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Covid-19 Vaccine Hesitancy in Northern Nigeria

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Abstract

The rapid development of the Covid-19 vaccine candidates through new and improved technologies and the rapidity with which these vaccine candidates were trialed and approved for public administration was highly commendable. However, the rapid administration of the Covid-19 vaccines raises a lot of concern among various world populations. This concern, relating directly to the safety and intents of the big pharmaceutical companies and governments, has led to the greatest form of health promotion initiative resistance in recorded human history. The universal level of hesitancy against the Covid-19 vaccines is now a subject of major concern among public health experts. This study which seeks to identify factors fostering Covid-19 vaccine hesitancy was conducted among the COVID-19 vaccine hesitant populations in Northern Nigeria. Findings from this study indicate that 84% of the study population makes use of the internet and other social media platforms for their news information sources. 42% of the study population would follow the guidance of their healthcare workers on issues relating to the Covid-19 vaccines. Covid-19 vaccine hesitancy in Northern Nigeria is largely fostered by a lack of appropriate information and a huge knowledge gap about the Covid-19 vaccines. It is, therefore, imperative that Government engages the young people of Northern Nigeria as critical stakeholders in the fight against Covid-19 vaccine hesitancy. Proper and tailored health educational programs, and meaningful engagements of religious leaders, parents, and healthcare workers in health promotion activities can help overcome the current challenge of Covid-19 vaccine hesitancy in Northern Nigeria.

Keywords: *Covid-19, Healthcare Workers, Immunization, Vaccine, Northern Nigeria, Vaccine Hesitancy.*

Introduction

The Covid-19 global pandemic has alerted the entire world to the poor state of the global public health emergency preparedness and readiness to combating emerging diseases [1]. While some parts of the world are gradually recovering from the devastating impacts of the Covid-19 global pandemic, other nations are still reeling and grossly embattled with the multi-variants of the SARS-CoV-2 infections. Yet, in the face of a common human enemy potent enough to cause devastating health and economic effects at a global level, there also was found a common and unified global resolve to defeating this enemy [2]. The rapid transmission rate and case fatalities associated with the SAR-CoV-2 infection created a global panic, and the pandemonium that ensues in a bid to curbing the spread of this infection has invariably led to a massive downturn in the global economy. There are now increasing records of Long Covid (LC) (long-term effects of Covid-19 infections) and increasing reports of mental health challenges directly relating to the after-effects of the Covid-19 lockdowns and movement/travel restrictions [3, 4].

The global resolve to defeat this common enemy led to the rapid exchange of scientific information during the lockdowns and travel

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restrictions. Real-time research findings were rapidly disseminated among researchers, and published papers in journals were readily and openly accessed on the internet. Research pre-prints were also made rapidly available for the ease of knowledge exchange among the global scientific body. These cross-cutting collaborations and cooperation led to the rapid development of vaccine candidates using new and advanced scientific technologies [2]. These vaccine candidates were rapidly trialed at various clinical and population-based settings, and rapid approvals were given for their administration at population levels. While the rapidity with which these Covid-19 vaccine candidates were given approvals for public administration raises lots of questions regarding safety and the intentions of the big pharmaceutical companies and governments, evidence has shown the many beneficial effects of these vaccines [5]. In addition, despite the inequitable distribution of the Covid-19 vaccines, the COVAX Initiative, through the efforts of the GAVI Alliance, has ensured that all nations of the world are able to get certain doses of the Covid-19 vaccines. Most African countries, especially the Sub-Saharan African (SSA) nations, have been disproportionately affected in these global inequities [6].

