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KNOWLEDGE AND ATTITUDE TOWARDS COVID-19 VACCINES AMONG UNDERGRADUATE STUDENTS IN A PRIVATE TERTIARY INSTITUTION IN NIGERIA

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Abstract - *The study assessed the Knowledge and attitude towards COVID-19 vaccines among undergraduate students in a private tertiary institution. The study sample was 335 students. Data was analyzed using descriptive statistics, findings were illustrated using textual descriptions, and graphs, with frequencies and percentages. From the results, Gender distribution revealed that 254 (75.8%), of the participants were females, while the remaining 81 (24.2%) were males. The students' awareness and sources of information on COVID-19 vaccines show that, 98.5% of participants are aware of the vaccines. Out of which majority, 64.2%, were informed through social media platforms. While 35.2% through official government channels and newspapers. Personal interactions were also influential, as 38.2% credited family and friends for enlightening them about the vaccines. When examining the student's attitude towards the vaccine, those who said they hadn't any of the COVID-19 vaccines were asked to give the reasons for not receiving the vaccine were Concerns about vaccine safety 109(41.9%), Lack of information about vaccines 51 (19.6%) Personal beliefs or values 42 (16.2%), Medical reasons 22 (8.5%) Lack of access to vaccines 36(13.8%), Age-related reasons 8 (3.1%) and Other unique reasons 7 (2.7%). The reasons influencing their stance were Vaccine efficacy accounted for 100 (35.5%), Vaccine safety was 142(50.4%), Trust in healthcare authorities was 128(45.4%), Trust in vaccine manufacturers had 88(31.2%), Recommendations from family and friends were 81(28.7%), Media coverage stood at 74(26.2%), and Personal beliefs or values at 76(26.6%).*

***Key Words*: Students, knowledge, attitude, Covid-19**

1. INTRODUCTION

The World Health Organization (WHO) declared the novel Coronavirus a global pandemic on the 11th of March, 2020. (Cucinotta & Vanelli, 2020) This was after a series of acute respiratory diseases were reported in Wuhan China in December 2019. These outbreaks were eventually traced to be caused by the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2, 2019-nCoV) christened 'COVID-19'. (Yuki et al., 2020) In the absence of vaccines or curative drugs, public health measures were quickly adopted and tweaked daily to accommodate the rapid changes we were faced with across the globe. Countries adopted the swift implementation of lockdowns, use of personal protective equipment, border closures, contact tracings, quarantine, and isolation to manage the spread and attempt to flatten the curve. (Mudenda et al., 2022b).

In Nigeria, the National Center for Disease Control and Prevention under the Ministry of Health issued a communique indicating the first confirmed case found in Lagos was reported on the 28th of February 2020 (Jacobs & Okeke, 2022). Infection rates apparently remained on a steady increase for about a month. A steep rise in cases began in mid-April and continued over time with occasional declines. At the beginning of the pandemic, an early COVID-19 modelling report identified Nigeria as a country with high importation risk and susceptibility to the virus (Gilbert et al., 2020). University campuses can be attributed to certain characteristics that raise the risk of COVID-19 spreading. From overcrowded classrooms and hostels to poor health behaviours among young people and unavoidable regular interactions among students, staff and other members of the university community.

On the 2nd of March, 2021, Nigeria received its first shipment of nearly 4 million doses of AstraZeneca/Oxford vaccine via the COVAX facility from Mumbai. (Unicef, 2021) Since then, other brands (Moderna, Johnson & Johnson and Pfizer vaccines) have been shipped in from the COVAX Facility and the African Union (UNICEF, n.d.) to strengthen the immunity of the population against the COVID-19 virus. The influx of these vaccines was indeed a step in the right

direction to releasing the burdens of the virus on the already flawed healthcare system in the country, however, the different demographic, socio-cultural, and psychological factors peculiar to different individuals threatened the acceptability of COVID-19 vaccines worldwide and of course among students. Students in tertiary institutions are expected to be more knowledgeable and logical about general health issues which should influence their health-seeking behaviours. As a result, they are more likely to contribute to public access to credible and evidence-based health information about the COVID-19 virus. Comprehensive evaluations of university students' knowledge and attitude are necessary to serve as essential data to stakeholders for identifying field gaps and developing initiatives to better motivate communities to adhere to health standards. Additionally, educational institutions, health programmers and government agencies may use this information to inform how to engage university students on the subject of vaccine hesitancy. The purpose of this study was to assess students' knowledge and attitudes toward COVID-19 vaccines and analyze the different factors that affect these variables.

1.1 Problem statement

The Knowledge and Attitude towards COVID-19 vaccines among students in a tertiary institution have become a critical concern due to the need for widespread vaccination to mitigate the impact of the pandemic. Despite the availability of vaccines, there exists a gap in understanding the level of knowledge and the attitudes held by students towards COVID-19 vaccines. This knowledge gap hinders the effective implementation of vaccination campaigns and may pose challenges in achieving the desired vaccination rates a

mong the student population. Therefore, a comprehensive investigation is necessary to assess the knowledge and attitudes towards COVID-19 vaccines among students in tertiary institutions, identifying potential barriers and formulating strategies to enhance vaccine acceptance and uptake.

Research Questions

1. What is the level of knowledge of the students about COVID-19 vaccines?

2. What is the attitude of students towards COVID-19 vaccines?

3. Is there any correlation between the knowledge and attitude among the students towards COVID- 19 vaccines?

4. Is there a relationship between the socio-demographic characteristics and the Knowledge of COVID- 19 vaccines?

5. Is there a relationship between the socio-demographic characteristics and the attitude of COVID-19 vaccines?

Objectives:

1. To assess the level of knowledge and attitude towards COVID-19 vaccines among students in a tertiary institution.
2. To establish the relationship between the knowledge and attitude among the students, towards COVID-19 vaccines.
3. To determine the relationship between the socio-demographic characteristics of students and the knowledge and attitude of study of COVID-19 vaccines.

