-1.24 g/cm in CsCl.
3. Genomes consist of a single molecule of linear positive sense, single stranded –RNA, The RNA has a 5^1 -terminus cap and a 3^1 –terminus poly (A) tract [9,10].

4. Virions contain a large surface glycoprotein,
   a. Intermembrane protein, M,
   b. Nucleocapsid protein, N,
5. Some corona viruses contain a Haemagglutinin esterase protein, HE, that form short surface projections and a small membrane protein.
6. Virions contain lipids in their envelope and some of their surface proteins are heavily glycosylated. These form short surface projections and a small membrane protein, SM, [11].
7. The genomic RNA serves as the mRNA for the RNA polymerases.
8. When translated, the polymerase components are responsible for the formation of full length complementary and progeny RNA species.
9. They are also responsible for the production of sub genomic mRNAs.
10. One species of genome length complimentary RNA acts as a template for the synthesis of a 31 conterminal nestled set of genomic mRNAs that are 51 capped and 31 polyadenylated [12,13].
11. Synthesis of mRNA species from this template involves a process of discontinuous transcription due to leader priming mechanism.
12. The virus synthesizes five to seven major sub genomic mRNA.
13. Only the 5^1 –unique regions of the mRNAs are translationally active.
14. Virions mature in the cytoplasm by budding through the endoplasmic reticulum and Golgi membranes.
15. The viruses have narrow host ranges. [14]. The common routes of transmission are:
    a. Aerosol
    b. Fecal Oral
    c. Fomite [14].
16. Physical Properties of Corona Viruses Virions are sensitive/lethal to
    a. Heat
    b. Non-ionic detergent
    c. Lipid Solvent
    d. Formaldehyde
    e. Alcohol
    f. Oxidizing agents [14].

Method

Description of the Study Area

Samples were collected from infected and at-risk patients living in Abuja, Federal Capital Territory (F.C.T), Nigeria which occupies an area of about 8000 square kilometres and is located in the central region of Nigeria between longitudes 8º25’ and 9º28’N. Federal Capital Territory [15], also known as Abuja Federal Capital Territory is located north of the confluence of the Niger and Benue rivers. It is bordered by the states of Niger to the west and northwest, Kaduna to the northeast, Nasarawa to the east and south, and Kogi to the southwest. It is located at 8°50′N 7°10′E. The Federal Capital Territory has a landmass of approximately 7,315 km2 [16]. Abuja is the capital of Nigeria, and is the seat of policies makers, legislators and facilities for assessing, coordinating and management of issues relating to Covid-19 are readily available [15].

Sampling Area

This study was conducted in Abuja Municipal Area Council, AMAC.

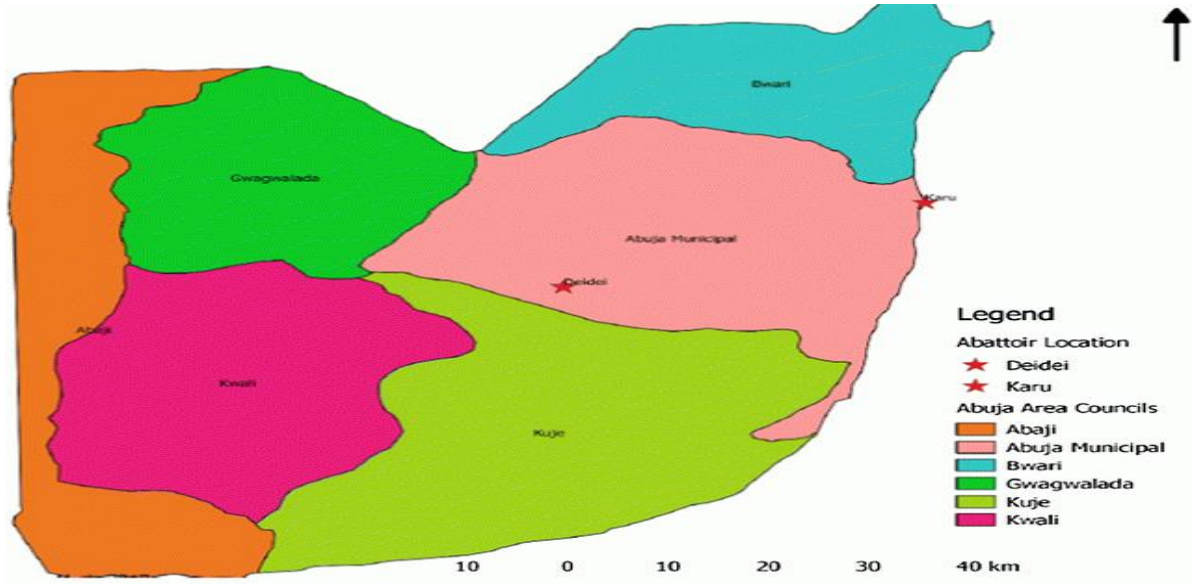

Figure 2. Map of Federal Capital Territory

The Sampling area was, Abuja Municipal Area Council (AMAC)

Study Population

Participants for this research were unisex adults and children, who were (i) Individuals at risk (Health care providers, health care users, programme managers and community leaders). (ii) Individuals infected with Corona virus.

