

SARS-CoV-2 (COVID-19 pandemic) in Nigeria: Multi-institutional survey of knowledge, practices and perception amongst undergraduate veterinary medical students

Adebowale, O.O.^{a*}, Adenubi, O.T.^b, Adesokan, H.K.^c, Oloye, A.A.^d, Bankole, N.O.^e, Fadipe, O.E.^f, Ayo-Ajayi, P.O.^g, Akinloye, A.K.^h

^a*Department of Veterinary Public Health and Preventive Medicine, College of Veterinary Medicine, Federal University of Agriculture, PMB 2240, Alabata, Abeokuta, Ogun State, Nigeria.*

ORCID: 0000-0002-4207-7423

^b*Department of Veterinary Pharmacology and Toxicology, College of Veterinary Medicine, Federal University of Agriculture, PMB 2240, Alabata, Abeokuta, Ogun State, Nigeria.* ORCID:

0000-0003-3445-8485

^c*Department of Veterinary Public Health and Preventive Medicine, University of Ibadan, Ibadan, Oyo State.* ORCID: 0000-0001 -5050-8580

^d*Department of Veterinary Surgery and Theriogenology, College of Veterinary Medicine, Federal University of Agriculture, PMB 2240, Alabata, Abeokuta, Ogun State, Nigeria.* 0000-0002-3341-

0810

^e*Department of Veterinary Microbiology, College of Veterinary Medicine, Federal University of Agriculture, PMB 2240, Alabata, Abeokuta, Ogun State, Nigeria.* ORCID: 0000-0001-7706-5003

^f*Veterinary Council of Nigeria, Federal Capital Territory, Abuja.*

^g*Nigerian Field Epidemiology and Laboratory Training Program.*

^h*Department of Veterinary Anatomy, College of Veterinary Medicine, Federal University of Agriculture, PMB 2240, Alabata, Abeokuta, Ogun State, Nigeria.*

*Corresponding author: Oluwawemimo Adebowale, Department of Veterinary Public Health and Preventive Medicine, College of Veterinary Medicine, Federal University of Agriculture, PMB 2240, Alabata, Abeokuta, Ogun State, Nigeria. Tel: +2349085608043; E-mail: adebowaleoluwawemimo1@gmail.com

Abstract

Background: The novel Coronavirus SARS-CoV-2 (COVID-19) is a global pandemic with an increasing public health concern. Due to the non-availability of a vaccine against the disease, non-pharmaceutical interventions constitute major preventive and control measures. However, inadequate knowledge about the disease and poor perception might limit compliance.

Aim: This study examined COVID-19-related knowledge, practices, perceptions and associated factors amongst undergraduate veterinary medical students in Nigeria.

Methods: A cross-sectional web survey was employed to collect data from 437 consenting respondents using pre-tested self-administered questionnaire (August 2020). Demographic factors associated with the knowledge and adoption of recommended preventive practices towards COVID-19 were explored using multivariate logistic regression at $P \leq 0.05$.

Results: The respondents' mean knowledge and practice scores were 22.7 (SD \pm 3.0) and 24.1 (SD \pm 2.9), respectively with overall 63.4% and 88.8% displaying good knowledge and satisfactory practice levels. However, relatively lower proportions showed adherence to avoid touching face or nose (19.5%), face mask-wearing (58.1%), and social distancing (57.4%). Being in the 6th year of study (OR = 3.18, 95%CI: 1.62-6.26, P = 0.001) and female (OR = 2.22, 95% CI = 1.11-4.41, P = 0.024) were significant positive predictors of good knowledge and satisfactory practices, respectively. While only 30% of the respondents perceived the pandemic as a scam or a disease of the elites (24.0%), the respondents were worried about their academics being affected negatively (55.6%).

Conclusion: The study revealed good knowledge and satisfactory preventive practices towards COVID-19 among Nigerian Veterinary students; albeit with essential gaps in the key non-pharmaceutical preventive measures recommended by the WHO. Therefore, there is a need to step up enlightenment and targeted campaigns about COVID-19 pandemic.

Keywords: COVID-19, Knowledge, Practices, Perception, Veterinarians students, Nigeria

1 Introduction

The COVID-19 pandemic is an ongoing infection that has spread to over 188 countries globally with over 245,984 new cases, 25,602,665 confirmed, and 852,758 deaths as at September 2nd 2020 (WHO, 2020). The disease was first reported to have originated from Wuhan, China and the causative agent identified as a novel coronavirus, Severe Acute Respiratory Syndrome (Coronavirus-2 SARS-CoV-2) (Mahdy, 2020). This disease is similar to the previously emerged SARS-CoV and the Middle East Respiratory Syndrome Coronavirus (MERS-CoV). COVID-19 was announced as a pandemic by the World Health Organization and disease of a public health emergency globally on March 12, 2020 (Mahdy, 2020). Subsequently, countries globally have had to implement global standard control strategies, which had hitherto not been employed since the Spanish Flu epidemic. These measures, which included travel restrictions, lockdowns or curfews, workplace hazard controls, closure of public facilities including pubs, restaurants, gyms, schools and higher institutions, strict hand hygiene practices, social distancing and the wearing of facemasks have impacted lives on a global scale. Despite these mitigation measures, the number of cases is still on the increase globally with the Americas, Europe and South-East Asia badly affected (WHO, 2020).

Nigeria reported its index case of COVID-19 on February 27, 2020; incidentally, the first in Nigeria and West Africa according to the Nigerian Centre for Disease Control (NCDC, 2020). Subsequently, a lockdown or curfew in various states was implemented to contain the fast spread of the virus. All citizens except those on essential duties were expected to stay at home and maintain good handwashing hygiene practices, local and international travels were restricted, businesses, offices, public gatherings (including religious places), schools and universities were closed, and public and private sports cancelled. However, the numbers of cases and deaths are still

on the rise, and the virus has spread to all the 36 states in the country, as well as the Federal Capital Territory (FCT), Abuja. According to the NCDC, more than 286,000 tests, 43,537 confirmed positive cases, 22,567 active cases, 20,087 discharges and 883 human deaths were reported as at the commencement of this study August 1st, 2020.

The pandemic has brought about huge negative consequences on business, education, health, and tourism globally (Pragholapati, 2020). Presently, primary, secondary and tertiary institutions in Nigeria are still closed and this has seriously affected millions of students in tertiary institutions who have their semesters cancelled or suspended due to the pandemic. While many other countries have switched to virtual learning, many tertiary institutions within Nigeria lack the various online educational platforms or facilities for such method of teaching (Eze et al., 2018), which could worsen the situation for students in the country. Several studies have reported students' mental health becomes greatly affected when faced with a public health emergency and academic delays, which has been positively correlated with anxiety levels (Pragholapati, 2020., Huang et al., 2020; Duong et al., 2020; Werner et al., 2020; Roy et al., 2020). Studies by previous authors had shown that COVID-19 has a profound impact on the public, medical students, dental medical students, and radiology trainees, as well as the knowledge, practices and attitudes (Khasawneh et al., 2020; Galea et al., 2020; Iyer et al., 2020; Alvin et al., 2020) but none, is known yet about veterinary medical students in Nigeria. Adequate knowledge among individuals measures the first line of defence against this disease (Salman et al., 2020). It is therefore important to understand the knowledge, views, adherence to the Nigerian government control policies among the veterinary student population.

99 To the best of our knowledge, this is the first study that would investigate the knowledge,
100 preventive practices and perceived impacts (KPP) of COVID-19 pandemic among veterinary
101 medical students in Nigeria.