2. Literature Review

2.1 COVID-19

The World Health Organization (WHO) has defined COVID-19 as an infectious disease caused by a newly discovered coronavirus. (Cucinotta & Vanelli, 2020) Specifically, COVID-19 is caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). The initial cases of SARS were reported in Asia in February 2003 and subsequently spread to multiple countries in North America, South America, Europe, and Asia before the global outbreak was contained. Due to the high contagiousness and rapid spread of the coronavirus, the global impact of COVID-19 has been devastating, affecting nearly all countries worldwide. Concealed transmission of the virus within and among communities has been difficult to curtail since detecting mild and asymptomatic cases is challenging. It is argued that the virus has now transitioned into a seasonal, low-level epidemic and so more and more individuals and communities have developed an underestimated risk perception of the virus. Also, a COVID-19 vaccine has been developed but despite the established history of vaccines as a medical intervention in Nigeria, there remains a concerning disregard for the urgent and indispensable necessity of COVID-19 vaccination among the population. The prevailing issue of COVID-19 vaccine apathy and entrenched hesitancy within communities may be attributed to the dissemination of misinformation and disinformation about the nature of COVID-19 vaccines.

2.2 Knowledge of COVID-19 vaccines

The knowledge about COVID-19 vaccines encompasses factors such as vaccine awareness among individuals and communities, awareness of various approved brands of the COVID-19 vaccine, and the rationale behind the necessity of vaccination. Furthermore, it includes awareness of potential side effects as outlined by the World Health Organization (WHO), as well as information regarding the availability and administration procedures of the vaccine.

Adane, Ademas, and Kloos (Adane et al., 2022) conducted a cross-sectional study in northeastern Ethiopia using the Snowball technique to evaluate knowledge, attitudes, and practices among healthcare workers (HCWs) related to the COVID-19 vaccine. Results obtained demonstrated overall knowledge of COVID-19 vaccines. The mean knowledge score of healthcare workers (HCWs) regarding COVID-19 and its

vaccine was 14.97, with a standard deviation of 1.881. The overall rate of good knowledge among HCWs was 62.5%, with a 95% confidence interval of 57.4-66.8%. Among those with good knowledge, 69.79% expressed their intention to get vaccinated as soon as a vaccine becomes available.

In terms of gender distribution, a higher proportion of males (64.65%) had good knowledge compared to females (60.3%), while a larger percentage of females (39.69%) had poor knowledge about COVID-19 and its vaccines. Among different HCW categories, laboratory technicians had the highest rate of good knowledge (67.4%), followed by nurses and midwives (64.6%) and non-medical auxiliary staff (54.38%). Regarding chronic disease status, 64.7% of those with a chronic disease had good knowledge. The majority of HCWs (86.7%) acknowledged that COVID-19 is a serious disease, and 83.9% believed it could lead to various health complications. Additionally, 38.3% of HCWs perceived significant differences in effectiveness among the Pfizer, Moderna, and AstraZeneca COVID-19 vaccines.

A similar study was conducted to assess the knowledge, attitude, and acceptance of students in three tertiary institutions in Ogun state, Nigeria to the COVID-19 vaccine. The findings from the analysis indicate that a significant proportion of respondents know about the approved COVID-19 vaccines, with Johnson & Johnson's Janssen being the most recognized (70.8%), followed by Moderna (61.4%), AstraZeneca-Oxford (57.2%), and Pfizer-BioNTech (51.8%). However, it is concerning that only a minority of respondents correctly identified that certain vaccines, such as K-BCG (44.9%) and K-Anthrax (42.0%), are not intended for COVID-19. (Mudenda et al., 2022a)

Furthermore, the study revealed that a majority of respondents were aware that COVID-19 vaccination can protect against falling ill with COVID-19 (77.4%). Additionally, a significant percentage understood that even after receiving the COVID-19 vaccine, it is still possible to test positive for COVID-19 on a viral test (58.0%). However, a smaller proportion of students held misconceptions, such as the belief that the COVID-19 vaccine could alter their DNA (29.0%), the assumption that prior COVID-19 infection eliminates the need for vaccination (36.7%), and the misconception that the vaccine can cause illness with COVID-19 (31.1%).

In contrast, a study carried out in September 2022 among medical students at a Nigerian University reveals that overall, a small proportion of respondents (2.6%) demonstrated excellent knowledge, while a significant majority (76.8%) had poor knowledge regarding COVID-19 and its vaccines. The mean knowledge score was 4.30 with a standard deviation of 2.746, indicating a relatively low level of knowledge among the participants.

When comparing the mean knowledge scores between male and female participants, females (mean: 4.46, SD: 2.732) exhibited slightly higher knowledge levels than males (mean: 4.16, SD: 2.762). A notable finding is that 11.59% of the respondents were not aware that vaccines were available in Nigeria, and 43.78% were unsure about which specific vaccines were being used. (Orok et al., 2022)

2.3 Attitude towards COVID-19 Vaccines

In South-eastern Nigeria, a cross-sectional study was conducted among adults to assess their attitudes towards COVID-19 vaccines. The findings revealed that 60.2% of respondents (n = 201) exhibited positive attitudes, with a mean score of 13.96±2.97. These results indicate a generally favorable disposition towards COVID-19 vaccination among the adult population in the studied region. (James et al., 2022). A 2022 study in Zambia conducted to evaluate the knowledge, attitudes, and acceptance of COVID-19 vaccines among secondary school students revealed that only 12.7% of the surveyed students were willing to receive the vaccine if it became available. Interestingly, students who indicated their willingness to be vaccinated had better knowledge about the vaccine compared to those who were hesitant, consistent with studies conducted in Canada, China (including Hong Kong), and Sweden. , (Afifi et al., 2021), (Nilsson et al., 2021), (Rehati et al., 2022) , (Wong et al., 2022).