Exclusion Criteria

Anybody that is immune suppressed due to underlying ailments or any life-threatening disease/s. Infants or children below the age of ten years. Any asthmatic patient. Those seventy-five years and above. Those that have mental health challenges. Those that have general allergic reactions to lipids.

Inclusion Criteria

All health workers (who do not fall in the exclusion criteria above) exposed by virtue of their job schedules or otherwise to infected COVID 19 patients. Any individual either male or female within this age bracket (≥10 years ≤75 years) exposed to COVID 19 through any means. All those at risk due to recent travels, meeting, ceremonies, and failure to obey lay down regulation for prevention of infection, attendance at funerals etc. Already infected individuals whose histories reflect/imply/A and B above and those without any major underlying ailments. All consented to be part of the study.

Study Design

Completely randomized and double blinded research design was adopted for this study. Informed consent questionnaire forms were distributed to volunteers who though at risk, presented clear cut signs and symptoms of Corona virus 2 infection; Informed consent research forms were also distributed to volunteers, who though, at risk, showed no signs and symptoms of infection with Corona virus 2. Queries in the questionnaire were presented to ensure they had similar meaning in all the study areas. The queries were then used to populate a Google form.

This form had the advantage of being cost-effective, no paper wastage, time economy as well as reliable [16], and has been applied for the survey of COVID-19 with success in Nigeria and elsewhere [17], The questionnaire was administered to the contacts of few participants through their mobile devices. (Hard copies of the questionnaires were also produced and administered to participants who prefer this method). The study was also designed to fully

accommodate the following as far as vaccine and local remedies for combating the pandemic were consigned:

Descriptive Phase

This critically appraised the use of vaccine worldwide with its attendant adverse side effects. - As common parlance indicated secularly that post administration evidence of vaccine to individuals at risk still revealed signs and symptoms of COVID-19. disease.

Intervention Phase

Critical appraisal of orthodox vaccine against C0VID-19 and its non-pharmaceutical measures against well-known local remedies such as lipids which could lead the whole world out of the woods in the era of this pandemic.

Evaluation Phase

Despite the fact that, there are still noticeable signs and symptoms of chronic COVID-19 disease post vaccine administration due to high mutation potential of Corona virus 2. This research tested the efficacy of a locally generated lipid mixture against commonly used orthodox vaccine with this regard.

Hypothesis

To achieve the purpose/essence of the later parts of this study design we advanced the following hypotheses – at least for the intention of this current journal.

Hypothesis

$H_{o:}$ No gaps/pitfalls exist across all ages (unisex) at risk in the secular management of COVID-19 pandemic due to excessive concentration of COVID-19 management on different orthodox vaccines and other non-pharmaceutical measures without appraising these against other possible local herbal remedies (such as natural lipid mixtures) which had been in use since creation.

$H_{a:}$ Gaps/pitfalls exist across all ages (unisex) in the secular management of COVID-19 pandemic due to excessive concentration of COVID-19 management on different orthodox vaccines and other non-pharmaceutical measures without appraising these against other possible local herbal remedies (such as natural lipid mixtures) which had been in use since creation.

Principle of screening test for COVID-19 disease (Using Panbio COVID-19 Ag Rapid Test Device) for the detection of the etiological agent which is *Corona virus* 2).

The device is an in-vitro diagnostic rapid test for the qualitative detection of SARS-CoV-2 antigen (Ag) in human nasal swab specimens from individuals who meet COVID-19 clinical criteria such as fever, cough (usually a dry cough without much sputum being produced), shortness of breath, sore throat (dyspnea), headache, fatigue, chills, recent loss of smell (anosmia) or taste, nasal congestion and runny nose (rhinorrhea), poor appetite and/ or epidemiological criteria and those at risk (health, airport workers and transporters) [18].

Principle of confirmatory test for COVID-19 disease (Using Polymerase Chain Reaction (PCR) to detect the etiological agent which is *Corona virus* 2).

Covid-19 virus is a positive sense ssRNA, so there is need to convert the ssRNA to DNA in a process called reverse transcription because only DNA can be copied-or-amplified which is a key part of the real time RT-PCR process for detecting viruses [19].

A sample was collected from the parts of the body where the COVID-19 virus gathered such as a person's nose or throat. The sample was then treated with several chemical solutions that removed substances such as proteins and fats till the extract from the sample only had the RNA present. The RNA was reversely transcribed to DNA using a specific enzyme called reverse transcriptase. Short fragments of DNA that were complimentary to specific parts of the transcribed viral DNA. If the virus was present in a sample, these fragments were used for building DNA strands during amplification, while the others were used for building the

DNA and adding marker labels to the strands, which were then used to detect the virus. The mixture was then placed in an RT-PCR machine. The machine cycles through temperatures that heated and cooled the mixture to trigger specific chemical reactions that created new identical copies of the target sections of viral DNA. The cycle was repeated over and over to continue copying the target sections of viral DNA. Each cycles doubled the previous number: two copies became four, four copies became eight, and so on. A standard real time RT-PCR set –up usually goes through 35 cycles, which means that, by the end of the process, around 35 billion new copies of the sections of viral DNA were created from each strand of the virus present in the sample [19].