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2 Materials and Methods

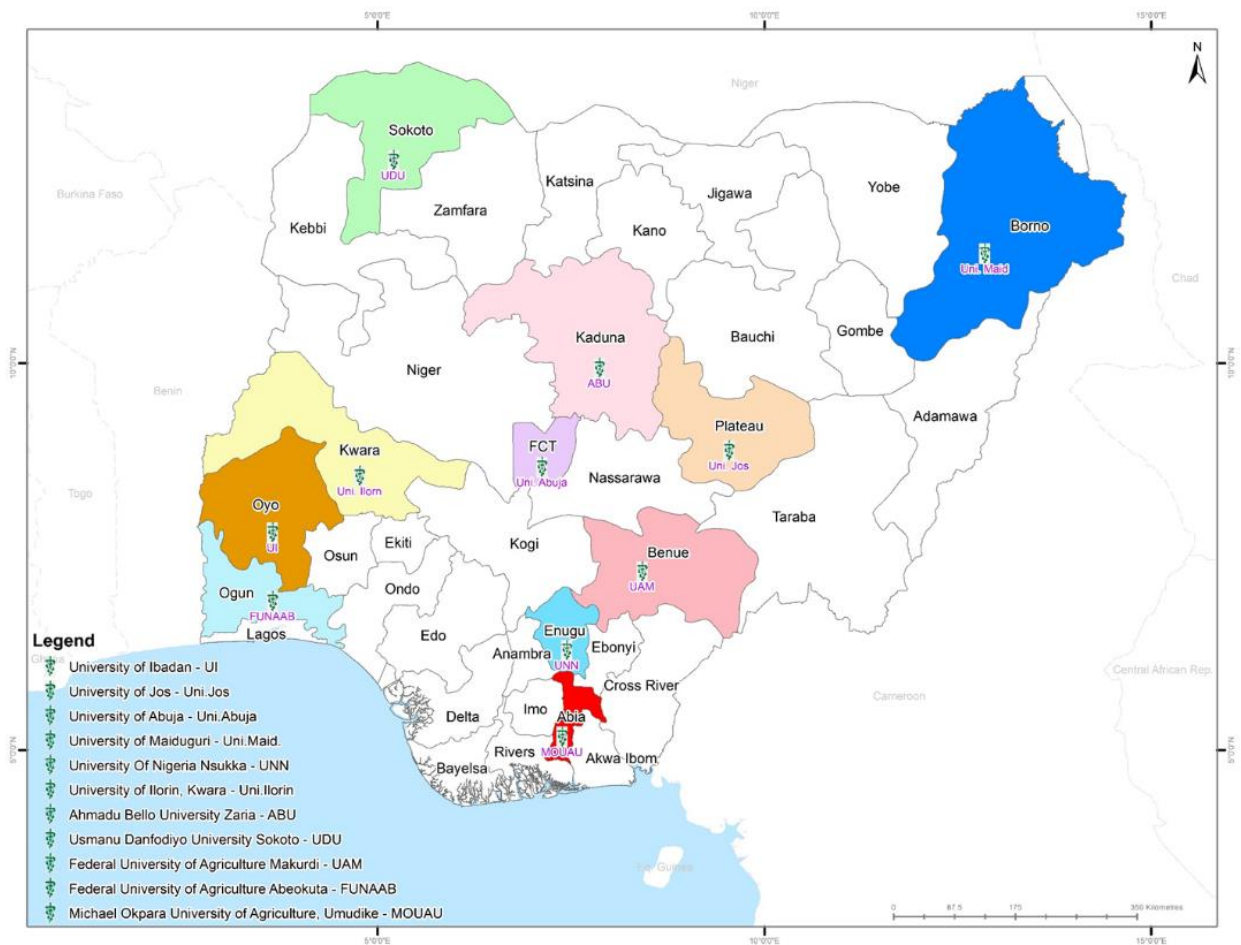
2.1 Study design and setting

This cross-sectional, multi-institutional web survey was conducted from August 1st to 18th, 2020 among undergraduate veterinary students in Nigeria, a West African country that is comprised of 36 states categorized into six geopolitical zones – South West, South East, South South, North East, North West, North Central and the Federal Capital Territory (FCT). The country runs the Doctor of Veterinary Medicine (DVM) programme, a six-year course in twelve universities and regulated by the Veterinary Council of Nigeria (VCN). The programme is divided into three phases namely, the preclinical (year two and three i.e. DVM 1 and 2), paraclinical (year four i.e. DVM 3) and clinical (year five and six i.e. DVM 4 and 5).

2.2 Study population structure and sampling

The study population included veterinary medical students in 11 veterinary schools in the country. These universities and their respective geopolitical zones are University of Nigeria, Nsukka, Enugu State, Michael Okpara University of Agriculture, Umudike, Abia State (South East); Federal University of Agriculture, Makurdi, Benue State, University of Jos, Plateau State, University of Ilorin, Kwara State (North Central); Ahmadu Bello University, Zaria, Kaduna State, Usmanu Danfodiyo University, Sokoto, Sokoto State (North West); Federal University of Agriculture, Abeokuta, Ogun State, University of Ibadan, Ibadan, Oyo State ((South West); University of Maiduguri, Borno, Borno State (North East); and the University of Abuja (FCT) (See Figure 1).

124



125 Figure 1. The spatial distribution of veterinary schools of respondents.

126 The inclusion criteria for the participants were 1) students must be fully registered in any one of
127 the veterinary schools previously listed, 2) and must be in DVM 1 (year 2) to DVM 5 (year 6).
128 One university was excluded from the study it was yet to reach the clinical phase of the veterinary
129 programme. Similarly, Year 1 students were excluded largely because of non-exposure to core
130 veterinary courses. At least, it was ensured one veterinary school was representative of each of the
131 geopolitical zones in Nigeria.

132 A total of 385 participants were needed considering a simple random sampling at an expected
133 response rate of 50%, an absolute precision at a 95% confidence interval, with an acceptable error

of 5% (WinEpi 2.0). Considering the non-response rate, 10% of the sample size was added to give a total of 423 participants (Odetokun et al., 2019). For student recruitment, a purposive and chain referral sampling techniques was performed.

2.3 Questionnaire design, pretest and data collection

The questionnaire using google forms (Alphabet Inc., California, USA) comprised a total of 41 questions (both open and closed-ended) written in English and adapted from WHO resources and other pertinent studies (Olapegba et al., 2020; Adenubi et al., 2020a; Adenubi et al., 2020b; Kebede et al., 2020; Pragholapati, 2020; Mahdy, 2020; Alzoubi et al., 2020). The questionnaire was divided into four sections and comprised questions on students' demographics, knowledge, practices, and perceptions towards COVID-19.

The first section consisted of questions assessing the socio-demographic profiles of the respondents (further considered as our independent variables). These included age as at last birthday (in years), sex, religion, the name of Institution, programme year, state of residence during the lockdown, number of household members, and type of lockdown instituted by the state government where resident.

To assess students' general knowledge about COVID-19, an 11-item questionnaire was provided in section B. The various sources of updates and information on the pandemic were requested. Ten out of the 11 questions focused on the cause of COVID-19 infection, incubation period, risk conditions, country of the first outbreak, modes of transmission, identification of common symptoms of the infection, if it was possible to have asymptomatic individuals, and methods of prevention, control and treatment. The responses were scored and summed up to 31.

Section C of the questionnaire assessed respondents' practices during the pandemic and comprised 3 Likert-item questions (10) that have been developed from recommended guidelines of the WHO and Ministry of Health, Nigeria for the prevention of COVID-19 transmission. These included handwashing/sanitizing, avoiding crowded places, keeping physical/social distance, avoiding touching of face or nose, avoiding handshakes, use of facemasks, and medications. The responses were never, sometimes, all the time each weighing 1, 2, and 3 points respectively (total = 30).

The questions in section D were structured to evaluate respondents' perceptions. The 5-point Likert item questions (12) were adapted to assess students' perception of the infection based on the country's peculiarity. Some of the questions asked included whether the disease was a scam, affected only the elites, impact on academics and virtual learning in higher institutions, stigmatization, whether participants were optimistic the pandemic would be brought under control, and if they felt depressed. The agreement scale ranged from '1' for "strongly agree" to '5' for "strongly disagree".

The questionnaire was reviewed by a panel of experts and revised based on their comments. Subsequently, it was pilot-tested (n = 13 students from all the eleven veterinary schools, who were excluded in the main study). The completion of the online survey took about 8 minutes. Detailed information on the questionnaire is presented in Supplementary material A.

For respondents' recruitment, invitations were sent to students nationwide to participate in the study using the WhatsApp platforms of the Association of Veterinary Medical Students (AVMS) of the various university chapters. The link to the survey questionnaire was included in the sent invitations and a brief description of the purpose of the study was provided. They were informed that participation was voluntary without any attached penalty for refusal.

2.4 Ethical approval

The study protocol was approved by the College of Veterinary Medicine, Federal University of Agriculture Research Ethics Committee (reference number: FUNAAB/COLVET/CREC/2020/07/01). Before invitations, informed consent was obtained from the presidents of the different AVMS chapters. Participation in the study was voluntary; personal identifiers were not collected and information from respondents was treated confidentially. Every participant was notified of his/her right to discontinue at any stage of the study according to the World Medical Association Declaration of Helsinki, 2001.

2.5 Data Analysis

Data generated were captured and filtered in Microsoft Excel®, 2013 (Microsoft Corporation, Redmond, WA). Data analyses were conducted by GraphPad Prism 8.0.0 (descriptive statistics and figure presentations) and Stata 12.0 (inferential statistics). Descriptive statistics were conducted for all variables and presented in forms of frequencies and proportions/percentages using Microsoft Excel® (2013). To evaluate the knowledge and practices levels of respondents, a numeric pattern of scoring was used by giving a score of “1” for the “correct answer” and “0” for an “incorrect” or “I don’t know” response. The levels of measured outcomes were expressed as mean and standard deviation (Mean \pm SD). The scores were thereafter converted to percentages, and cut-off points for good / satisfactory levels were set at ≥ 70 %. Mean scores were compared across demographic categories using ANOVA and independent t-tests where appropriate.

