Attitude and preventive practices towards COVID-19 disease and the impact of awareness training on knowledge of the disease among correctional officers [version 2; peer review: 1 approved, 1 approved with reservations]

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Abstract
COVID-19 remains a public health emergency of international concern. Efforts at the global and national levels are being made to control its spread. The Nigerian Correctional Service is also proactive in the fight against the disease by organizing COVID-19 awareness training for correctional officers. We conducted a pre- and post-test assessment of COVID-19 knowledge among correctional officers in Enugu State Command to determine the impact of awareness training on their knowledge level. The study also assessed correctional officers’ attitude and preventive practices towards the disease. The mean knowledge score was 19.34 out of 25, and the awareness training significantly improved the participants’ COVID-19 knowledge. We found a significant moderate, positive correlation between knowledge and attitude/practice, and a significantly higher knowledge level among those with higher educational qualifications. Regular hand washing with soap and water (87.9%), wearing face masks (84.4%), and social distancing (83%) were practiced by the majority of the participants. The majority of the participants (53.2%) received COVID-19 information from multiple sources including the Nigeria Centre for Disease Control and the World Health Organization.

Keywords
COVID-19, Knowledge, Attitude, Practice, Correctional officers
Introduction

COVID-19 is a novel viral disease discovered in Wuhan, Hubei Province, China in 2019 and is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) (Chen et al., 2020). The index cases of the disease were as a result of animal to human transmission. However, human-to-human transmission from respiratory droplets and contact with contaminated surfaces has been implicated in subsequent cases (Adhikari et al., 2020; Hassan et al., 2020; Li et al., 2020).

The symptoms of this highly contagious disease include dry cough, fever, anosmia (loss of smell), weakness, headache, body pains, vomiting, sore throat, and respiratory difficulty, and the onset of symptoms ranges from 1–14 days (Ahmed, 2020; Wang et al., 2020). Some infected individuals may remain asymptomatic (without symptoms) after contracting the virus (Lee et al., 2020; Oran & Topol, 2020), whereas among the symptomatic cases, the majority of them are mild or moderate (Bi et al., 2020; Chang et al., 2020), with about 10% being severe (Bi et al., 2020; Chang et al., 2020).

While all age groups can equally contract the virus, the elderly are more vulnerable. Other vulnerability factors are obesity, underlying medical conditions such as diabetes mellitus, systemic hypertension and other cardiac pathologies, and immune-compromising diseases such as HIV infection (Ahmed, 2020; Chen et al., 2020; Guan et al., 2020; Huang et al., 2020; Zhang et al., 2020; Zhou et al., 2020). Similarly, mortality rate has been reported to be higher among these categories of people (Guan et al., 2020; Zhang et al., 2020).

Considering that there was no treatment or vaccine available against the disease during the early period of its outbreak (Ahmed, 2020), preventive measures appeared to be the only scientific evidence available to curtail the high spread and mortality associated with it. These measures included practices such as regular hand washing with soap and water, the use of alcohol-base hand sanitizer, wearing face masks in public places, avoiding crowded places, and maintaining social distancing (Chu et al., 2020; WHO advice for the public).

The level of knowledge of a disease condition is associated with attitude towards the disease, and these interact to substantially affect the practices and measures aimed at controlling it (Ayinde et al., 2020; Choi & Yang, 2010; Hung, 2003; Yap et al., 2010; Zhong et al., 2020). One study in Pakistan that examined medical students’ knowledge, perceptions, and behavioral intentions towards the H1N1 influenza observed that inadequate knowledge and a negative attitude are associated with poor compliance with practices designed to prevent the spread of the disease (Hussain et al., 2012). In other studies, it was also found that adequate knowledge propels individuals to comply with practices and measures that promote good health (Aziz et al., 2018; Rahman & Sathi, 2020).

More so, availability of information, the source of information and demographic variables such as gender and educational level have a great effect on people’s knowledge, behavioral response and compliance towards the necessary preventive measures against a disease outbreak (Ahmed et al., 2020; Al-Hazmi et al., 2018; Ayinde et al., 2020; Erfani et al., 2020; Olum et al., 2020; Tandi et al., 2018; Zhong et al., 2020).