While the challenge of inequitable distribution exists in SSA, a greater challenge that has been recorded globally now borders on Covid-19 Vaccine Hesitancy, thus, the availability of the Covid-19 vaccine does not transmit into its acceptance among populations. The wave of social misinformation and disinformation and the politicization of vaccine science as regards the Covid-19 vaccines has led us back to an old but familiar challenge of vaccine hesitancy [7]. The pockets of vaccine hesitancy that have been recorded throughout human history have now reached an alarming rate in the 21st century [7]. Africa, and indeed Nigeria, has always battled with the challenge of vaccine hesitancy among its teeming population. The rejection of the Polio vaccine in Northern Nigeria and the protracted efforts it has taken the Nigerian Government to fighting poliomyelitis among its Northern population is a testament to this hesitancy [8]. The hesitancy towards the Covid-19 vaccine has, however surpassed the polio vaccine resistance. The Covid-19 vaccine hesitancy now cuts across all social demographics and religious inclines in Nigeria. The few available Covid-19 vaccines are now getting expired, with only a few members of the population accepting to take the vaccines [9]. This challenge is closely associated with the gross mistrust that the people have in the Nigerian Government. While studies have shown that some members of the population do not believe in the existence of Covid-19, some studies have also indicated the need for better education on the subject of Covid-19 vaccination among the population [10]. This study seeks to identify the factors fostering Covid-19 vaccine hesitancy among the population of Northern Nigeria. It is hoped that a thorough understanding of these factors will help inform the implementation science approaches to be employed at reaching the Covid-19 vaccine hesitant population in Northern Nigeria.

Theoretical Framework

Vaccine hesitancy in Northern Nigeria is not new as this part of the country has always battled with the acceptance of vaccines. Lived experience with experimented vaccines trialed by a global pharmaceutical company, that eventually led to the death of several children in Northern Nigeria always comes up whenever a new vaccine is being introduced to this part of the country. The hesitancy against the Covid-19 vaccines in Northern Nigeria is therefore not a surprise as the people are always ready to relay the facts of their past experience. Studies from Northern Nigeria have all indicated a marked level of hesitancy on the part of the Northern Nigerian population to accepting the Covid-19 vaccines [8, 10]. *Objective of Study:* The objective of this study is to identify the factors influencing Covid-19 vaccine hesitancy among

the Covid-19 vaccine hesitant population of Northern Nigeria. *Problem Statement:* Despite the availability of the Covid-19 vaccines, a large number of the population in Northern Nigeria are hesitant to take the Covid-19 vaccines. *Research Question:* What are the factors influencing Covid-19 vaccine hesitancy among the Covid-19 vaccine hesitant population in Northern Nigeria?

Materials and Methods

Study Site and Population

This study is a clustered, and a randomized cross-sectional survey among the population of three (3) states in the three (3) geo-political zones of Northern Nigeria. The geo-political zones are North-East, North-West, and North-Central, respectively. The study was conducted between the months of January 2022 to April 2022 at the three mega cities of Yola, Kano, and Jos, respectively. The target population were Nigerian citizens of 18 years of age and above. While participation in the survey was voluntary and consensual, the semi-structured questionnaire was randomly administered to presenting and consenting individuals who have not taken the Covid-19 vaccine and who affirms their unwillingness to take the vaccine. Trained volunteers who helped in the administration of the questionnaires also helped in bridging the language barrier encountered by a few of the study participants who could not speak fluent English.

Sample Size Determination

The sample size for this study was determined using the Online *"Creative Research Systems®"* (CRS) sample size calculator at 99% Confidence Level (CL). The structured questionnaire was administered to randomly presenting, willing, and consensual participants.

Measures and Data Collection

The semi-structured questionnaire administered was designed into three key sections. The first section captured basic information on social demographics such as age, gender, religion, ethnicity, education, and employment status. The second section captures information on the perceived risks of contracting the Covid-19 infection, and this centers around the marital status of individual participants means of transportation, housing type, quality of food, observance of Covid-19 Infection Prevention and Control Measures (IPCMs), and family sizes. The third section asks questions about the drivers of Covid-19 vaccine hesitancy, including sources of information, Knowledge about the Covid-19 vaccine, future willingness to take the Covid-19 vaccine, history of vaccination, and the individual influencers of the Covid-19 vaccine uptake. The questionnaire was piloted with 100 participants who were later excluded from the study. The essence of this pilot study was to test the simplicity of the tool and to validate the use of the study questionnaire.