Associations between the socio-demographics of respondents (independent variables) and binary outcomes of knowledge and practices (dependent variables) using chi-square tests were determined. Variables significant at $p \leq 0.25$ were processed further by the logistic regression model using Stata 12.0. A $p < 0.05$ was considered statistically significant and odds ratios were

200 computed to determine the strength of associations between variables at 95 % confidence intervals
201 (CIs). All illustrations were performed with GraphPad Prism 8.0 and Microsoft Excel®.

3 Results

3.1 Demographic information of respondents

A total of 437 respondents participated in this study across Nigeria. The mean age of respondents was 22.14 ± 2.99 years, and the median number of members in a household was 6 (min =1, max = 90). The highest percentage of the respondents (17.2%, 95% CI; 13.9 - 21.0) were in the Federal University of Agriculture, Abeokuta and DVM 4 (year 5, 23.8%, 95% CI; 20.0 - 28.0). Figures 2a and 2b. Majority of respondents resided in the South West (38.9%, 95% CI; 34.6 - 43.7) and North Central (38.2%, 95% CI; 33.7 – 42.8) regions of the country. The demographics of the study sample are presented in table 1.

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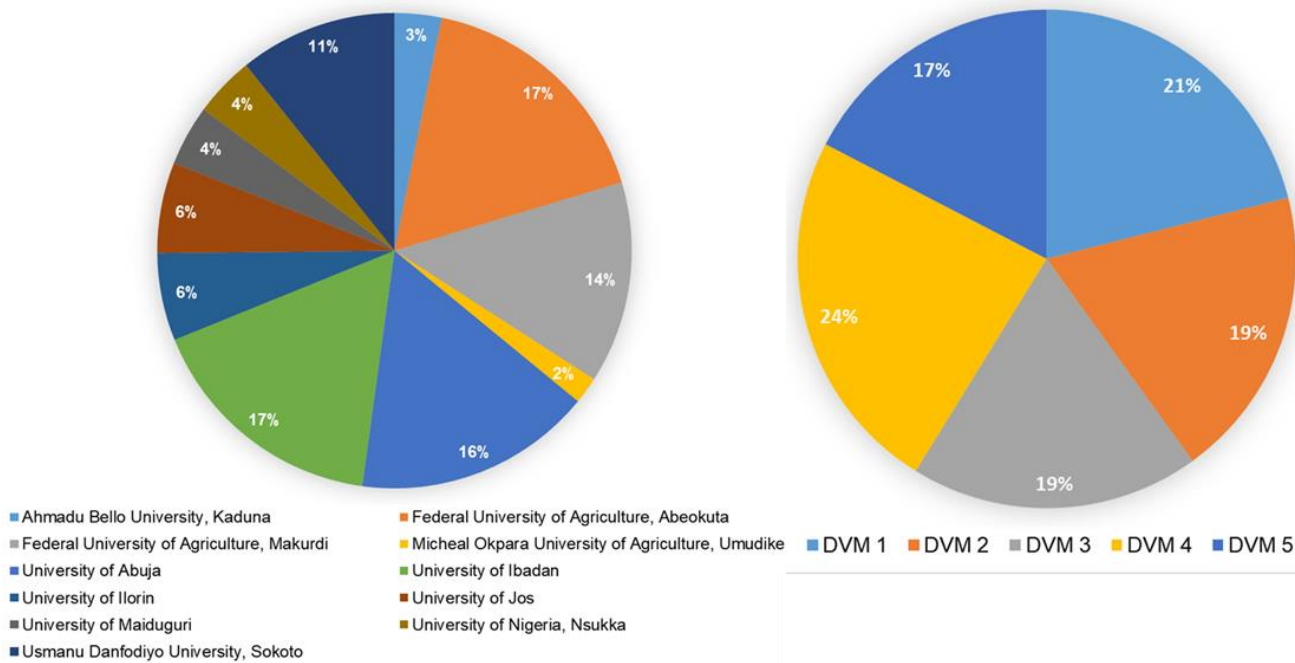


Figure 2. a) the distribution of respondents and veterinary schools; b) the various DMV levels of respondents

Table 1. Socio-demographic profile of veterinary medical students in Nigeria that participated in the online survey

S/N	Variables	Proportions (%)	95 % CI
1	Age in years (n=436)		
	16 - 20	138 (31.7)	27.5 - 36.2
	21 - 25	249 (57.1)	52.4 - 61.7
	26 - 30	43 (9.9)	7.4 - 13.0
	31 - 35	5 (1.1)	0.4 - 2.7
	36 - 40	1 (0.2)	0.0 - 1.4
2	Sex (n=437)		
	Female	177 (40.5)	36.0 - 45.2
	Male	260 (59.5)	54.8 - 64.0
3	Religion (n=437)		
	Christianity	316 (72.3)	67.9 - 76.3
	Islam	119 (27.2)	23.3 - 31.6
	Others	2 (0.5)	0.0 - 1.8
4	Name of University (n=437)		
	FUNAAB	75 (17.2)	13.9 - 21.0
	UI	73 (16.7)	13.5 - 20.5
	UNIILORIN	26 (5.9)	4.1 - 8.6
	UNIABUJA	71 (16.2)	13.1 - 20.0
	UNIJOS	27 (6.2)	4.3 - 8.9
	UNIMAID	18 (4.1)	2.6 - 6.5
	UDUS	47 (10.8)	8.2 - 14.0
	ABU	14 (3.2)	1.9 - 5.4
	MOUUAU	8 (1.8)	0.9 - 3.6
	UAM	60 (13.7)	10.8 - 17.3
	UNN	18 (4.1)	2.6 - 6.5
5	The level/year of study (n=437)		
	DVM 1 (year 2)	92 (21.1)	17.5 - 25.1
	DVM 2 (year 3)	83 (19.0)	15.6 - 23.0
	DVM 3 (year 4)	82 (18.8)	15.4 - 22.7
	DVM 4 (year 5)	104 (23.8)	20.0 - 28.0
	DVM 5 (year 6)	76 (17.8)	14.1 - 21.2
6	Number of household members (n=431)		
	Less than 5	96 (22.3)	18.6 - 26.4
	5-10	295 (68.4)	63.9 - 72.7
	10 and above	40 (9.3)	6.9 - 12.4
7	Geopolitical regions of residence (n=435)		
	North Central	166 (38.2)	33.7 - 42.8
	North East	25 (5.7)	3.9 - 8.4
	North West	40 (9.2)	6.8 - 12.3
	South East	21 (4.8)	3.1 - 7.3
	South South	13 (3.0)	1.7 - 5.1
	South West	170 (39.1)	34.6 - 43.7
8	Type of lockdown where resident (n=437)		
	Partial	299 (68.4)	64.0 - 72.6
	Total	103 (23.6)	19.8 - 27.8
	Not Sure	35 (8.0)	5.8 - 11.0

FUNAAB—Federal University of Agriculture, Abeokuta; UI—University of Ibadan, Ibadan; UNIILORIN—University of Ilorin, Ilorin; UNIABUJA—University of Abuja, Abuja; UNIJOS—University of Jos, Jos; UNIMAID—University of Maiduguri, Maiduguri; UDUS—Usmanu Danfodiyo University, Sokoto; ABU—Ahmadu Bello University, Zaria; MOUUAU—Michael Okpara University of Agriculture, Umudike; UAM—University of Agriculture, Makurdi; UNN—University of Nigeria, Nsukka.

3.2 Respondents knowledge level towards COVID – 19.

The most preferred source was through social media/internet platforms (n=403), including Facebook, Instagram, and Twitter. The less employed sources of information were newspapers (n=126) and classrooms (n=98). See Figure 3.