As new copies of the viral DNA sections were built, the marker labels attached to the DNA strands and then released a fluorescent dye, which was measured by the machine computer and presented in real time on the screen. The computer tracked the amount of fluorescence in the sample after each cycle. When a certain level of fluorescence was surpassed, this confirmed that the virus was present. Scientists also monitored how many cycles it took to reach this level in order to estimate the severity of the infection the fewer the cycles, the more severe the viral infection was [18, 19].

Sample Size

The sample size was calculated using the survey sample size formula cited in Kadam and Bhalerao (2010). [20].

Ethical Procedure

The research was approved by the Health Research Ethics Committee Institute of Public Health, Federal Ministry of Health, and Abuja. Written informed consent was sought and obtained from each of the volunteers after the researcher explained the concept and procedure of the research. Anonymity was strictly observed. Respondents were assured of non-maleficent of the study and freedom to refuse to respond to the questionnaire or withdraw from the study at any stage without any penalty.

Observation and Result

This is a longitudinal study (prospective) which is part of the current ongoing study among male and female cohorts whose ages were specified in Tables 2a and b; 3a and b. that took place in one of the Local Government Areas; Abuja Municipal Area Council (AMAC) earmarked for the project work.

Table 1. Number of Volunteers in Different Age Groups during the Preliminary Trial in Abuja Municipal Area Council (AMAC)

Age (years)	**Frequency**	
	Male	**Female**
≥ 20 – 45	23	12
≥ 46 – 65	30	20
≥ 66 - above	17	9
Others (who neither used vaccine nor local remedy)	16	4

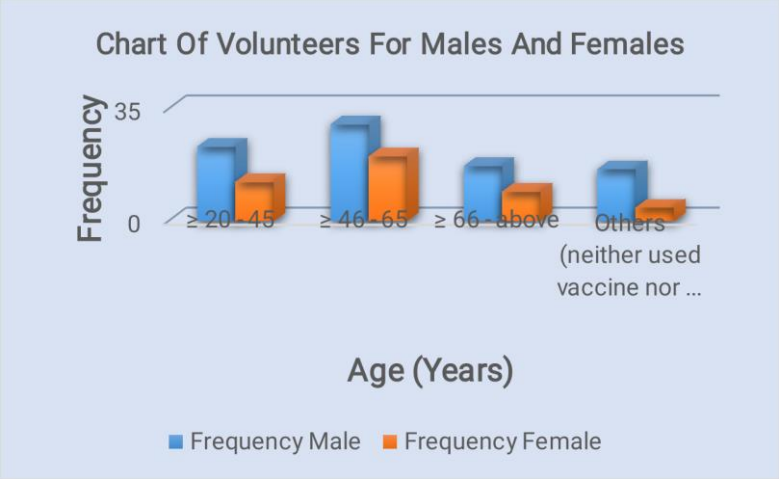

Figure 3. Chart of Volunteers for Males and Females

Table 2. Status of Volunteers at Different Age Groups Pre- and Post-vaccination in Males

Pre-vaccination for Males		
Age	**Frequency**	
	Positive	**Negative**
≥ 20 - 45	10	4
≥ 46 - 65	8	4
≥ 66 - Above	4	4
Post-Vaccination for Males		
Age	**Frequency**	
	Positive	**Negative**
≥ 20 - 45	6	8
≥ 46 - 65	5	9
≥ 66 - Above	2	4

$\chi 2$ Cal = 11.64; $\chi 2$ tab = 5.99 It is significant at 0.05% level.