2.4 Relationship between the socio-demographic characteristics and the Knowledge of COVID-19 vaccines.

In a descriptive study carried out by Adedeji-Adenola et al. (2022) to assess Nigerian adults' understanding of the COVID-19 vaccine, it was found that health workers were more knowledgeable about COVID-19-related matters than non-health workers. They were approximately 1.87 times more likely to have this awareness. The study also revealed that individuals who had previously been diagnosed with COVID-19 demonstrated greater knowledge than those who hadn't been infected, with the latter being only 56% as likely to exhibit the same level of awareness.

As envisaged, those with a diploma-level education had a markedly higher level of awareness - they were 2.24 times more likely to be aware compared to those with lower education levels. The study also considered the influence of religious beliefs on the vaccine knowledge level, with Christians and Muslims demonstrating a significantly higher level of awareness than followers of other religions. Christians and Muslims were 6.36 and 7.55 times more likely to be aware, respectively.

2.4 Relationship between the socio-demographic characteristics and the Attitude towards COVID-19 vaccines.

A study conducted by (Al-Mustapha et al., 2022), provides interesting insights about the relationship between COVID-19 vaccine recipients in Kwara state and their unique socio-demographic characteristics. The study showed vaccine recipients were from all age groups, even though up to 74% were over 40 years old. This could be due to a variety of reasons such as older age groups being more susceptible to severe illness and thus prioritised for vaccinations, or it may reflect higher vaccine acceptance in this age group. Another study amongst patients attending the general outpatient

clinic in a tertiary hospital in southern Nigeria by Ilikannu et al., (2022) also reinforces this finding.

Notably, the research reveals that Less than a third (28.8%) of the people who got the shot work in health-related fields. According to (Chutiyami et al., 2022), there was a clear indication that health professionals were more likely to accept the COVID-19 vaccine which could be a direct implication of their professional understanding of how vaccines work and their awareness of the health benefits they provide. In terms of gender, more men got the vaccine compared to women, who made up only 40% of the total vaccinated population. The analysis done on the gender distribution of vaccine recipients noted that men received the vaccines at a higher rate than women, who comprised 40% of the vaccinated group. One possible explanation for this gender disparity in vaccination rates could be due to varying levels of vaccine acceptance, accessibility, or prioritisation between men and women. Another significant factor is the unique reproductive functions of females, as pregnant women and nursing mothers were initially exempted from vaccine uptake due to concerns about potential harm to these groups. Temitope Olumuyiwa Ojo et al., (2023) conducted a cross-sectional national survey in Nigeria with a total of 2370 respondents, it revealed that only 32.8% had received the COVID-19 vaccine, adults who were 60 years or older were 2.2 times more likely to get vaccinated than the younger adults thereby corroborating the findings of (Al-Mustapha et al., 2022).

The cross-sectional survey also analysed the effect of education on the attitude towards the vaccine. As expected, there was a direct correlation between the level of education and the likelihood of receiving the vaccination, those with tertiary education were the most likely to get vaccinated, with a 3.03 times higher likelihood. Meanwhile, those with secondary education were 1.77 times more likely, and those with primary education were 1.72 times more likely to be vaccinated. This pattern seems to indicate that the level of education plays a significant role in shaping one's understanding and acceptance of the vaccine. (Temitope Olumuyiwa Ojo et al., 2023)

The COVID-19 virus is still a threat as many variants can still emerge. As transmission remains prevalent within communities, the potential for the emergence of new variants and subsequent surges in case numbers, as well as fatalities, persists. Thus, without continuous surveillance, improved herd immunity through vaccination, the peril posed by the virus persists with a particular emphasis on high-risk populations. There appears to be a dearth of recent studies specifically assessing the knowledge, attitude, and relationship between these factors regarding COVID-19 vaccines among students and also adults in Nigeria, but there seems to be a gap in the literature regarding the current situation and trends among students in Nigeria, specifically in Abuja. This observation reinforces the need for conducting this research, as it will help policymakers to obtain valuable insights into the effectiveness of past educational campaigns and identify any areas that require additional attention or improvement.

3. MATERIALS AND METHODS

3.1 Settings

Baze University is a private institution with its main Campus 6 km from Abuja Central Area, on Jabi Airport Road Bypass Ring Road. It was founded by Senator Datti BABA-Ahmed in 2011 to provide university education up to International standards in Nigeria at about half the cost of sending a student to study outside the country.

3.2 Study Design and Population of study

This research is a descriptive study where the target population's features are elaborately discussed and predictions are made according to the trends set by the survey data.. The Study Population included all the undergraduate students in the university regardless of their choice of accommodation.

3.3 Sample Size Determination

$n = Z^2 * P(1-P) / E^2$

where:

- n is the sample size,

- Z is the Z-value (from the standard normal distribution) for the desired confidence level,

- P is the estimated proportion of the population that has the characteristic of interest, and

- E is the margin of error.

The corrected sample size (n') will be calculated using the following formula since the estimated population is less than 5,000:

$n' = n / (1 + (n - 1) / N)$

Where N is the population size.

Using Fisher's formula:

$n = (1.96)^2 * 0.5(1-0.5) / (0.05)^2$

$= 3.8416 * 0.25 / 0.0025$

$= 384.16$

$=385$ (rounded up).

Applying the finite population correction (FPC) as the population size is 2,000:

$n' = 385 / (1 + (385 - 1) / 2000)$

$= 385 /1.192$

$= 323.15$

$=323$ (rounded up to the nearest whole number).