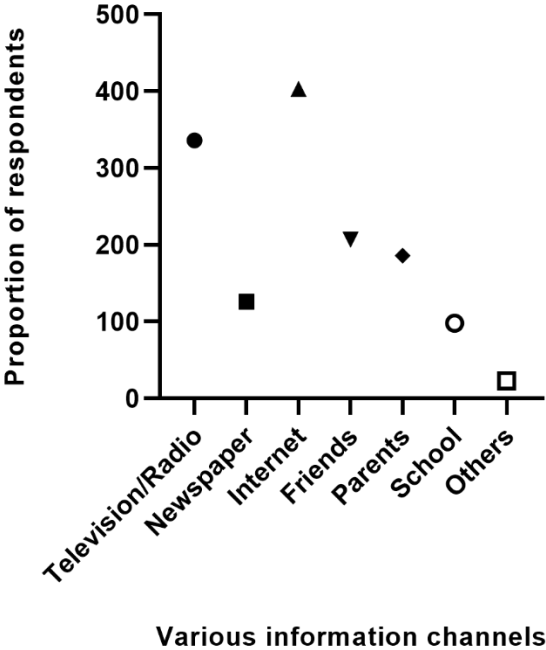


Figure 3. The different information channels used by veterinary medical students to gain information updates on COVID – 19.

The respondents showed an overall mean knowledge score of 22.7 (SD \pm 3.0; score 0 \rightarrow 31), suggesting a mean level of 73.4% (SD \pm 9.7%, range 38.7 – 93.5%) on COVID – 19. A total of 277 (63.4%) students had knowledge scores \geq 70% cut off, however, none responded correctly to all the knowledge items (71 – 93.5%). Knowledge varied significantly among the age groups ($p = 0.0042$) with those within groups 21 – 25 years and 26 – 30 years having higher scores ($p = 0.011$). Similarly, knowledge scores significantly varied among DVM levels ($p = 0.0001$) and Veterinary

schools ($p = 0.027$) with students in DVM 5 (Year 6) outperforming those in the preclinical levels DVM 1 ($p < 0.0001$), DVM 2 ($p = 0.024$) and DVM 3 ($p = 0.042$).

Table 2 presents details of knowledge components and students' performance on various questions on COVID-19. High proportions of students correctly identified COVID – 19 as a viral infection (98.9%, $n=432$) and that it originated from Wuhan China (99.3%, $n=434$), while 27.9% correctly ($n=122$) reported it as similar to both SARS-CoV and MERS-CoV.

Clinical signs associated with COVID-19 as identified by respondents were as follows: fever (97.5%, $n=426$), fatigue (70.9%, $n=310$), dry cough (86.5%, $n=378$), runny nose (38.0%, $n=166$), shortness of breath (91.5%, $n=400$), myalgia (35.0%, $n=153$), loss of taste (40.0%, $n = 175$), loss of smell (46.0%, $n=201$), and diarrhoea/vomiting (21.3%, $n=93$). Only 5 (1.1%) of the respondents correctly identified all the possible clinical presentations (Table 2). A high proportion (84.2%, $n=368$) knew that the COVID-19 virus spreads via respiratory droplets of infected people, and asymptomatic state of infection and transmission is possible (88.3%, $n=386$). Also, majority of the respondents knew the application of alcohol-based sanitizers (95.9%), soap and detergent (75.0%), high temperature inactivates or kills the virus (61.1%). Meanwhile, 308 (70.5%) were aware there was no cure for the disease (Table 2).

Table 2. Knowledge of COVID-19 among veterinary medical students in Nigeria, August 2020 ($N = 437$).

Knowledge items and correct answers	Frequency (%)	
	Correct	Incorrect
1. COVID-19 is caused by a virus	432 (98.9)	5 (1.10)
2. Incubation period of the disease is 2 – 14 days	410 (93.8)	27 (6.2)
3. COVID- 19 is similar to		
MERS-CoV	134 (30.7)	303 (69.3)
SARS-CoV	288 (65.9)	149 (34.1)
4. COVID- 19 was first reported in China	434 (99.3)	3 (0.7)

Knowledge items and correct answers	Frequency (%)	
	Correct	Incorrect
5. Possible common symptoms of COVID- 19:		
Fever	426 (97.5)	11 (2.5)
Dry cough	378 (86.5)	59 (13.5)
Runny nose	166 (38.0)	271 (62.0)
Shortness of breath	400 (91.5)	37 (8.5)
Joint/Muscle ache	153 (35.0)	284 (65.0)
Loss of taste	175 (40.0)	262 (60.0)
Loss of smell	201 (46.0)	236 (54.0)
Diarrhoea/vomiting	93 (21.3)	344 (78.7)
Fatigue	310 (70.9)	127 (29.1)
6. COVID 19 can be transmitted through		
Direct contact with an infected person	401 (91.8)	36 (8.2)
Air droplet	368 (84.2)	69 (15.8)
Indirect contact such as contaminated surfaces	285 (65.2)	152 (34.8)
Handshake	357 (81.7)	80 (18.3)
Kissing	303 (69.3)	134 (30.7)
7. It is possible to have COVID 19 and not show symptoms (Yes)	386 (88.3)	51 (11.7)
8. What can kill the virus:		
Alcohol-based sanitizers	419 (95.9)	18 (4.1)
Soap/detergents	328 (75.1)	109 (24.9)
High-temperature application	267 (61.1)	170 (38.9)
9. Pets have been scientifically proven to transmit COVID- 19 (No)	184 (42.1)	253 (57.9)
10. There is a cure for COVID 19 (No)	308 (70.5)	129 (29.5)

3.3 COVID-19 and self-reported preventive practices of respondents

Majority of the students reported maintaining good personal hygiene (n=386, 84.2%), while a lower proportion would not touch their face or nose all the time (n=85, 19.5%). Averagely, respondents observed the stay at home policy (n=219, 50.1%), face mask-wearing in public (n=254, 58.1%), and social distancing from people (n=251, 57.4%). Up to 66.4% (n=299) reported never self-medicating to prevent COVID- 19 infection. A significant association between the knowledge that there was no cure for COVID-19 and not self- medicating was observed ($p = 0.01$). Figure 4 further describes in details respondents' practices towards preventing being infected and community spread.

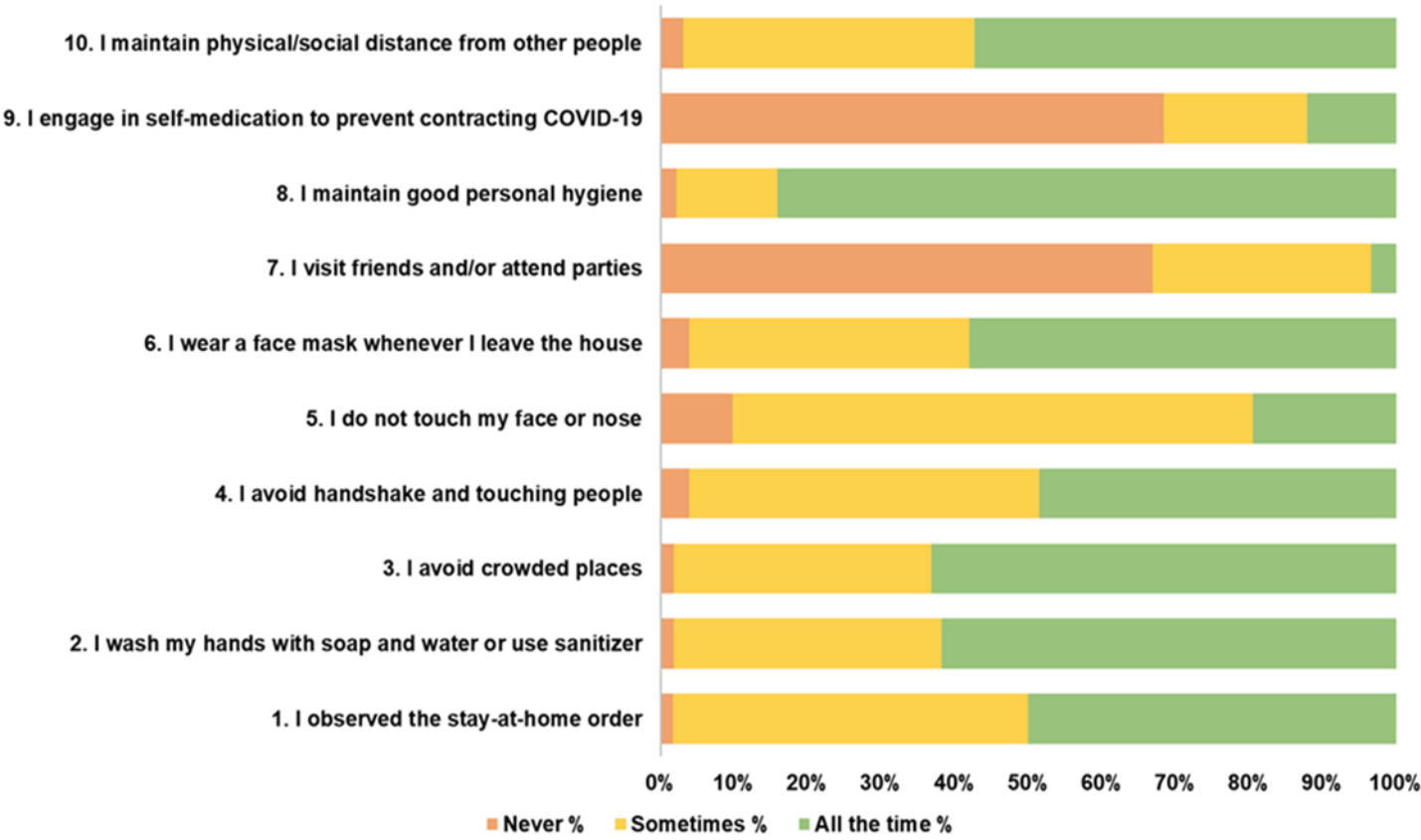


Figure 4. Self-reported practices by veterinary medical students in Nigeria towards preventing infection and community spread during the COVID – 19 pandemic