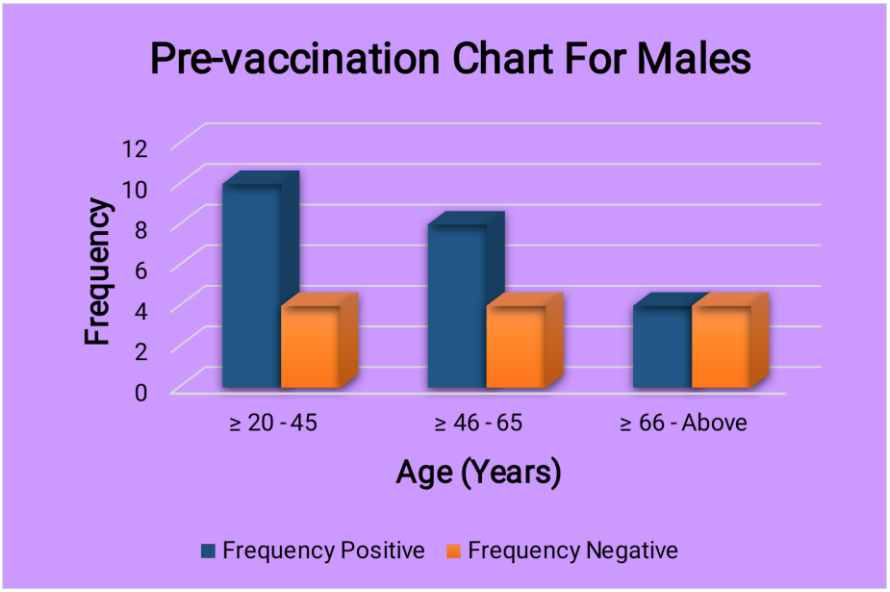

Figure 4. Pre-vaccination Chart for Males

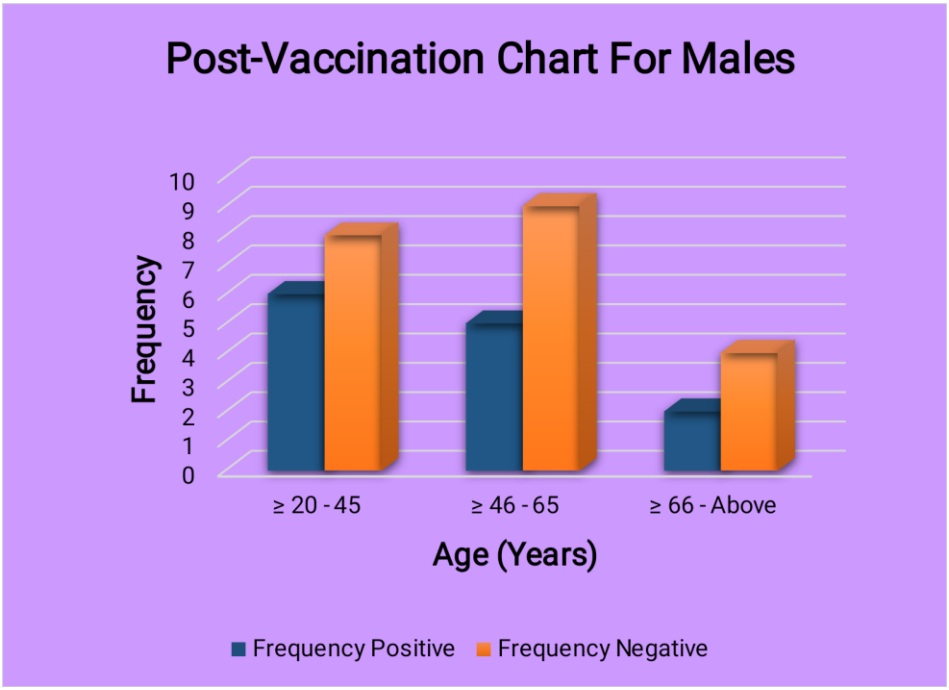

Figure 5. Post-vaccination Chart for Males

Table 3. Status of volunteers at Different Age Groups Pre and Post Vaccination in Females

Pre-vaccination For Females		
Age	**Frequency**	
	Positive	**Negative**
≥ 20 - 45	4	3
≥ 46 - 65	7	2
≥ 66 - Above	6	3
Post-vaccination For Females		
Age	**Frequency**	
	Positive	**Negative**
≥ 20 - 45	5	5
≥ 46 - 65	4	6
≥ 66 - Above	3	2

$\chi 2$ Cal = 4.75; $\chi 2$tab = 5.99. It is not significant at 0.05% level.