3.4 Inclusion Criteria and Exclusion Criteria

All enrolled undergraduate students of the University including students living off-campus are included while those who weren't enrolled undergraduate student in Baze University was excluded

3.5 Sampling Technique

Convenience and Snowball Sampling: The online survey was administered to participants at their convenience, allowing them to fill out the survey at a time that suited them best.

3.6 Methods of Data Collection and Data Processing

Dissemination of an Online survey on Google forms. Data analysis was done using spreadsheet packages and SPSS.

3.7 Validity and Reliability

The questionnaire was developed and adapted from a similar study done in Ogun state Nigeria. (Adetayo et al., 2021). The constructs of "knowledge" and "attitude" towards COVID-19 vaccines were explicitly defined and operationalized. The study design minimises potential confounding variables and biases. Data was collected anonymously to reduce social desirability bias, and statistical analyses controlled for demographic factors like age, gender, and field of study to ensure that observed patterns can be attributed to knowledge and attitudes towards the vaccine.

3.8 Instrument

A structured questionnaire titled "Knowledge and Attitude" was adopted for the study. Furthermore, even as some items in the questionnaire were adapted as they have been used in other nations and contexts, certain instrument sections were self-developed.

3.9 Method of Data Analysis

Descriptive statistics were presented in a frequency distribution table to encapsulate results related to socio-demographic characteristics, knowledge and attitude. Subsequently, the findings were illustrated using textual descriptions, graphs, and tables, and detailed with frequencies and percentages.

4. ETHICAL CONSIDERATIONS

Participants were properly informed about the research purpose, potential risks, and benefits. They were assured that their participation was voluntary, and they could opt-out at any time without consequences. This information was provided via a consent form which they signed prior to their involvement. The privacy of participants was rigorously protected. Any identifiable information was eliminated or disguised to maintain anonymity, and these precautions were communicated to all participants.

Data was stored securely with access limited to the research team. To minimise potential discomfort due to the sensitive nature of COVID-19 vaccines, the questionnaire was carefully structured to prevent distress or anxiety. The study was conducted with cultural sensitivity to the norms and beliefs of Nigerian students regarding public health and vaccinations. Before initiating the study, approval was obtained from the Institution's ethics committee, ensuring that the research adhered to necessary ethical standards. These ethical guidelines ensured that the study respected participant rights and was conducted responsibly.

5. LIMITATIONS OF THE STUDY

Given that online survey participation is usually voluntary, there exists a potential for self-selection bias; individuals who opt to respond could fundamentally differ from those who abstain. Also, in the absence of an interviewer to offer clarity or additional insights, participants might misconstrue questions, resulting in imprecise answers online questionnaires, especially those employing closed-ended queries, might not fully encompass the intricate details and depths of respondents' emotions, convictions, or experiences. Finally, distributing online surveys to a vast group resulted in reduced response rates, challenging the generalizability of the findings.

6. RESULTS

6.1 Sociodemographic Characteristics

The study successfully engaged a total of 335 students. Gender distribution revealed that a significant portion, 254 (75.8%), were females, while the remaining 81(24.2%) were males.

In terms of faculty affiliation, the Faculty of Medical and Health Sciences had the highest participation with 134 (40%) of the total. Then the Faculty of Law with 67 (20%) the Faculty of Management and Social Sciences with 64 (19.1%), and the Faculty of Computing and Applied Sciences with 38 (11.3%). The Faculty of Environmental Sciences and the Faculty of Engineering had the least representation with 17 (5.1%) and 15 (4.5%) students respectively. The majority were from the third year, totalling 127 (37.9%). The second-year students made up 92 (27.5%) of the participants. Fourth-year students counted 52 (15.5%). First-year and fifth-year students were lesser in number, with 36 (10.7%) and 28 (8.4%) respectively. A segment of the students, 56 (16.7%), were below the age of 18. The majority, 191 (57%), fell within the 18-20 age bracket. Meanwhile, 76 (22.7%) were aged between 21 and 24. Only a small fraction, 12 (3.6%), were aged 25 and above. In relation to religious affiliations, the majority identified as Christians, accounting for 199(59.4%) and Muslims 131 (39.1%). Those who identified with religions other than Christianity and Islam were minimal, numbering 5(1.5%) of the respondents.

6.2 Knowledge of respondents about COVID-19 Vaccines

In Table 2, the students' awareness and sources of information regarding the COVID-19 vaccines are outlined. Impressively, 98.5% of participants acknowledged their awareness of the vaccines. Out of which majority, 64.2%, were informed through social media platforms. Concurrently, official government channels and newspapers or news websites each played a role for 35.2% of the students. Personal interactions were also influential, as 38.2% credited family and friends for enlightening them about the vaccines. Health professionals proved pivotal for 28.4% of the participants. Additionally, a minor proportion identified markets as their point of discovery for such information. The bar chart below gives a visual representation of the results.

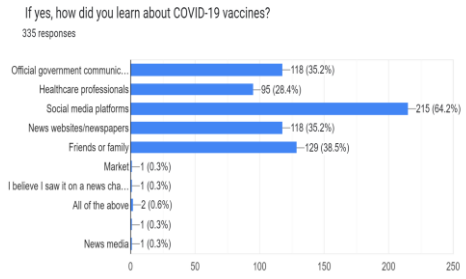

Figure -1: How did you learn about COVID-19 vaccines?

6.2a Sources of Information about COVID-19 Vaccines.

When examining additional sources that participants referred to for information on COVID-19 vaccines, the data revealed that health authorities such as CDC and WHO were cited by 186 participants (33.5%), social media platforms by 157 (28.3%), news websites by 64 (11.5%), healthcare professionals by 72 (13.0%), peers or friends by 38 (6.8%), government websites by 33 (5.9%). Less frequently mentioned were the market, a parent, health-centric websites, medical professionals on social media, and independent research, each with 1 mention, representing 0.2% to 0.3% of the responses. The pie chart below gives a visual representation of the results.