The overall preventive practice mean score of students towards COVID- 19 was 24.1 (SD \pm 2.9; score 0 \rightarrow 30), suggesting a mean level of 80.3% (SD \pm 9.6%, range 40.0 - 100.0%). The practice level was generally satisfactory with 88.8% (n=388) of the respondents having the \geq 70% cut off, while one student reported observing all the preventive measures. A positive correlation between preventive practice measures and knowledge about COVID – 19 was observed, although weak ($r = 0.16$, $n = 437$, $p = 0.0009$, 95% CI; 6.2 - 25.0). The practice scores were similar across DVM levels ($p = 0.09$), geopolitical regions of residence ($p = 0.36$), and lockdown type ($p = 0.10$).

3.4 Bivariate analysis for the association between sociodemographic profiles of respondents and their knowledge and practice levels on COVID-19 pandemic

The bivariate analysis showed that only age ($p = 0.040$), name of University ($P = 0.080$), year of study ($p = 0.009$) and geopolitical region ($p = 0.073$) were significantly associated with knowledge levels at $p \leq 0.25$ (Table 3).

Similarly, sex ($p = 0.012$), religion ($p = 0.076$), name of University ($p = 0.010$) and geopolitical region were associated factors with practice level of respondents towards COVID-19 pandemic (Table 4).

Table 3. Bivariate analysis of veterinary medical students' socio-demographics with the knowledge levels about COVID-19 pandemic in Nigeria

Variable	Category	Knowledge level		X ²	P value
		Good	Poor		
Age (in years)	16-20	79 (57.2)	59 (42.8)	8.30	0.040*
	21-25	158 (63.4)	91 (36.6)		
	25-30	34 (79.1)	9 (20.9)		
	>30	6 (85.7)	1 (14.3)		
Sex	Male	164 (63.1)	96 (36.9)	0.03	0.871
	Female	113 (63.8)	64 (36.2)		
Religion	Christianity	202 (63.7)	115 (36.3)	0.06	0.813
	Islam	75 (62.5)	45 (37.5)		
Name of University	FUNAAB	46 (61.3)	29 (38.7)	12.70	0.080*
	UI	50 (68.4)	23 (31.5)		
	UNIABUJA	40 (56.3)	31 (43.7)		
	UDUS	22 (46.8)	25 (53.2)		
	UAM	38 (63.3)	22 (36.7)		
	UNILORIN	20 (76.9)	6 (23.1)		
	UNIJOS	19 (70.4)	8 (29.6)		
	OTHERS	42 (72.4)	16 (27.6)		
Level/Year of study	DMV 1 (year 2)	48 (52.2)	44 (47.8)	13.42	0.009*
	DVM 2 (Year 3)	48 (57.8)	35 (42.2)		
	DVM 3 (Year 4)	52 (63.4)	30 (36.6)		
	DVM 4 (Year 5)	70 (67.3)	34 (32.7)		
	DVM 5 (Year 6)	59 (77.6)	17 (22.4)		

Variable	Category	Knowledge level		X ²	P value
		Good	Poor		
No. of household members	Less than 5	120 (62.2)	73 (37.8)	0.34	0.845
	5-10	129 (63.9)	73 (36.1)		
	>10	28 (66.7)	14 (33.3)		
Geopolitical region	North Central	109 (65.7)	57 (34.3)	10.34	0.073*
	North East	16 (64.0)	9 (36.0)		
	North West	18 (42.9)	24 (57.1)		
	South East	16 (76.2)	5 (23.8)		
	South South	10 (76.9)	3 (23.1)		
	South West	108 (63.5)	62 (36.5)		
Type of lockdown	Partial	196 (65.6)	103 (34.4)	1.95	0.378
	Total	60 (58.2)	43 (41.8)		
	Not Sure	21 (60.0)	14 (40.0)		
Total		277 (63.4)	160 (36.6)		

* Significant at $P \leq 0.25$

Table 4: Bivariate analysis of veterinary medical students’ sociodemographics with the practice levels about COVID-19 pandemic in Nigeria

Variable	Category	Practice level		X ²	P value
		Satisfactory	Unsatisfactory		
Age (in years)	16-20	119 (86.2)	19 (13.8)	1.27	0.589
	21-25	224 (90.0)	25 (10.00)		
	25-30	38 (88.4)	5 (11.6)		
	>30	6 (85.7)	1 (14.3)		
Sex	Male	222 (85.4)	38 (14.6)	6.38	0.012*
	Female	165 (93.2)	12 (6.8)		
Religion	Christianity	286 (90.2)	31 (9.8)	3.15	0.076*
	Islam	101 (84.2)	19 (15.8)		
Name of University	FUNAAB	69 (92.0)	6 (8.0)	18.42	0.010*
	UI	62 (84.9)	11 (15.1)		
	UNIABUJA	67 (94.4)	4 (5.6)		
	UDUS	34 (72.3)	13 (27.7)		
	UAM	55 (91.7)	5 (8.3)		
	UNILORIN	21 (80.8)	5 (19.2)		
	UNIJOS	26 (96.3)	1 (3.7)		
	OTHERS	53 (91.4)	5 (8.6)		
Level/Year of study	DMV 1 (Year 2)	79 (85.9)	13 (14.1)	1.06	0.901
	DVM 2 (Year 3)	73 (88.0)	10 (12.0)		
	DVM 3 (Year 4)	74 (90.2)	8 (9.8)		
	DVM 4 (Year 5)	93 (89.5)	11 (10.5)		
	DVM 5 (Year 6)	68 (89.5)	8 (10.5)		

Variable	Category	Practice level		X ²	P value	
		Satisfactory	Unsatisfactory			
No. of household members	Less than 5	174 (90.2)	19 (9.8)			
	5-10	177 (87.6)	25 (12.4)	1.00	0.608	
	>10	36 (85.7)	6 (14.3)			
Geopolitical region	North Central	154 (92.8)	12 (7.2)			
	North East	17 (68.0)	8 (32.0)			
	North West	33 (78.6)	9 (21.4)	17.9	0.007*	
	South East	20 (95.2)	1 (4.8)			
	South South	12 (92.3)	1 (7.7)			
	South West	150 (88.2)	20 (11.8)			
	Type of lockdown	Partial	264 (88.3)	35 (11.7)		
		Total	93 (90.3)	10 (9.7)	0.61	0.739
Not Sure		30 (85.7)	5 (14.3)			
Total		387 (88.8)	50 (11.2)			

* Significant at $P \leq 0.25$

3.5 Multivariate analysis for the association between sociodemographic profiles of respondents and their knowledge and practice levels on COVID-19 pandemic

The multivariate logistic regression analysis reveals only the level/year of study ($p = 0.014$) and sex ($p = 0.024$) of respondents respectively were significant positive predictors of good knowledge and practice levels towards COVID-19. Respondents in Year 6 (clinical) were about 3.2 times more likely to have good knowledge of COVID-19 pandemic (OR = 3.18, 95%CI: 1.62-6.26, $p = 0.001$) than those in Year 2 (non-clinical). On the other hand, the female had higher odds of demonstrating satisfactory practices regarding COVID-19 pandemic (OR = 2.22, 95%CI = 1.11-4.41, $p = 0.024$) than the males (Table 5). Besides, respondents in the North West region had the lowest odds of having good knowledge on COVID-19 pandemic (OR = 0.39, 95%CI: 0.20-0.78, $p = 0.008$) when compared with other geopolitical regions. Similarly, respondents in the North East (OR = 0.18, 95%CI: 0.07-0.50, $p = 0.001$) and North West (OR = 0.31, 95%CI: 0.12-0.79, $p = 0.014$) geopolitical regions had significantly lowest odds of demonstrating satisfactory practices regarding COVID-19 when compared with other regions in relation to the North Central region as the reference (Table 5).