Data Analysis

Data collected in this study were analyzed with simple descriptive statistics, ANOVA, and the Pearson Correlation and Regression Analysis using the Excel Data Analysis Tool Pack. All collected data were securely kept in an encrypted format and duly archived in a backup folder.

Ethical Considerations

Participation in this study was totally consensual and voluntary, with Informed Consent sought only from the participants. All participants gave both verbal and written consent or thumb print before participating in this study. All information given are treated with confidentiality and complete anonymity. As the questionnaire contains simple, non-invasive measurements and questions dealing with basic demographics and social characteristics relating to Covid-19 Vaccine Hesitancy, and because this study focuses more strategically on the vaccine-hesitant population, there was no need for information or responses that could be linked to any participant.

Results

Because verbal and written consent was sought by the trained volunteers from the study participants, all respondents answered the questions in the questionnaire. The painstaking efforts of the Study Volunteers to ensure that all fields of the questionnaire were answered reflect in the successful administration of 500 hundred questionnaires at each of the three geo-political zones in Northern Nigeria. A total of 1,500 questionnaires were administered in Northern Nigeria as it regards this study.

Basic Social Demographics

Table 1. Gender Distribution among the Study Participants

Male	Female
860 (57%)	640 (43%)

From the total 1,500 participants in this study, 57% (n=860) were males, while 43% (n=640) were females. The statistical analysis of gender in relation to Covid-19 vaccine hesitancy reveals a perfect negative correlation (r=-1), with a p-value =1 at a 95% Confidence Level (CL). With F stat (0) < F crit (9.6), it is thus concluded that gender has no significant relationship with Covid-19 vaccine hesitancy in Northern Nigeria.

Table 2. Age Distribution of the Study Participants (Years)

18-24 Yrs	25-31 Yrs	32-38 Yrs	39-45 Yrs	46-52 Yrs	>53 Yrs
370 (25%)	470 (31%)	340 (23%)	110 (7%)	120 (8%)	90 (6%)

The data above reveals a majority of the Covid-19 vaccine hesitant population in Northern Nigeria are young adults and middle-aged individuals between 18 to 38 years (79%). At the same time, the statistical analysis gives a p-value =1, with an F stat (0) < F crit (3.7), the correlation analysis (r=0.78) gives a very strong positive correlation between age and Covid-19 vaccine hesitancy in Northern Nigeria.

Table 3. Religions of the Study Participants

Christianity	Islam	Traditional Religion	Others
840 (56%)	638 (42.5%)	20 (1.3%)	2 (0.2%)

Religion plays a major role in Nigerian society. Hence, a total of 98.8% of the study participants actively practice one form of religion or the other. The statistical analysis of collected data reveals an F stat (0) < F crit (4.3) with a p-value =1. This shows that the relationship between religion and Covid-19 vaccine hesitancy is not statistically significant. However, a correlation value of r=0.90 shows a very strong positive correlation between religion and Covid-19 vaccine hesitancy in Northern Nigeria.

Table 4. Educational Levels of the Study Participants

Primary	Secondary	Tertiary	No Education
60 (4%)	270 (18%)	1150 (77%)	20 (1%)

A majority of the study participants had tertiary education (77%), with only 1% (n=20) of the study population who did not have any form of educational training. The majority of the study participants (n=1,480) have had one form of education or the other. The statistical analysis

reveals no significant relationship between education and Covid-19 vaccine hesitancy (p-value=1); however, the correlation analysis reveals a perfect positive relationship (r=1) between education and Covid-19 vaccine hesitancy in Northern Nigeria. This clearly indicates that academic education and Covid-19 vaccine hesitancy are akin to each other, especially in Northern Nigeria.