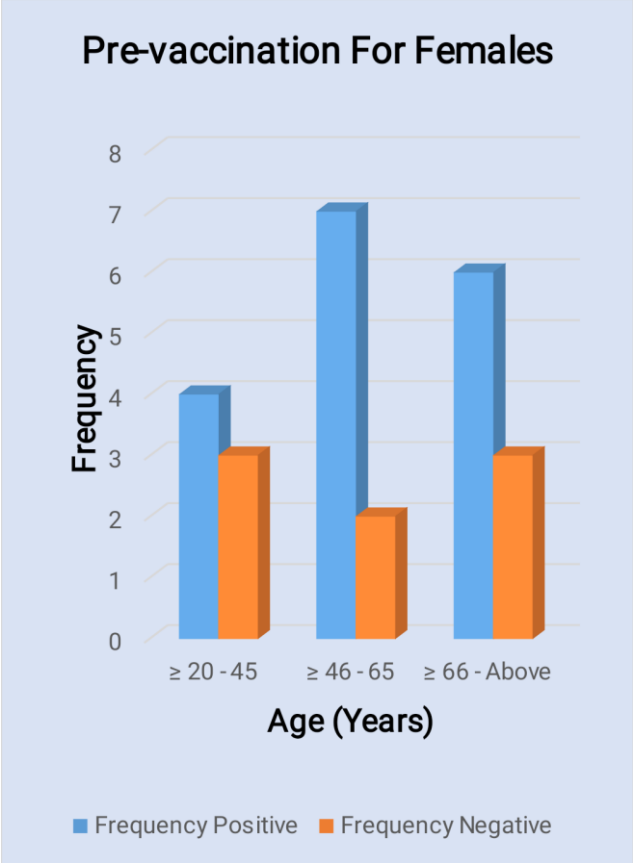

Figure 6. Pre-vaccination Chart for Females

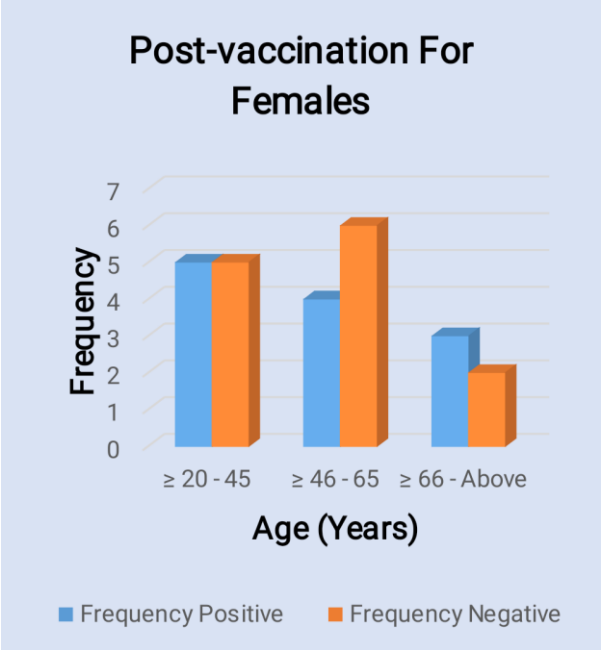

Figure 7. Post-vaccination Chart for Females

Table 4. The Status of Male Volunteers at Different Age Groups using Local Remedy Pre and Post Lipids Mixture Administration

Pre-Local Lipids Mixture Remedy Usage for Males		
Age	**Frequency**	
	Positive	**Negative**
≥ 20 - 45	10	8
≥ 46 - 65	15	5
≥ 66 - Above	5	3
Post Local Lipids Mixture Remedy Usage for Males		
Age	**Frequency**	
	Positive	**Negative**
≥ 20 - 45	0	18
≥ 46 - 65	0	20
≥ 66 - Above	0	8

$\chi 2$ Cal = 38.39; $\chi 2$ tab = 5.99. Significant difference exists in the level of potency between pre and post herbal drug administration.

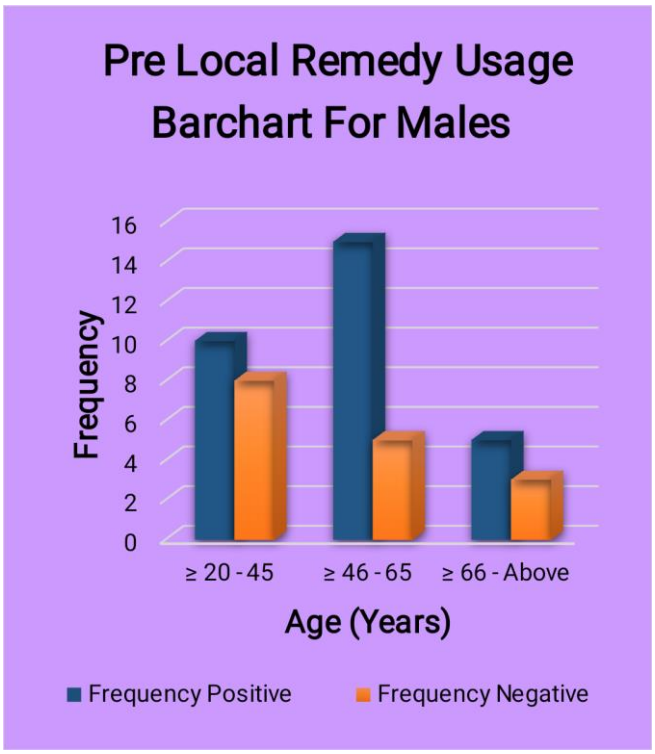

Figure 8. Pre-Local Remedy Usage Chart for Males

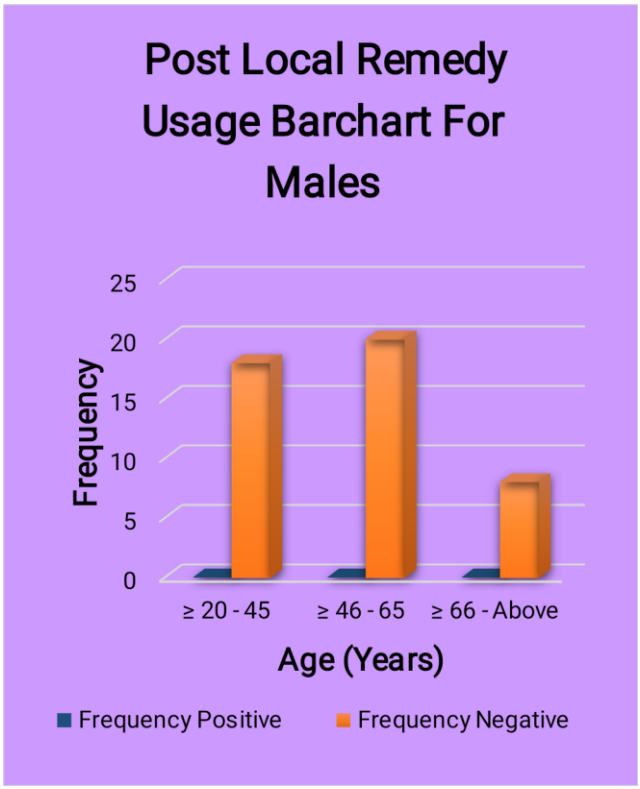

Figure 9. Post Local Remedy Usage Chart for Males

Table 5. The Status of Female Volunteers at Different Age Groups using the Local Remedy at Pre and Post Administration