Table 5. Multivariate logistic regression analysis of factors associated with knowledge and practice levels on COVID-19 pandemic among veterinary medical students in Nigeria

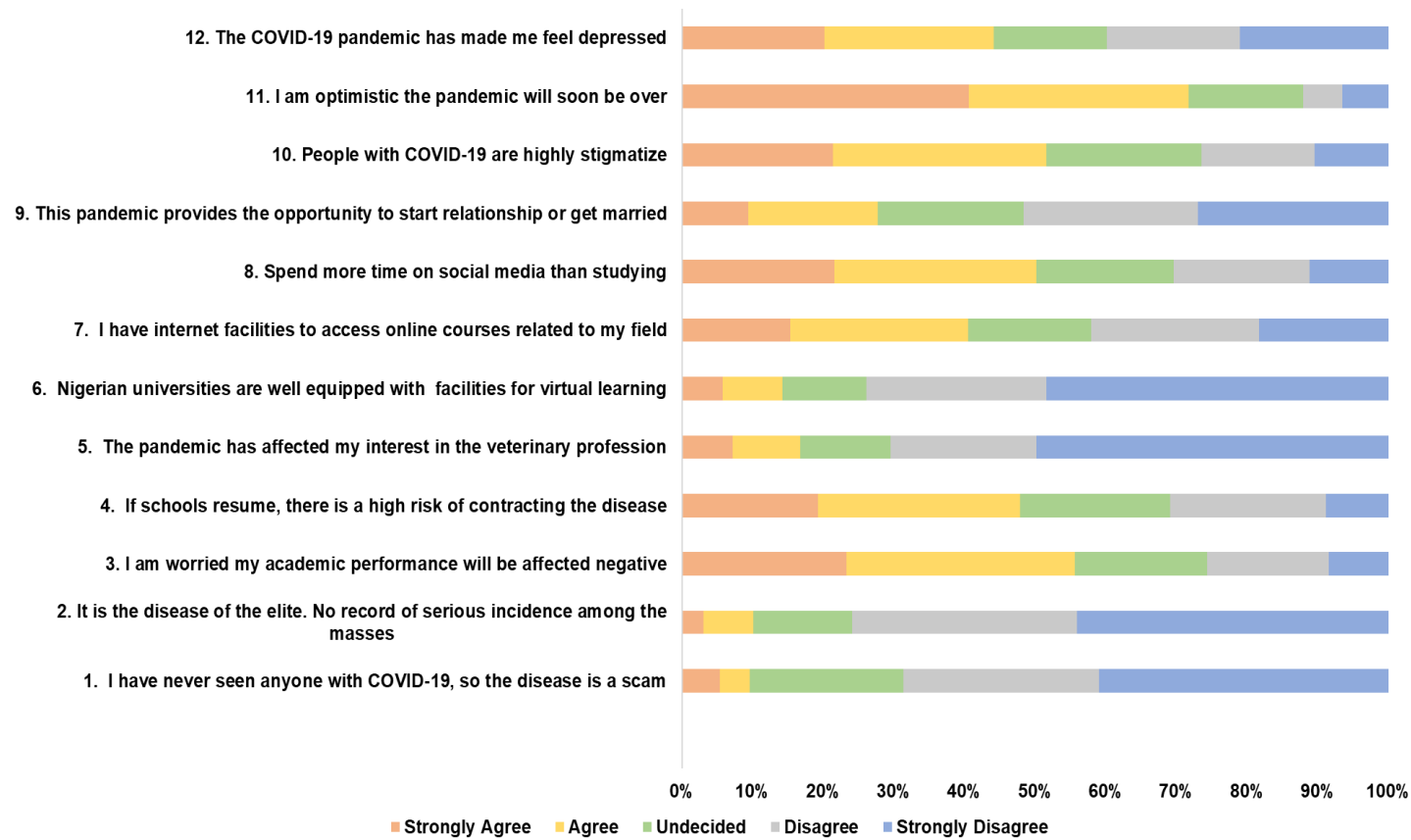
Variable	Category	Knowledge level			Practice		
		OR	95%CI	P value	OR	95%CI	P value
Age (in years)	16-20	1					
	21-25	1.30	0.85-1.98	0.230			
	25-30	2.82	1.26-6.33	0.012			
	>30	4.48	0.53-38.22	0.170			
Sex	Male				1		
	Female				2.22	1.11-4.41	0.024*
Religion	Christianity				1		
	Islam				0.63	0.34-1.20	0.159
Name of University	FUNAAB	1			1.00		
	UI	1.37	0.70-2.70	0.362	0.49	0.17-1.40	0.184
	UNIABUJA	0.81	0.42-1.57	0.540	1.46	0.39-5.39	0.573
	UDUS	0.55	0.27-1.16	0.118	0.23	0.08-0.65	0.006*
	UAM	1.09	0.54-2.20	0.812	0.96	0.28-3.30	0.944
	UNILORIN	2.10	0.75-5.85	0.155	0.37	0.10-1.31	0.124
	UNIJOS	1.50	0.58-3.86	0.404	2.26	0.26-19.69	0.460
	OTHERS	1.65	0.79-3.47	0.182	0.92	0.27-3.18	0.897
Level/Year of study	DMV 1 (year 2)	1.00					
	DVM 2 (Year 3)	1.26	0.69-2.29	0.453			
	DVM 3 (Year 4)	1.59	0.87-2.92	0.135			
	DVM 4 (Year 5)	1.89	1.06-3.37	0.032			
	DVM 5 (Year 6)	3.18	1.62-6.26	0.001			
	DMV 1 (year 2)						
Geopolitical region	North Central	1.00			1.00		
	North East	0.93	0.39-2.24	0.871	0.18	0.07-0.50	0.001*
	North West	0.39	0.20-0.78	0.008	0.31	0.12-0.79	0.014
	South East	1.67	0.58-4.80	0.338	1.70	0.21-13.69	0.618
	South South	1.74	0.46-6.59	0.413	1.02	0.12-8.47	0.986
	South West	0.91	0.58-1.43	0.683	0.72	0.34-1.52	0.384

* Significant at $P \leq 0.05$, 1=Reference

3.6 Perceptions about COVID – 19.

Most of the respondents reported they have seen persons infected with COVID-19 and do not think the pandemic was a scam (68.6%, n=300), or a disease of the elites (76.0%, n=332). Also, 73.9 % (n=323) respondents disagreed they had internet facilities to educate themselves with online programmes related to the profession. Averagely, 55.6% (n=243) students were worried their academic performance would be affected negatively and 50.1% (n=199) spend more time on social media than studying. A good proportion (71.6%, n=313) of the students were optimistic about the pandemic being over soon while 44.1% agreed being depressed as a result of the pandemic. Figure 5.

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341 Figure 5 The perceptions of veterinary medical students in Nigeria towards COVID-19 pandemic
342 and the impact on their learning and emotional well being

4 Discussion

This study, which aptly reflected the KPP of Veterinary medical student towards the COVID-19 pandemic, is the first in Nigeria and one of the few in Africa to the best of the authors' knowledge. The majority of the students had good knowledge and satisfactory practices regarding COVID-19 pandemic; however, there were important gaps in the key non-pharmaceutical preventive measures recommended by the WHO with implications for public health and disease control.

The study revealed a higher number of male respondents than females. This is similar to previous studies which showed a reflection of male dominance in the veterinary profession in Nigeria (Odetokun et al., 2019; Adebowale et al., 2020; Adenubi et al., 2020b). Female veterinary students who participated in this study (40.5%), when compared with a similar and recent study conducted among veterinary professionals with 27.2% female respondents seems higher (Adenubi et al., 2020b). Presently, gender shift with more females than males in the veterinary profession especially in the Western world (Allen, 2016; Lofstedt, 2003; Henry and Jackson, 2015; Begeny and Ryan 2019) and in South Africa (Gerry, 2011) is reported.

The respondents' mean knowledge score was 22.7 (SD \pm 3.0; 73.4%) with an overall 63.4% displaying good knowledge which seems satisfactory and similar to reports for medical students in Jordan with overall 69.5% showing good knowledge (Olaimat et al., 2020) and veterinary professionals in Nigeria (64.0 %, Adenubi et al 2020b). The knowledge level displayed was higher than reports from two university communities in Pakistan (50.2%; Salman et al., 2020) and Nigeria (59.5 %; Adenubi et al., 2020a) as well as among the public visiting a medical centre in Ethiopia (41.3%, Kebede et al., 2010). However, other studies have recorded higher knowledge level towards the COVID- 19 pandemic among undergraduate students in China

(82.3%, Peng et al., 2020), residents in North central Nigeria (99.5%; Reuben et al 2020), the United States (80%, Clements, 2020), and China (90.0%; Zhong et al., 2020).