Table 5. Nature of Employment of the Study Participants

Government	Private/Business	NGO	Farming	Student
440 (29.3%)	440 (29.3%)	80 (5.3%)	100 (6.7%)	440 (29.3%)

The majority of the participants in this study tend to be evenly spread in their employment endeavors. Government civil servants, those in private and self-managed businesses, and students all have an equal distribution of 29.3% each. Participants in farming practices were 6.7% (n=100), while participants working with Non-Governmental Organizations (NGOs) represent 5.3% (=80) respectively.

Perceived Risks of Contracting Covid-19

Table 6. Marital Status of the Study Participants

Married	Single
670 (44.7%)	830 (55.3%)

While the marital status of individuals can be used to assess the perception of risk, especially in relation to the Covid-19 pandemic, this parameter has, however had no impact on the Covid-19 vaccine hesitant population in this study. From the total of 1,500 participants, 55.3% (n=830) were single and yet to be married, while 44.7% (n=670) were already married. The narrow margin between these two populations could be an indicator of the lack of any major significance between marital status and Covid-19 vaccine hesitancy in Northern Nigeria.

Table 7. Personal Means of Transportation of the Study of Participants

Yes	No
520 (35%)	980 (65%)

The above table shows that 65% (n=980) of the study population not having a personal means of transportation but rather relying on public means of transportation. Commuting by public means on each day of the week is a potential source of exposure to the Covid-19 infection. With many citizens and members of the population not adhering to the Covid-19 IPCMs, commuting through public means remains an active source of risk and a means through which the SARS-CoV-2 can be contracted.

Table 8. Housing types of the Study Participants

Personally Built Housing	Family Housing	Rented Apartments
350 (23%)	730 (49%)	420 (28%)

The data presented in the table above reveals 49% (n=730) of the study participants lived in communal or family houses. Family houses usually consist of members of the extended

family. The congestive nature of family or compound houses makes for the easy spread of the SARS-CoV-2 infection, especially in places where the Covid-19 IPCMs are not observed. While communal living is a way of life that is well encouraged in most parts of Africa, and in Nigeria in particular, this poses a risk for major infectious disease transmissions among family members.

Table 9. Negative Impacts of the Economic Downturn on the Quality of Food Available to the Study Participants

Yes	No
1160 (77%)	340 (23%)

Nutrition remains an integral component of maintaining good health and well-being. To fight diseases and other infectious agents, the body needs to have built enough immunity that can only be acquired through good nutrition or through immunization. With the emergence of Covid-19 in late 2019, the world has witnessed a tremendous economic downturn, which has affected all countries, families, and individuals. 77% (n=1,160) of the study population indicates that the current spate of the economic downturn has affected their nutritional status. This is because their individual abilities to purchase good nutritive food has grossly diminished. Poor nutrition invariably leads to poor or low levels of immunity, and this remains a very strong predisposing factor to easily contracting the SARS-CoV-2 infection.

Table 10. Family Sizes Distribution among the Study Participants

1-3 Members	4-6 Members	7-9 Members	>9 Members
390 (26%)	560 (37%)	360 (24%)	190 (13%)

With the communal nature of living in Northern Nigeria, it is no surprise that the average family size at this part of Nigeria ranges between 4 to 6 children. A staggering 61% (n=920) of the study population live in families of between 4 to 9 members. At the same time, 26% (n=390) live in families of three minimum members. In addition, 13% (n=190) of the study population lives in families with greater than 9 family members. It is important to note that the more members of families living in a single house, the higher the chances of contracting the SARS-CoV-2 infection.

Table 11. Observance of Covid-19 IPCMs among the Study Population

Yes	No
1170 (78%)	330 (22%)

It is of note that while the 1,500 participants in this study are a cohort of the Covid-19 vaccine hesitant populations in Nigeria, a majority of this population are very diligent at observing the Nigerian Government laid down Covid-19 IPCMs. 78% (n=1,170) of the study population observes the Covid-19 IPCMs, while 22% (n=330) remain adamant and not adhering to the Covid-19 IPCMs as instructed by the Government. It is also important to note that a handful of this population believes that Covid-19 is a hoax of the Government that further impoverish the population.