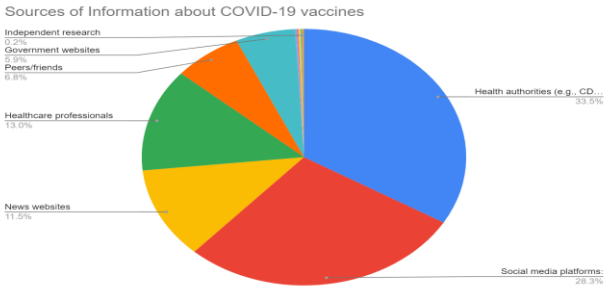

Figure -2: Sources of Information about COVID-19 Vaccines.

6.2b Level of Knowledge of COVID-19 vaccines

When participants assessed their understanding of the vaccines, a select 9 (2.7%) individuals, ranked their knowledge as 'very high'. Following this, 39 (11.6%) participants considered their insight to be 'high'. The majority, constituting 213 (63.6%) respondents, deemed their knowledge as 'moderate'. On the lower end of the spectrum, 63 (18.8%) participants rated their understanding as 'low', and a small subset of 11 (3.3%), placed their awareness as 'very low'. The bar chart below gives a visual representation of the results.

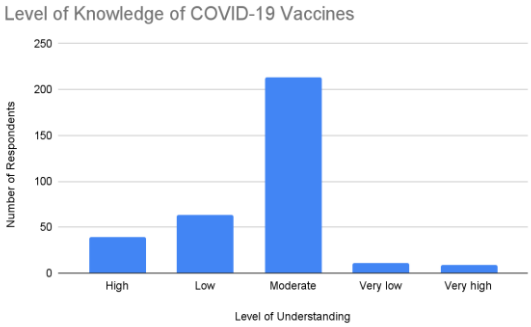

Figure -3: Level of knowledge of COVID-19 vaccines

6.3 Knowledge of COVID-19 Vaccine Brands

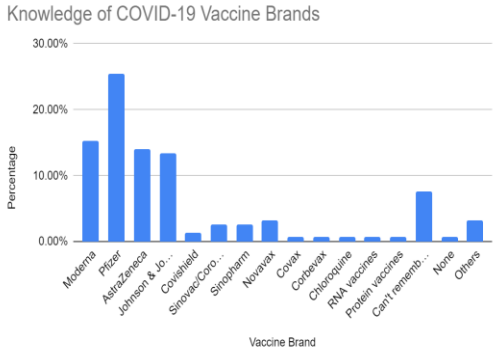

Figure -4: Knowledge of COVID-19 Vaccine Brands

Of the 335 participants in the survey, 203, (60.6%), acknowledged being informed about COVID-19 vaccines. When prompted to enumerate the vaccines they were aware of, despite variations in spelling, a substantial portion of the 157 who responded could recognize specific vaccine brands. The predominantly mentioned brands were Pfizer, with 40 responses (25.48%), followed by Moderna at 24 (15.27%), AstraZeneca with 22 (14.01%), and Johnson & Johnson securing 21 mentions (13.38%). Some respondents were also aware of Covishield 2 (1.27%), Sinovac/CoronaVac 4 (2.55%), Sinopharm 4 (2.55%), and Novavax 5 (3.18%).

On the other hand, a few respondents listed what appeared to be incorrect or less conventional responses: Covax, Corbevax, and Chloroquine each had 1 (0.64%), and there was 1 mention each (1 (0.64%)) for the categories RNA vaccines and Protein vaccines. 12 (7.64%), either couldn't recall the names or were unsure of their responses. Additionally, 6 (3.82%) either provided ambiguous answers or didn't specify any vaccine at all. The bar chart above gives a breakdown of these results.

6.3a Assessing the in-depth knowledge of COVID-19 vaccines

1. 20.3% (68 participants) believe that once vaccinated, one doesn't need to follow preventive measures against COVID-19. In contrast, 79.9% (267 participants) disagree with this notion.

2. 52.2% (175 participants) agree that COVID-19 vaccines can protect against severe illness and hospitalisation, while 47.8% (160 participants) believe the opposite.

205(61.2%) feel that the COVID-19 vaccines were developed too quickly, potentially compromising safety. On the other hand, 130 (38.8%) hold the opposite view.

253 (75.5%) think that the COVID-19 vaccines can lead to severe side effects. However, 82 (24.5%) do not share this belief.

217 (64.8%) have confidence that the COVID-19 vaccines underwent rigorous safety and efficacy tests, whereas 1118 (35.2%) question this.

6. 74(22.1%) think that COVID-19 vaccines can modify DNA. Conversely, 261 (77.9%) don't believe this claim.

7. 216 (64.5%) opine that COVID-19 vaccines can reduce the virus's transmission to others, but 119 (35.5%) have a differing viewpoint.

8. 90 (26.9%) suspect that the COVID-19 vaccines could cause fertility issues. Meanwhile, 245 (73.1%) refute this idea.

6.3b Have you received any COVID-19 Vaccine?

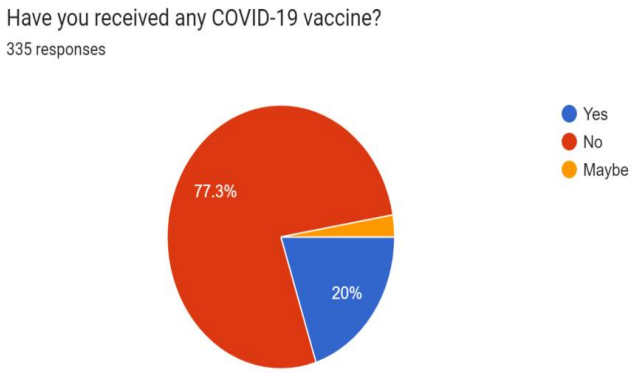

Figure -5: Number of Vaccinated Respondents

The respondents were then asked on whether they had received any COVID-19 vaccine. 20% (67 participants) affirmed while 259 (77.3%) said no and 9(2.7%) confirmed not being sure. The pie chart above gives a visual representation of the results.