Majority of the veterinary medical students relied on the internet and social media to get information or updates about the pandemic, which might have contributed to the high level of knowledge acquired about COVID-19. This is following similar studies by Khasawneh et al. (2020), Alzoubi et al. (2020) and Olaimat et al. (2020) where the internet/social media was reported as the most common source of information for medical and non-medical students. Several guidelines and information on COVID-19 have been uploaded online by WHO and NCDC immediately after pronouncing the guidelines. Also, the public receives constant notifications or reminders about these guidelines by network service providers in the country. It is, however important that government agencies should work towards dispelling misinformation, misconceptions, rumours or hoax news from illicit social media platforms, which have increased 50 times more during the pandemic (Pragholapati, 2020).

Further, being students in their final year (which corresponds to the clinical year) than in non-clinical was a positive predictor for good knowledge about COVID- 19. This is not surprising because all veterinary schools engage students in clinical courses in veterinary public health, epidemiology of infectious/zoonotic diseases, mechanisms of disease spread and control. It is expected that the greater the exposure to clinical teaching in the final year of veterinary school, the more the students at this level will likely be keen or inquisitive to acquire more information or knowledge than others. Besides, respondents in the North West region had the lowest odds of having good knowledge of COVID-19 pandemic when compared with other geopolitical regions. This finding is very vital to planning an informed disease mitigation programme as such data are required in enhancing targeted educational programmes among university student populations in

the country. Multi-stakeholder collaborative efforts and strategies should be promoted within institutions to contain pandemic among university students.

The level of preventive practices among the students (88.8%) was also commendable; however, there were some important gaps in public health concerns. Averagely, respondents (50.1%) observed the stay at home policy, face mask-wearing in public (58.1%), and social distancing from people (57.4%). While these three constitute key non-pharmaceutical preventive measures recommended by the WHO, it appears worrisome that only a little above average of the respondents adhered to these measures. Meanwhile, the issue of face masking is becoming debatable within some groups of people globally. Some see the policy as a bridge of human rights, while some other people feel uncomfortably hot and experience difficulty in breathing when wearing face masks. Our data on face masking is similar to other studies which showed that although people know it is one of the protective guidelines, many do not frequently comply with its use in public places (Alzoubi et al., 2020; Olum et al., 2020, Salman et al., 2020; Clements, 2020, Reuben et al., 2020).

Majority of the respondents practised good hygiene and did not use any self-medication as prophylaxis. It was observed that knowing that there was no cure for the virus significantly influenced the respondents' choice not to self-medicate as a prophylactic measure. Female students displayed a satisfactory practice level twice more than male in this study. This is not surprising as the females are viewed to be more cautious than their male counterparts who often dare and take risks. Findings from Pakistan showed literate society, particularly women had good knowledge, optimistic attitudes, and practices towards COVID-19 (Afzal et al., 2020). Similarly, Zhong et al. (2020) and Salman et al. (2020) similarly documented that preventative practices

were better in the female population than males. Other studies, on the contrary, reported good practices were associated with age, gender and education (Hager al., 2020; Afzal et al 2020)

Again, the majority of the respondents had right perceptions about COVID-19 pandemic, as 76.0% perceived the disease as not a scam nor a disease of the elites (70.0%). Besides, the majority of the students held an optimistic attitude with 71.6% believing that COVID-19 would finally be successfully controlled. Such perceptions could promote global drive at containing the pandemic since this might eventually rub on their level of adherence to preventive measures. Importantly, the consequent perceived impacts of COVID-19 pandemic on academics in Nigeria by the respondents is a matter of concern. The respondents were worried their academic performance would be affected negatively (55.6%) and that they spent more time on social media than studying (50.1%). Many (74.0%) shared their dissatisfaction about the government tertiary institutions because of the inadequate online facilities or tools to perform virtual education in Nigeria during such a time like this. While many colleges and universities worldwide switch to online teaching to reduce people contact, public universities in Nigeria have not been able to achieve this.

Lastly, over 44.0% of student participants indicated having depression due to the pandemic. Several studies have shown the psychological impact of the epidemic on the general public, patients, medical staff, children, and older adults (Cao et al., 2020; Huang et al., 2020; Usher et al., 2020). Students' mental health is greatly affected and may worsen existing mental health problems when faced with a public health emergency, social isolation, and economic recession. In times like this, students need attention, assistance, and support from the community, family, and tertiary institutions (Pragholapati, 2020). The emotional status of the respondents, as reflected by their response to their perception about marital issues appears to favour disinterest in

love relationship and marriage contraction. This might be attributed to more engaging thoughts about overcoming the prevailing pandemic.

This study had some limitations. Firstly, data analysed were self-reported, which might suffer from reporting bias. Secondly, a convenience sampling method was used and might limit the generalizability of the finding to the general student population. However, the overall response rate was sufficient to eliminate or reduce this bias. Thirdly, uneven access to internet services and connectivity in the country might have affected the number of respondents from one institution to the other.

5 Conclusion

COVID-19 as a pandemic needs extraordinary steps for its control, which include understanding the knowledge, practices and perceptions of the population. Although the knowledge and preventive practices of the veterinary students in this study were satisfactory, there were important gaps in some key preventive practices recommended by the WHO. Some of the identified KPP gaps in this study require urgent attention and must be targeted towards promoting strategic educational planning and behavioural changes. Also, e-learning facilities should be provided within the Nigerian universities, constantly upgraded and usage maximized by staff and students.

Authors' contributions

AOO and AOT conceptualised the project, AOO and AHK drafted the manuscript with input from all the authors, AOO, AOT, AHK, OAA, BNO, APO, and FOE designed the questionnaire and collected data, AOO, AHK, BNO and APO did the statistical analysis, AAK revised the manuscript critically. All authors read and approved the final version of the manuscript to be published and agreed to be accountable for all aspects of the work.

456 **Conflict of interest**

457 All authors declare no conflict of interest.

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6 **References**

Adebowale, O. O., Afolabi, M. O., Adesokan, H. K., Fasanmi, O. G., Adeyemo, O. K., Awoyomi, O. J., & Fasina, F. O. (2020). Determinants of Work-Related Risks among Veterinary Clinical Students in South West Nigeria. *Veterinary Medicine International*, 2020, Article ID 2780378, 10 pages. <https://doi.org/10.1155/2020/27803781-10>.
<https://doi.org/10.1155/2020/2780378>

Adenubi, O.T., Adebowale, O.O., Oloye, A.A., Bankole, N.O., Ayo-Ajayi, P.O., & Akinloye, A.K. (2020a). University Community-Based Survey on the Knowledge, Attitude and Perception about COVID-19 Pandemic: The Federal University of Agriculture, Abeokuta, Nigeria as a Case Study. *Preprints*, 2020a, 2020060185 (doi: 10.20944/preprints202006.0185.v1).

Adenubi, O., Adebowale, O., Oloye, A., Bankole, N., Adesokan, H., Fadipe, O., Ayo-Ajayi, P., & Akinloye, A. (2020b). Level of Knowledge, Attitude and Perception About COVID-19 Pandemic and Infection Control: A Cross-Sectional Study Among Veterinarians in Nigeria. *Preprints*, 2020b, 2020070337 (doi: 10.20944/preprints202007.0337.v1).

Afzal, M. S., Khan, A., Qureshi, U. U. R., Saleem, S., Saqib, M. A. N., Shabbir, R. M. K., ... Ahmed, H. (2020). Community-Based Assessment of Knowledge, Attitude, Practices and Risk Factors Regarding COVID-19 Among Pakistanis Residents During a Recent Outbreak: A Cross-Sectional Survey. *Journal of Community Health*. <https://doi.org/10.1007/s10900-020-00875-z>

Allen, L. C. V. (2016). "Feminisation: threat or opportunity?" *Veterinary Record*, 178, (16), 391–393.

Alvin, M. D., George, E., Deng, F., Warhadpande, S., & Lee, S. I. (2020). The Impact of COVID-19 on Radiology Trainees. *Radiology*, 296 (2), 246-248. <https://doi.org/10.1148/radiol.2020201222>

Alzoubi, H., Alnawaiseh, N., Al-Mnayyis, A., Abu-Lubad, M., Aqel, A., & Al-Shagahin, H. (2020). Covid-19 - Knowledge, attitude and practice among medical and non-medical university students in Jordan. *Journal of Pure and Applied Microbiology*, 14 (1), 17-24 <https://doi.org/10.22207/JPAM.14.1.04>

Begeny, C., & Ryan, M. (2019). Gender bias alive and kicking. *BSAVA Companion*, 2019 (1), 26-27.