Drivers of Covid-19 Vaccine Hesitancy

Table 12. Sources of Information

Radio	Television	Internet/Social Media Platforms
470 (31%)	640 (43%)	1260 (84%)

While information remains key to human survival currently and age, the persistent wave of misinformation and disinformation in the 21st century is now a cause for concern. From this study, 84% (n=1,260) of the participants relies on the use of the internet and other social media platforms for their information sources. With the advent of mobile phones and other hand-held devices, people now prefer to get their information in real time and on the go. While 31% (n=470) and 43% (n=640) of the study participants still listen to traditional radio and television stations to get news information, a majority (84%) of the study population do not rely solely on these traditional channels to get information. The statistical analysis of this data reveals a very strong Positive correlation (r=0.89) between sources of information and Covid-19 vaccine hesitancy. While this relationship is not perfect, a calculated p-value=0.94 also shows that there is no significant relationship between sources of information and Covid-19 vaccine hesitancy among the study population.

Table 13. Participants Need for more Knowledge about the Covid-19 Vaccine

Yes	No
1320 (88%)	180 (12%)

The analyzed data from this study, as shown in Table 13 (above) reveals a staggering 88% (n=1,320) of the study population do not have adequate Knowledge about the Covid-19 vaccine. This data reveals a major knowledge gap between the Government of Nigeria, the Covid-19 program implementers, and the Nigerian population. Only 12% (n=180) of the study population seems to have adequate Knowledge about the Covid-19 vaccines. The statistical analysis of this data shows a perfect negative correlation (r=-1) between Covid-19 vaccine knowledge and Covid-19 vaccine hesitancy. Thus, this indicates that the lesser the level of Knowledge of people about the Covid-19 vaccines, the higher the chances of hesitancy. With a calculated p-value=0.04 [F stat (23.12) > F crit (18.51)], and at a CL of 95%, there is a significant positive relationship between the level of Knowledge about the Covid-19 vaccines and Covid-19 vaccine hesitancy in Northern Nigeria.

Table 14. History of Vaccination among the Study Participants

Yes	No
770 (51%)	730 (49%)

From the 1,500 participants in this study, 51% (n=770) have had a history of vaccination, while 49% (n=730) had no history of ever taking a vaccine. The correlation analysis reveals a perfect negative association (r=-1) between previous vaccination history and Covid-19 vaccine hesitancy. This clearly indicates that the lower the history of vaccine uptake, the higher the chances of not accepting the Covid-19 vaccine. A further ANOVA of the collected data gave a p-value=0.79, which indicates that there is no statistical significance between a history of vaccination and Covid-19 vaccine hesitancy.

Table 15. Willingness among the Study Participants to take the Covid-19 Vaccine only if recommended by any of the Followings

Imam	Pastor	Community Leader	Parents	Friends	Healthcare Workers	Teacher	Boss	Partner
220	230	70	430	80	630	40	30	150
(14.7%)	(15.3%)	(4.7%)	(28.7%)	(5.3%)	(42%)	(2.7%)	(2%)	(10%)

The data presented in Table 15, reveals three major influencers of Covid-19 vaccine uptake among the Covid-19 vaccine hesitant population in Northern Nigeria. Religious leaders have 30% (n=450) influence on the hesitant population, while parents have a 28.7% (n=430) influence on their wards. Healthcare Workers (HCWs), however have a staggering 42% (n=630) influence at convincing the Covid-19 vaccine hesitant populations to accept the Covid-19 vaccines. The statistical analysis of the primary data reveals a perfect negative correlation (r=-1) between the influences of religious leaders and parents on Covid-19 vaccine uptake. This clearly indicates that the higher the level of motivation to accept the Covid-19 vaccine from religious leaders and parents, the lower the level of hesitancy. Further analysis of the collected data however shows a perfect positive correlation (r=1) between the influences of HCWs on the Covid-19 vaccine-hesitant population in this study. This correlation data portends that the higher the level of engagement of HCWs at educating the Covid-19 vaccine hesitant population on the need to take up the Covid-19 vaccines, the higher will be the level of acceptance among the hesitant population.