Pre-Local Lipids Mixture Remedy Usage for Females		
Age	**Frequency**	
	Positive	**Negative**
≥ 20 - 45	4	2
≥ 46 - 65	7	1
≥ 66 - Above	2	4
Post Local Lipids Mixture Remedy Usage for Females		
Age	**Frequency**	
	Positive	**Negative**
≥ 20 - 45	0	6
≥ 46 – 65	0	8
≥ 66 - Above	0	6

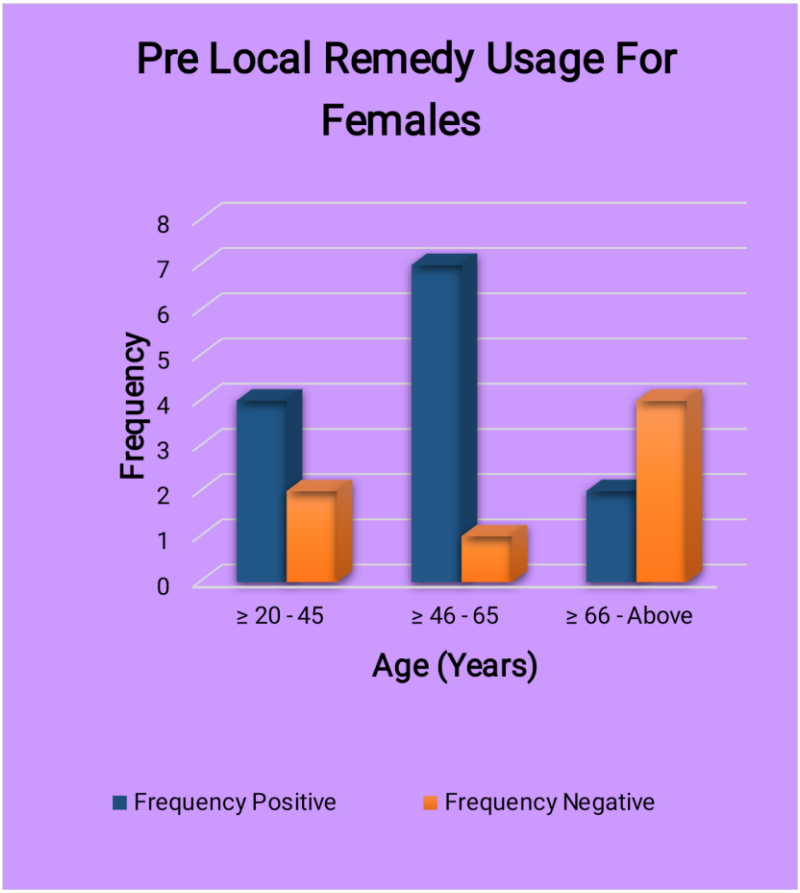

Figure 10. Pre-Local Remedy Usage Chart for Females

Tables 2 & 3: show the status of volunteers at different age groups of pre and post vaccination in males and females. Chi-square ($\chi^{2)}$ Cal = 30.86 ;($\chi^{2)}$ tab = 5.99. Significant difference exists in the level of local drug potency between pre and post herbal drug administration. We have no reason to reject alternate hypothesis and as such it was retained based on current evidence.