Cao, W., Fang, Z., Hou, G., Han, M., Xu, X., Dong, J., & Zheng, J. (2020). The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Research*. <https://doi.org/10.1016/j.psychres.2020.112934>

Clements, J. M. (2020). Knowledge and behaviours toward COVID-19 among us residents during the early days of the pandemic: Cross-sectional online questionnaire. *Journal of Medical Internet Research*, 6 (2), e19161. <https://doi.org/10.2196/19161>

- Duong, V., Luo, J., & Wang, Y. (2020). "The Ivory Tower Lost : How College Students Respond Differently than the General Public to the COVID-19 Pandemic,"2019. arXiv.org > cs > arXiv:2004.09968
- Eze, S. C., Chinedu-Eze, V. C., & Bello, A. O. (2018). The utilisation of e-learning facilities in the educational delivery system of Nigeria: a study of M-University. *International Journal of Educational Technology in Higher Education*, 15, 34-54. <https://doi.org/10.1186/s41239-018-0116-z>
- Galea, S., Merchant, R. M., & Lurie, N. (2020). The Mental Health Consequences of COVID-19 and Physical Distancing: The Need for Prevention and Early Intervention. *JAMA Internal Medicine*, 180 (6), 817 -818. <https://doi.org/10.1001/jamainternmed.2020.1562>
- Gerry, S. (2011). "Addressing the veterinary shortage," December 2011, <https://www.farmersweekly.co.za/bottomline/addressing-the-veterinary-shortage/>.
- Hager, E., Odetokun, I. A., Bolarinwa, O., Zainab, A., Okechukwu, O., & Al-Mustapha, A. I. (2020). Knowledge, attitude, and perceptions towards the 2019 Coronavirus Pandemic: A bi-national survey in Africa. *PloS One*, ONE 15 (7), e0236918. <https://doi.org/10.1371/journal.pone.0236918>
- Henry, C., & Jackson, E. (2015). Women's entrepreneurship and the future of the veterinary profession. *Journal of the Association for Management Education and Development*, 22 (3), 34-42. <https://doi.org/10.1016/j.ajp.2020.102083>.
- Huang, L., Xu, F., & Liu, H. (2020). Emotional responses and coping strategies of nurses and nursing college students during COVID-19 outbreak. *International Journal of Biological Science*, 16 (10), 1745-1752. <https://doi.org/10.7150/ijbs.45221>.
- Iyer, P., Aziz, K., & Ojcius, D. M. (2020). Impact of COVID-19 on dental education in the United States. *Journal of Dental Education*, 84 (16), 718-722. <https://doi.org/10.1002/jdd.12163>
- Kebede, Y., Yitayih, Y., Birhanu, Z., Mekonen, S., & Ambelu, A. (2020). Knowledge, perceptions and preventive practices towards COVID-19 early in the outbreak among Jimma university medical center visitors, Southwest Ethiopia. *PLoS ONE*, 15 (5), e0233744. <https://doi.org/10.1371/journal.pone.0233744>
- Khasawneh, A. I., Humeidan, A. A., Alsulaiman, J. W., Bloukh, S., Ramadan, M., Al-Shatanawi, T. N., Awad, H.H., Hijazi, W.Y., Al-Kammash, K.R., Obeidat, N., Saleh, T., & Kheirallah, K. A. (2020). Medical Students and COVID-19: Knowledge, Attitudes, and Precautionary Measures. A Descriptive Study from Jordan. *Frontiers in Public Health*, 8, 253-262. <https://doi.org/10.3389/fpubh.2020.00253>
- Lofstedt, J. (2003). Gender and veterinary medicine. *The Canadian Veterinary Journal = La Revue Veterinaire Canadienne*, 44 (7), 533-535.
- Mahdy, A.A. (2020). The Impact of COVID-19 Pandemic on the Academic Performance of Veterinary Medical Students. Preprints. doi:10.20944/preprints202006.0130.v1
- NCDC, 2020. "First case of Coronavirus disease confirmed in Nigeria". Nigeria Centre for Disease Control. 28 February 2020. Retrieved 25 July 2020.

- 543 Odetokun, I. A., Akpabio, U., Alhaji, N. B., Biobaku, K. T., Oloso, N. O., Ghali-Mohammed,
544 I., Biobaku, A. J., Adetunji, V. O., & Fasina, F. O. (2019). Knowledge of Antimicrobial
545 Resistance among Veterinary Students and Their Personal Antibiotic Use Practices: A
546 National Cross-Sectional Survey. *Antibiotics*, 8 (4), 243.
547 <https://doi.org/10.3390/antibiotics8040243>
- 548 Olaimat, A. N., Aolymat, I., Shahbaz, H. M., & Holley, R. A. (2020). Knowledge and
549 Information Sources About COVID-19 Among University Students in Jordan: A Cross-
550 Sectional Study. *Frontiers in Public Health*, 8, 54-63.
551 <https://doi.org/10.3389/fpubh.2020.00254>
- 552 Olapegba, P. O., Ayandele, O., Kolawole, S. O., Oguntayo, R., Gandi, J. C., Dangiwa, A. L.,
553 ... Iorfa, S. K. (2020). A Preliminary Assessment of Novel Coronavirus (COVID-19)
554 Knowledge and Perceptions in Nigeria. *medRxiv* 2020.04.11.20061408; doi:
555 <https://doi.org/10.1101/2020.04.11.20061408>
556
- 557 Olum, R., Chekwech, G., Wekha, G., Nassozi, D. R., & Bongomin, F. (2020). Coronavirus
558 Disease-2019: Knowledge, Attitude, and Practices of Health Care Workers at Makerere
559 University Teaching Hospitals, Uganda. *Frontiers in Public Health*, 8, 181.
560 <https://doi.org/10.3389/fpubh.2020.00181>
561
- 562 Peng, Y., Pei, C., Zheng, Y., Wang, J., Zhang, K., Zheng, Z., & Zu, P. (2020). A cross-
563 sectional survey of knowledge, attitude and practice associated with COVID-19 among
564 undergraduate students in China. *BMC Public Health*, 20, 1292-1300.
565 <https://doi.org/10.1186/s12889-020-09392-z>
- 566 Praghlapati, A. (2020). COVID-19 Impact on Students.
567 <https://doi.org/10.17605/OSF.IO/NUYJ9>
568 .
- 569 Reuben, R. C., Danladi, M. M. A., Saleh, D. A., & Ejembi, P. E. (2020). Knowledge,
570 Attitudes and Practices Towards COVID-19: An Epidemiological Survey in North-Central
571 Nigeria. *Journal of Community Health*. <https://doi.org/10.1007/s10900-020-00881-1>
- 572 Roy, D., Tripathy, S., Kar, S. K., Sharma, N., Verma, S. K., & Kaushal, V. (2020). Study of
573 knowledge, attitude, anxiety & perceived mental healthcare need in Indian population during
574 COVID-19 pandemic. *Asian Journal of Psychiatry*, 51, 102083.
575 <https://doi.org/10.1016/j.ajp.2020.102083>
- 576 Salman, M., Mustafa, Z. U., Asif, N., Zaidi, H. A., Hussain, K., Shehzadi, N., Khan, T. M.,
577 & Saleem, Z. (2020). Knowledge, attitude and preventive practices related to COVID-19: a
578 cross-sectional study in two Pakistani university populations. *Drugs & therapy perspectives* :
579 for rational drug selection and use, 1–7. Advance online publication.
580 <https://doi.org/10.1007/s40267-020-00737-7>
- 581 Usher, K., Durkin, J., & Bhullar, N. (2020). The COVID-19 pandemic and mental health
582 impacts. *International Journal of Mental Health Nursing*, 29 (3), 315-318.
583 <https://doi.org/10.1111/inm.12726>

Werner, E.A., Aloisio, C.E., Butler, A.D., D'Antonio, K.M., Kenny, J.M., Mitchell, A., Ona, S., & Monk, C. (2020). Addressing Mental Health in Patients and Providers during the COVID-19 Pandemic, *Seminars in Perinatology*.
<https://doi.org/10.1016/j.semperi.2020.151279>.

World Health Organisation Dashboard, 2020. <https://covid19.who.int/>. Assessed online September 3, 2020

World Medical Association. World Medical Association Declaration of Helsinki. Ethical principles for medical research involving human subjects (2001). *Bulletin World Health Organisation*, 79, 373–374.

Zhong, B. L., Luo, W., Li, H. M., Zhang, Q. Q., Liu, X. G., Li, W. T., & Li, Y. (2020). Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: A quick online cross-sectional survey. *International Journal of Biological Sciences*, 16 (10), 1745-1752
<https://doi.org/10.7150/ijbs.45221>.