Discussion

The deleterious impacts of the global Covid-19 lockdowns on routine immunizations and the global Covid-19 vaccine hesitancy challenges are well documented across all regions of the world [11-14]. Findings from this study has revealed some critical Covid-19 implementation science gaps in Northern Nigeria. While the Government of Nigeria and other national and international donor/funding agencies are making efforts to mitigate the impacts of the Covid-19 global pandemic on the Nigerian population, it is also imperative that our approaches and methods at reaching the population be well-guided. Data from this study has shown a well-defined age group, among which the possibility for Covid-19 vaccine hesitancy is much higher (18-38 years). Younger to middle-aged adults who are mostly unmarried or single and who mostly live in extended family houses have higher chances of being hesitant to the Covid-19 vaccine uptake in Northern Nigeria.

It can be seen from this study that a majority (84%) of the population of Northern Nigeria gets their news information from the internet and other social media platforms. The advent of mobile phones and other hand-held devices has made possible the availability of new information on the go. Studies have shown that many citizens in Northern Nigeria do not believe that Covid-19 exists [10], and many more believe that Covid-19 is a government hoax at further deceiving the population [15]. While much has been published about the disinformation created by some religious leaders, fake news information, political distrust in leadership, and the failure of some parents to permit their wards to take the Covid-19 vaccines [16-18], findings in this study has highlighted the need to bridge the Covid-19 vaccine knowledge gap found among 88% of the study population. Many have heard about Covid-19, yet, they still do not have an understanding on how the Covid-19 vaccines were developed and how these could be rapidly approved for public administration without ill intentions on the part of governments. Many skeptics among the Covid-19 vaccine hesitant population exists, but

this skepticism is akin to the inadequate Knowledge about the Covid-19 vaccine currently prevalent among the population. In view of the findings from this study, however, much needs to be done at better educate the population on subjects relating to the Covid-19 vaccines. In addition, with the protracted history of vaccine hesitancy in Northern Nigeria [19, 20], and the gross disconnect between political leaders and the citizens, the Government of Nigeria needs to do more in a bid to ease this strained relationship between the leaderships and their followers. Neglecting the place of trust in governance could also account for vaccine apathy as currently being witnessed with the Covid-19 vaccine hesitancy in Northern Nigeria [21]. With distrust in what the Government has to say comes the quest for answers from other sources. However, in the absence of adequate self-efficacy and the inability to assess the right digital or online information, people can be easily misinformed [22]. In a survey study conducted in the Philippines and Malaysia, online information seeking was found to be one of the factors negatively impacting confidence in the Covid-19 vaccines [14].

This study has revealed a critical gap relating to the influence of the Nigerian HCWs on the Covid-19 vaccine hesitant population. There is a perfect positive correlation between the influence of HCWs and Covid-19 vaccine hesitancy. Many Covid-19 vaccine hesitant populations (42%) are waiting for their respective HCWs to educate and convince them on the need to accept the Covid-19 vaccines. Several global studies and reviews have corroborated the findings in this study, thus, showing the powerful influence of HCWs on healthcare seekers and their ability to use their prime positions to convince the population to accept the Covid-19 vaccines [23-26]. 30% of the participants in this study agreed that they would follow the guidance of their religious leaders. This puts religion and religious leaders in a prime position of influence when it comes to the acceptance of the Covid-19 vaccine among the populations of Northern Nigeria. Religion plays a vital role in the lives of the citizens of Nigeria as it affects all facets of social, political, and economic life. In a cross-sectional survey on Covid-19 vaccine confidence and hesitancy in the Philippines and Malaysia, religion was found as one of the factors negatively impacting confidence in the Covid-19 vaccine uptake [14].