6.3a Specific Vaccines Received

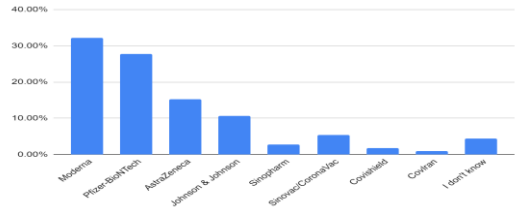

Figure -6: Vaccine Brands Recieved by Respondents

To further assess the participants' familiarity with their vaccinations, those who had been vaccinated were inquired about the specific vaccine(s) they received. The majority identified Moderna as the vaccines they took, with 36 (32.4%). This was followed by Pfizer-BioNTech with 31 (27.68%), AstraZeneca with 17 (15.18%), and Johnson & Johnson with 12 (10.71%). Sinopharm was received by 3 (2.68%), Sinovac/CoronaVac by 6 (5.36%), and Covishield by 2 (1.79%). Additionally, 5 participants (4.46%) were uncertain about the vaccine they received, while 1 (0.89%) incorrectly identified it as Covlran. The bar chart above gives a visual representation of the results.

6.3b Reasons for not receiving vaccines

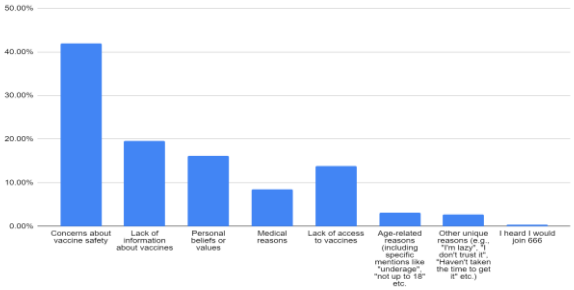

Figure -7: Reasons for not being vaccinated

Those who said they hadn't received any of the COVID-19 vaccines were asked to gives reasons which were were summarised into the following contexts; Concerns about vaccine safety 109(41.9%), Lack of information about vaccines 51 (19.6%) Personal beliefs or values 42 (16.2%), Medical reasons 22 (8.5%) Lack of access to vaccines 36(13.8%) Age-related reasons (including specific mentions like "underage", "not up to 18" etc.) 8 (3.1%) Other unique reasons 7 (2.7%), and finally a single mention about the fear of joining the '666'[1] 1(0.4%). The bar chart above gives a visual representation of the results. Attitude of respondents towards COVID-19 Vaccines

7. OVERALL ATTITUDE OF STUDY SUBJECTS TOWARDS COVID-19 VACCINES

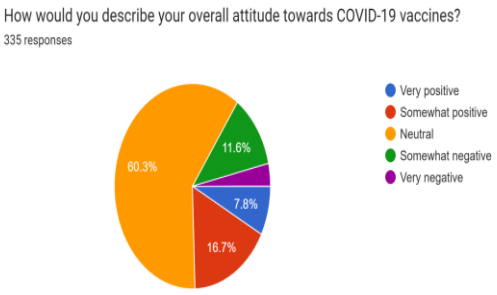

Figure -8: Overall Attitude Towards COVID-19 Vaccines

The respondents rated their attitude towards COVID-19 vaccines from 'very positive' as the highest rank to 'very negative' as the lowest. 26(7.8%) rated their attitude as 'Very positive', 56(16.7%) rated their attitude as 'Somewhat

positive' , 202(60.3%) rated their attitude as 'Neutral', 39(11.6%) rated their attitude as 'somewhat negative' and 12(3.6%) rated their attitude as 'Very negative'. The pie chart below gives a visual representation of the results.

7.1 Factors that shape respondents attitude towards COVID-19 vaccines

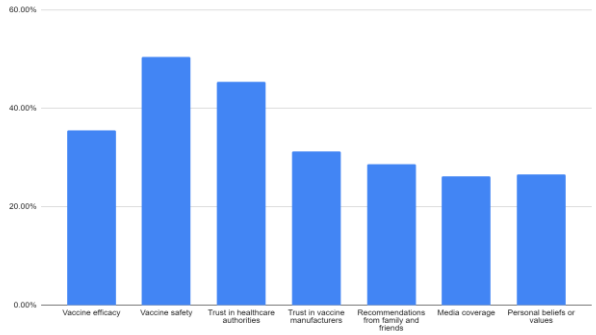

Figure -9: Factors that shape respondents' attitude towards COVID-19 vaccines

Concerning the factors that shape participants' views on COVID-19 vaccines, respondents highlighted the reasons influencing their stance. The breakdown is as follows: Vaccine efficacy accounted for 100 (35.5%), Vaccine safety was 142(50.4%), Trust in healthcare authorities was 128(45.4%), Trust in vaccine manufacturers had 88(31.2%), Recommendations from family and friends were 81(28.7%), Media coverage stood at 74(26.2%), and Personal beliefs or values at 76(26.6%). The results are visually represented in the bar chart above.

NB: The percentages can add up to more than 100% since respondents could select more than one way of handling misinformation.

7.1a Vaccine-related Misinformation or conspiracy theories regarding COVID-19 Vaccines

Respondents were also asked if they have encountered any vaccine-related misinformation or conspiracy theories regarding COVID-19 vaccines. 224(66.9%) had encountered one while 111(33.1%) hadn't experienced any.