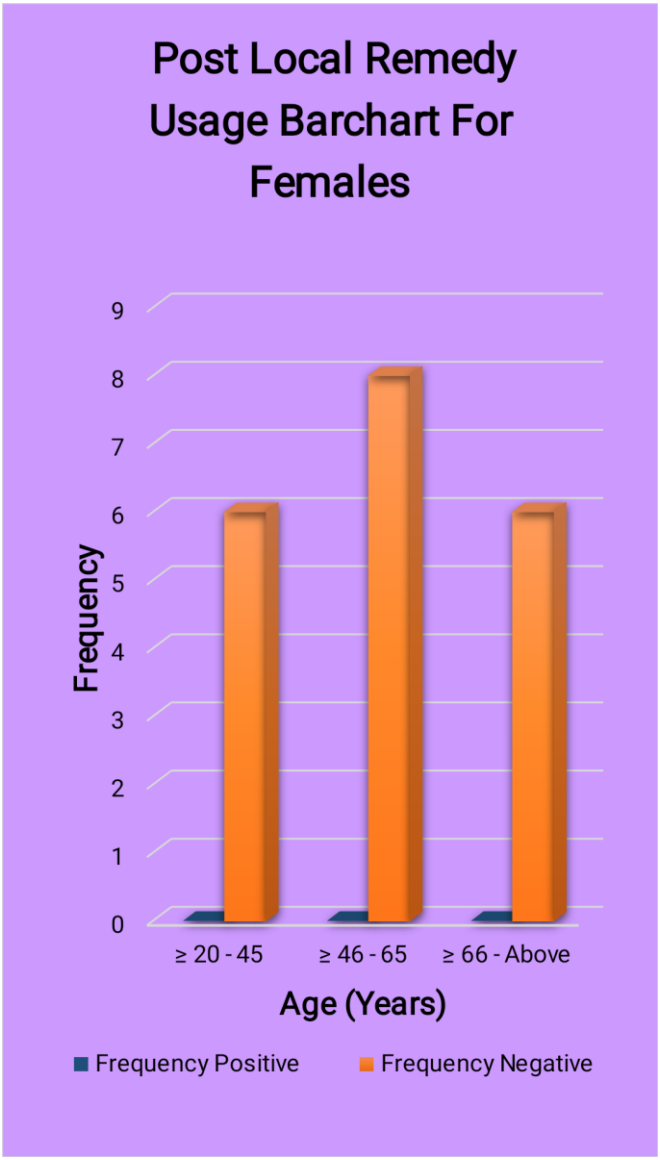

Figure 11. Post Local Remedy Usage Chart for Female

Interpretation of Data

The responses to the questionnaire by the respondents were presented in the form of Tables by using chi-square to assess the proportion of infectivity.

Discussion

In Table 1, 121 volunteers were present. 80 male and 41 female volunteers agreed to be part of the trial. 16 males and 4 females opted out of the study (i.e., they neither took the vaccine nor used the local remedy). 34 male volunteers agreed to be tested before administration of the vaccine, 22 male volunteers tested positive while 12 males were negative. At post vaccine administration, 13 volunteers were still positive while 21 were negative. This indicated that the vaccine had no 100% curative effect. This is in line with report from the Dutch Health Authority on the 5th of December 2021 who reported that 13 cases of the new Omicron coronavirus variant, have been found in the Netherlands among passengers that were on two flights from South Africa that arrived on Friday 3rd of December 2021 [21]. They were among 61 passengers who tested positive for COVID 19 on the two flights, which carried about 600 passengers.

In Table 2, we observed that Chi-square calculated was higher than chi-square tabulated,

indicating high level of significance therefore we have not enough evidence to retain the null hypothesis hence the alternative hypothesis one (1) was accepted. More female volunteers tested positive post vaccine administration, which shows that the vaccine's efficacy with these regards still has a lot of queries!

Out of 80 male volunteers, 46 males agreed to use the local remedy while 20 females also vie for local remedy. In Tables 4, we observed that with these values: Chi-square (χ^2 Cal = 38.39; χ^2 tab = 5.99) and (χ^2 Cal = 30.86; χ^2 tab = 5.99), the values are significant at 0.05% level, therefore we had not enough evidence to accept the two null hypotheses, and hence their alternative hypotheses were retained in the two cases considered together. This means we have not enough evidence to reject the alternate hypothesis, hence it was retained.

Conclusion

Gaps/pitfalls exist across all ages (unisex) in the secular management of COVID-19 pandemic due to excessive concentration of COVID-19 management on different orthodox vaccines and pharmaceutical measures without appraising these against other possible local herbal remedies (lipids) which had been in use since creation. We strongly suggest that cold viruses such as corona virus 2 that mutate a lot may not be effectively combated and handled by orthodox vaccine. Efforts must be geared towards the mass production and development of simple antivirals such as the natural lipids mixture used in this study termed "*Joseleen herbal lipids mixture (Johvir)"*. As it was significantly sensitive as COVID 19 antiviral agent ($P < 0.05$) χ^2 Cal = 30.86; χ^2 tab = 5.99).

Recommendations

1. I recommend that usage of herbal remedies for the cure of Covid-19 should be upheld.
2. The side effects of the local remedy are minimal.

Acknowledgement

Special appreciation goes to the Health Research Ethics Committee Institute of Public Health, Federal Ministry of Health, and Abuja, opinion leaders in the communities under each Local Government Area of study in FCT and also staff of Nigeria Institute of Pharmaceutical Research and Development (NIPRD), Idu. Appreciation goes to my guide Dr Joseph Ajobiewe for tireless effort in scrutinizing the project.

Conflict of Interest

There is no conflict of interest as this thesis is an original work and has not been presented nor published in any journal.

References

[1] Tella, A.,1979, Preliminary studies on nasal decongestant activity from the seed of the shea butter tree. Butyrospernum parkii. *British Journal of Clinical Pharmacology*. May 7(5):495-497. doi:10.1111/j.1365-2125.1979.tb00992.x. PMID: 89854; PMCID: PMC1429586.

[2] Akihisa, T., Kojima, N., Kikuchi, T., Yasukawa, K., Tokuda, H., Masters, E. T., & Manosroi, J., 2010. Anti-inflammatory and chemo preventive effects of triterpene cinnamates and acetates from shea fat. *Journal of oleo science*, 59(6), 273-80. doi: 10.5650/jos.59.273. PMID: 20484832.

[3] Mclintosh, K., 1974, Converses; a Comparative review. *Current Top Microbial Immunol*, 63 (2), 85-129. https://doi.org/10.1007/978-3-642-65775-7_3.

[4] Mizzen, L., Hilton, A., Cheley, S., & Anderson, R., 1985, Attenuation of murine coronavirus infection by ammonium chloride. *Virology*, 142(2), 378-88. doi: 10.1016/0042-6822(85)90345-9 PMCID: PMC7131027PMID: 2997991.