The influence of parents on their wards regarding decision-making cannot be overemphasized. Despite the adult population involved in this study, a surprising 28.7% of the study participants indicated that their decision to take the Covid-19 vaccines is dependent upon the guidance of their parents. This strong influence of parents on vaccine uptake by their wards have been supported by findings from several other studies at different parts of the world (27-30].

Many studies and literature have suggested ways to overcome the present wave of Covid-19 vaccine hesitancy among the population [31, 32]. However, it is imperative that informed and well-tailored strategies be employed to overcome the present challenge facing the nation and in effect, the global community. Findings from this study clearly agree with the findings from other researchers in the country on the need to device strategic implementation science approaches to combating the current challenge [33, 34]. The Nigerian Government and its health promotion agencies need to do more to reach out to the population through all means of news and information dissemination. Emphases now need to be placed on the use of the internet and other social media platforms to reach the Nigerian population with news information. Social media platforms and groups now need to be meaningfully engaged with health promotion discourses surrounding Covid-19 testing and vaccinations. Due to the lack of adequate information about the development of the Covid-19 vaccines, 88% of the study participants seek for better information through various online and social media platforms. The misinformation and conspiracy theories peddling on these social

media and online platforms, however, further confuse the choices and decisions of individuals regarding the Covid-19 vaccines. With low self-efficacy at assessing and identifying the right information, the individual is discouraged from accepting the Covid-19 vaccine. The dilemma created, however, opens the opportunity for the HCWs to help guide and convince the Covid-19 hesitant individual to accept the Covid-19 vaccines. Thus, accepting the Covid-19 vaccines in Northern Nigeria is largely dependent on the level of self-efficacy of the individual at identifying the right information about the Covid-19 vaccines and the influencing power of HCWs.

Strengths of the Study

This study was conducted at the three geo-political zones of Northern Nigeria, with three mega cities selected for this study due to cost implications. One (1) mega city was selected from each of the three (3) geo-political zones. While several studies have been conducted on various topics relating to Covid-19 in some parts of Northern Nigeria, this is the first study to be conducted among clusters of Covid-19 vaccine-hesitant populations in Northern Nigeria. This study also identifies, very specifically, factors influencing Covid-19 vaccine hesitancy among the population of Northern Nigeria. A much larger study on Covid-19 vaccine Hesitancy in Northern will be needed to cover all the states in Northern Nigeria. Such a study will further help to firmly establish the findings in this study.

Conclusion

While not neglecting the traditional use of radio and television stations, the young population of Northern Nigeria now needs to be actively engaged as critical stakeholders in the dissemination of information surrounding Covid-19 health promotions. Religious leaders and parents need to be actively engaged on topics relating to the Covid-19 vaccines. Adequate education and the engagement of religious leaders and parents as critical stakeholders in the well-being of their followers and wards will further strengthen the good intention of the Government at assuring good health for all its citizens. HCWs at all levels need to be well-educated on subjects relating to Covid-19, including Covid-19 vaccinations. Because studies have shown the lack of motivation and drive on the part of HCWs to accept the Covid-19 vaccines [35, 36], it is imperative that HCWs in Northern Nigeria become aware of their status as critical stakeholders in the current efforts aimed at ensuring that Nigeria attains a safe level of herd immunity against the SARS-CoV-2 infection. All HCWs should be actively engaged in continuous Covid-19 education exercises and certification programs. With 42% of the Covid-19 vaccine-hesitant population in Northern Nigeria relying on their HCWs to guide them on issues relating to the Covid-19 vaccines, it is most urgent that the Government of Nigeria, through the Federal Ministry of Health (FMoH) and its allied agencies, organize training programs and webinars aimed at further educating its health workforce on the subject of Covid-19 and other related subjects. When the population, the religious leaders, parents, and HCWs are well equipped through proper education on subjects surrounding health promotions, including Covid-19 related topics, it is obvious from this study that only then can we foster a society devoid of misconceptions about the safety of the Covid-19 vaccines.

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Declaration

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Conflict of Interest

The author declares no conflict of interest.

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