7.1b. How participants handle conspiracy theories/misinformation regarding COVID-19 Vaccines

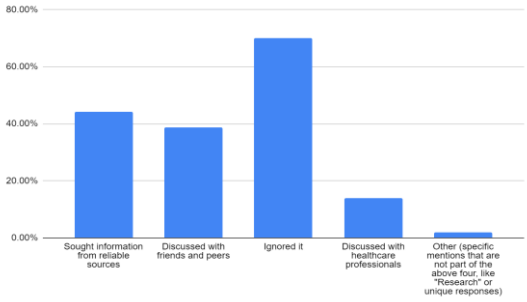

Figure -10: How participants handle conspiracy theories/misinformation regarding COVID-19 Vaccines

Moving further on how they handled conspiracy theories, participants who had encountered one gave the following methods; Sought information from reliable sources 118(44.19%), Discussed with friends and peers 103(38.58%), Ignored it 187(70.04%), Discussed with healthcare professionals 37(13.86%), Other (specific mentions that are not part of the above four, like "Research" or unique responses) 5(1.87%). The results are visually represented in the pie chart above.

NB: The percentages can add up to more than 100% since respondents could select more than one way of handling misinformation.

7.1c. Willingness to receive COVID-19 vaccines based on recommendations from medical authorities.

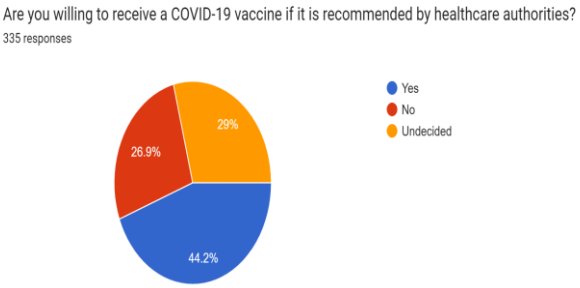

Figure-11: Willingness to receive COVID-19 vaccines based on recommendations from medical authorities.

On their willingness to receive a COVID-19 vaccine if it is recommended by healthcare authorities, the participants answered thus; Yes 148(44.2%), No 90(26.9%), Undecided 97(29%). The results are visually represented in the pie chart above.

7.1d. Reasons for not Taking the COVID-19 Vaccines or being undecided towards it.

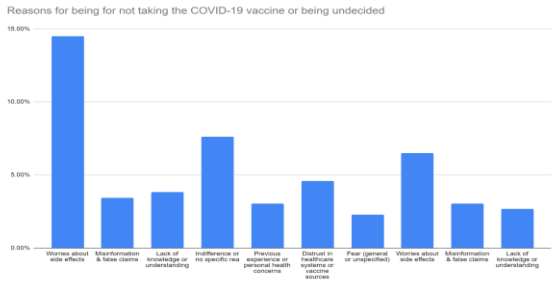

Figure 12: Reasons for not Taking the COVID-19 Vaccines or being undecided towards it.

For participants who refused the vaccine or were undecided about it, an open-ended question was provided for them to express their reasons. The major reasons were categorized under the following variables; Concerns about the efficacy & safety of the vaccine 7(2.67%), Worries about side effects 38(14.5%), Misinformation & false claims 9(3.44%), Lack of knowledge or understanding 10(3.8.2%), Indifference or no specific reason given 20(7.63%), Previous

experience or personal health concerns 8(3.05%), Distrust in healthcare systems or vaccine sources 12(4.58%), Fear (general or unspecified) 6(2.29%), Personal beliefs or feelings 17(6.49%), Other specific or unique reasons 8(3.05%). The results are visually represented in the bar chart above.

NB: The percentages can add up to more than 100% since respondents could select more than one way of handling misinformation.

8. Discussion

In Nigeria, COVID-19 vaccines were made available at no cost to the recipient on March 2nd, 2021 (Unicef, 2021). By the end of April 2021, only 1 million doses were given, mainly to healthcare and frontline workers. By February 2022, even though all adults over 18 were eligible, only 20 million doses had been administered, covering roughly 5% of the population with two doses. This low coverage regardless of the relative availability and accessibility to the vaccines raised concerns about the factors leading to vaccine hesitancy across the population. This study aims to provide evidence about the knowledge and attitude towards COVID-19 vacancies among undergraduate students in Baze University, Abuja. The study successfully submits that 215 participants listed social media as one of the first avenues where they learned about the COVID-19 vaccines. 186 (33.5%) looked to official WHO/CDC websites for further information about the vaccines. This is contrary to the findings of (Olawade et al., 2022) conducted among students in southwestern Nigeria where more students sought information about the vaccines on Social Media and seldom visited official WHO/CDC or even government websites. Regardless of their access to credible information on WHO/CDC websites as 33.5% of the participants claim, only 9 (2.7%) individuals ranked their knowledge as 'very high'. Following this, 39 (11.6%) participants considered their insight to be 'high'. While the majority, constituting 213 (63.6%) respondents deemed their knowledge as 'moderate'. This could be because respondents may not feel fully confident in their knowledge about COVID-19 vaccines. This could also stem from the overwhelming amount of available information, making it challenging to discern what's essential. Additionally, even if they consult credible websites, these students are simultaneously exposed to misinformation or contrasting views on other platforms, leading them to question their understanding. This is in line with a qualitative analysis of COVID-19 hesitancy conducted by Fieselmann et al., 2022 in Germany.

The majority of the university students who have heard of the COVID-19 vaccine (98.5%) have a decent level of awareness regarding the different brands of vaccines. Pfizer, Moderna, AstraZeneca, and Johnson & Johnson are the most recognized and commonly listed vaccines among the students, indicating that these brands may have higher visibility or prominence in the region or the media they consume. On the other hand, a minority of students 23 (14.66%) either provided incorrect information or couldn't specify a vaccine brand. This suggests a potential gap in accurate knowledge dissemination even among those who claim to be aware of the vaccine. The finding aligns with Adetayo et al.'s 2021 study conducted in two universities in the southwest region of Nigeria, implying a consistent pattern of vaccine brand awareness and misinformation among university students in different parts of the country. It's important to note that the majority of respondents who received the vaccine are well-informed about the specific brand or type of vaccine they were given. This suggests a high level of awareness and attention to detail among the vaccinated respondents concerning the vaccine they received. It could also indicate that the vaccination process and communication at vaccination centres are effective in informing individuals about the vaccine brand they are administered.