[5] Tyrell, D. A., Alexander, D. J., Almeida, J. D., Cunningham, C. H., Easterday, B. C., Garwes, D. J., Hierholzer, J. C., Kapikian, A., Macnaughton, M. R., & Mclntosh, K., 1978, Coronaviridae: second

report. *Intervirology*, 10(6), 321-27.doi:10.1159/000148996.

[6] Cavanagh, D., Brian, D. A., Enjuanes, L., Holmes, K. V., Lai, M. M., Laude, H., Siddell, S. G., Spaan, W., Taguchi, F., & Talbot, P. J., 1990, Recommendation of the coronavirus study group for the nomenclature of the structural proteins, mRNAs, and genes of coronaviruses, 176(1), 306-7. doi: 10.1016/0042-6822(90)90259-t. PMID: 2184577; PMCID: PMC7130901.

[7] Koopmans, M., & Horzinek, M. C., 1994, Toroviruses of animals and humans: a review. In Advances in virus research, Vol. 43, pp. 233-273. doi: 10.1016/s0065-3527(08)60050-0. PMID: 8191955; PMCID: PMC7130569.

[8] Siddell, S., Wege, H., & Ter Meulen, V., 1983, The biology of coronaviruses. *Journal of General Virology*, 64(4): 761-76. DOI:10.1099/0022-1317-64-4-761.

[9] Snijder, E. J., & Horzinek, M. C., 1993, Toroviruses replication, evolution and comparison with some members of the coronavirus-like superrammy. *Journal of General Virology*, 74(11), 2305-16. doi: 10.1099/0022-1317-74-11-2305. PMID: 8245847.

[10] Boursnell, M. E., Brown, T. D., Foulds, I. J., Green, P. F., Tomley, F. M., & Binns, M. M., 1987, Completion of the sequence of the genome of the coronavirus avian infectious bronchitis virus. *Journal of General Virology*, 68(1), 57-77. doi: 10.1099/0022-1317-68-1-57. PMID: 3027249.

[11] Bredenbeek, P. J., Pachuk, C. J., Noten, A. F., Charite, J., Luytjes, W., Weiss, S. R., & Spaan, W. J., 1990, The primary structure and expression of the second open reading frame of the polymerase gene of the coronavirus MHV-A59: a highly conserved polymerase is expressed by an efficient ribosomal frame shitting mechanism. *Nucleic acid research*, 18(7), 1825-32. doi: 10.1093/nar/18.7.1825. PMID: 2159623; PMCID: PMC330602.

[12] Ching, L., Chang, S. P., Nerurkar, V. R. (2020). Principles Behind the Technology for Detecting SARS-CoV-2, the Cause of COVID-19. *Hawaii J Health Soc Welf.* 1;79(5):136-142. PMID: 32432217; PMCID: PMC7226308.

[13] Serwaa, D., 2020, Knowledge, risk perception and preparedness towards coronavirus disease- 2019 (COVID-19) outbreak among Ghanaians: a quick online cross-sectional survey. *Pan African Medical Journal*, 35(2), 44 -55. PMID: 33623569 PMCID: PMC7875746 DOI: 10.11604/pamj.supp.2020.35.2.22630.

[14] Spaan, W., Cavanagh, D., & Horzinek, M. C. 1995, Coronaviruses: structure and genome expression. *Journal of General Virology*, 69(12), 2939-52. DOI: 10.1099/0022-1317-69-12- 2939.

[15] Federal Capital Territory | Location & Geography | Britannica", January 2015.

[16] Raju, V. N., & Harinarayana, N. S., 2016, Online survey tools: A case study of Google Forms. Paper presented at the National Conference on "Scientific, Computational & Information Research Trends in Engineering, GSSS-IETW, Mysore. 67 – 72.

[17] Nigeria Centre for Disease Control (NCDC) (2020). Coronovirus (COVID-19) Highlights: Case Summary in Nigeria 7th April, 2020. https://covid19.ncdc.gov.ng.

[18] Kevadiya, B. D., Machhi, J., Herskovitz, J., Oleynikov, M. D., Blomberg, W. R., Bajwa, N Soni, D, Gendelman, H. E. (2021). *Diagnostics for SARS-CoV-2 infections. Nat Mater* 20(5):593-605. doi: 10.1038/s41563-020-00906-z. PMID: 33589798; PMCID: PMC8264308.

[19] Corman, V. M., Landt, O., Kaiser, M., (2020), Detection of 2019 novel coronavirus (2019-nCoV) by real-time RT-PCR. *Euro Surveill.* ((3)) doi: 10.2807/1560-7917.ES.2020.25.3.2000045. [PMC free article] [PubMed] [CrossRef] [Google Scholar]

[20] Kadam, P. and Bhalerao, S., (2010). Sample Size Calculation. *International Journal of Ayurveda Research,* 1, 55-57. http://dx.doi.org/10.4103/0974-7788.59946.

[21] Jeurissen, P., Maarse, H., 2021, The market reform in Dutch health care: Results, lessons, and prospects [Internet]. Copenhagen (Denmark): European Observatory on Health Systems and Policies. PMID: 35143144.