A compelling 22.1% of Baze University scholars debunk the myth that vaccines can alter DNA, a sentiment shared by 29% of Zambian pupils in a similar study. Yet, when it comes to the vaccine's efficacy to protect against the virus and severe illness, the views diverge. 77.4% of Zambian students champion the vaccine's protective potential alongside only 52.2% of respondents Baze University students.

Overall, while there is a clear sense of understanding about the benefits and safety of the COVID-19 vaccines among the majority of the participants, there exists a significant minority that holds misconceptions or concerns about the vaccines. This underscores the importance of continued vaccine education and addressing specific worries that may be hindering a more unanimous acceptance of the vaccine. In terms of the study subjects' attitude towards vaccines, a whopping 55.8% are either not willing to take the vaccines or undecided even if a healthcare professional recommends it. This is in spite of the fact that 46.5% of the participants seek health authorities and professionals for information on COVID-19 vaccines. This solidifies evidence that beyond mere information seeking, there are deeper factors or concerns influencing the decisions of study participants.

When delving deeper into the reasons, the prevalent factors included a minimal sense of personal risk, perceived limited advantages, apprehensions related to health, gaps in information, and an inherent distrust in the system. These observations resonate with the findings from a parallel study conducted in Germany, as documented by Fieselmann et al.. This consistency underscores the importance of addressing these concerns to enhance understanding and trust.

A chi-square test was adopted in analyzing the factors influencing knowledge and attitude towards the COVID-19 vaccines, at 95% confidence level and statistical significance set at $p<0.05$. From our chi-square analysis assessing the relationship between knowledge and students' attitudes towards COVID-19 vaccines, ($p=0.011$). Consequently, this suggests a significant association between the level of knowledge and the attitude students hold about the vaccine. Sherman et al., 2020 and Abebe et al., 2021 corroborate these findings in Ethiopia and England. Data from this study highlights an intriguing paradox in the students' knowledge and actions regarding COVID-19 vaccines. While the majority recognize and acknowledge the benefits of the vaccine — particularly its ability to protect against severe outcomes and

limit the virus's spread — only 20% of the participants have acted upon this knowledge by getting vaccinated. Such a disconnect between understanding and action suggests that there are underlying barriers or concerns not directly related to the vaccine's efficacy or purpose. These could range from practical challenges, such as access to vaccination centres, to deeper psychological or socio-cultural factors, including vaccine mistrust, influence of misinformation, peer pressure, or personal beliefs about health and medicine. It is a similar scenario among vaccine refusers in Northern Nigeria who also have a common distrust in the vaccines. (Sato & Takasaki, 2021) This suggests a pervasive challenge in translating knowledge into action, pointing to the importance of addressing not just the informational but also the emotional and social barriers to vaccination.

This research suggests that the socio-demographic factors do not have a significant association with knowledge regarding COVID-19 vaccinations, as all the chi-square values derived in our study were below their respective critical thresholds. Nevertheless, a contrasting study conducted in Bangladesh indicated that a myriad of socio-demographic factors played a significant role in influencing awareness about COVID-19 vaccinations. This divergence in findings highlights the importance of this study, particularly when crafting awareness campaigns and health education programs tailored to different demographic contexts. (Islam et al., 2021)

In terms of the association between sociodemographic factors and attitude towards COVID-19 vaccines this study submits that gender is the only socio-demographic factor that has a significant effect on the attitude of study subjects towards COVID-19 vaccinations. Islam et al. 's findings corroborate this, by reporting numerous sociodemographic factors including gender and prior experience with vaccines were highlighted as significantly associated with shaping attitudes and perceptions towards the COVID-19 vaccinations.

Dimiter Toshkov, 2023 submits that gender disparities in attitude towards COVID-19 vaccines are a result of higher perceived risk by women than men. This implies that there are differences in how men and women perceive or respond to vaccines, and these differences are statistically significant. Further analysis would be needed to understand the specific nature of this gender-based effect and its implications.

9. CONCLUSION

The study submits that respondents have a good level of knowledge which has a significance on attitude level yet it doesn't connote vaccine acceptance. The study also establishes that socio-demographic factors have no significance on the knowledge of COVID-19 vaccines however, gender was found to have a significant effect on the of respondents' attitude towards COVID-19 vaccines. In light of this, further investigation is warranted into other elements hindering full vaccine adoption within the university population.

10. RECOMMENDATIONS

Drawing from a Vaccine Messaging guide presented by the Yale Institute for Global Health, it's essential that narratives advocating for vaccines and the messages within them are crafted based on behavioural and social research. Such messages should undergo rigorous testing for effectiveness and potential risks before being rolled out. (Yale Institute for Global Health, 2020)

The Yale Institute for Global Health highlights that the reasons behind vaccine hesitancy are multifaceted and varied. When those already sceptical about vaccines encounter pro-vaccine messages, it often reinforces their apprehensions, leading to a counterproductive outcome which is known as the 'backfire effect' according to psychologists. Consequently, evidence indicates that a generic communication approach, although effective in simpler tasks like curbing the spread of misinformation, might not successfully address vaccine hesitancy. In fact, it might amplify the concerns of those already dubious about vaccines. Hence communication strategies channelled towards reducing vaccine hesitancy for students in Baze University should ensure the aforementioned factors are duly put in consideration. Based on findings that gender has a significant association with the attitude of students, public health campaigns or interventions should be tailored to approach differently for both genders to address these varying attitudes.

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