Knowledge of the COVID-19 disease has been acquired through several channels, with different social media platforms and the internet dominating as the major sources of information of this novel disease (Abdelhafiz et al., 2020; Ahmed et al., 2020; Alzoubi et al., 2020; Huynh et al., 2020). Studies have documented robust evidence that people who obtained their information through professional and scientific institutions or personnel have a positive attitude and higher confidence about the disease condition than those who obtained information from informal sources such as friends and relatives (Tandi et al., 2018).

Given that adequate knowledge and a positive attitude towards COVID-19 among correctional officers is essential in effective control and prevention of disease outbreak in the prison population, the appropriate steps in this regard should entail an assessment of their knowledge, attitude and practice towards the COVID-19 pandemic. To this end, the Nigerian Correctional Service and the Carmelite Prisoners’ Interest Organization (CAPIO) organized a three-day awareness training to educate all correctional officers in Enugu State Command. The awareness education was delivered by a team led by a medical doctor and covered several areas including case identification, and infection prevention and control. While correctional officers’ knowledge, attitude and preventive practices towards COVID-19 were assessed before the commencement of the training, knowledge level was also evaluated after the training to determine the impact of the training on the participants.

Therefore, our study was guided by the following objectives:

1. To determine the baseline knowledge level, attitude and preventive practices of correctional officers towards COVID-19
2. To evaluate the impact of COVID-19 awareness training on their knowledge level
3. To assess the association between socio-demographic characteristics, and attitude and knowledge at baseline
4. To assess the correlation between knowledge, attitude and practice

Methods

Ethical considerations

Permission to carry out this study among correctional officers was obtained from the Nigerian Correctional Service with
The objectives of the study were explained to the participants before the commencement of the awareness training. They were made to understand that participation in the study was voluntary. It was further explained to them that they could withdraw from the study at any stage even after giving consent, and that such withdrawal or not giving consent would not in any way stop them from attending the training. Therefore, verbal and written consent were taken.

**Study design and setting**
This was an interventional study with a pretest and post-test assessment to evaluate the impact of COVID-19 awareness training among all correctional officers of Enugu State Command. Enugu State Command of the Nigerian Correctional Service has three lock-up custodial centers situated in Enugu metropolis, Oji andNsukka.

This was a three-day training that was held on 8th, 11th and 12th of June, 2020; with each day dedicated to one lock-up center such that officers ofNsukka, Enugu, and Oji custodial centers were trained on 8th, 11th, and 12th of June 2020, respectively. The awareness program was organized by the Nigerian Correctional Service and the Carmelite Prisoners’ Interest Organization (CAPIO). This program was facilitated by the consultant psychiatrist and head of the medical department of the Nigerian Correctional Service, Enugu State Command, other mental health professionals (psychiatrists and psychologists) and research experts from the CAPIO. The topics addressed during the training comprised: symptoms of COVID-19, epidemiology and risk factors of COVID-19, disease transmission, and guidelines and preventive measures against it. Correctional officers of the three correctional facilities inNsukka, Oji, and Enugu metropolis were involved. Each of these custodial centers has a lecture hall where the program was conducted.

**Participants**
Of the 156 correctional officers from the three lock-up custodial centers that were trained, 141 of them completed the pretest assessment while 134 completed the post-test assessment. The post-test participation was reduced by 15 as some of the participants were recalled by the prison authority to their sensitive security duty post; hence, they were not present at the end of the training during which the post-test questionnaire was delivered.

**Inclusion criteria**
Those working in the three lock-up custodial centers that received the awareness training and gave consent to participate.

**Exclusion criteria**
Staff who came late for the training missed the lecture; hence, they were excluded from the study.

**Variables**
The independent variables were the socio-demographic variables while the dependent variables were COVID-19 knowledge and attitude.

**Measurement**
Our study used a self-reported questionnaire (Okoro et al., 2020d) which was divided into two sections and was administered before and after the awareness training. The first section covered the participants’ socio-demographic characteristics, while the second section was about knowledge, attitude, and practices towards COVID-19 disease. The socio-demographic section contained questions about age, educational level, gender and sources of COVID-19 information. Knowledge related questions were guided by the surveys of previous studies (Abdelhafiz et al., 2020; Olum et al., 2020), as well as information from the World Health Organization health topics on coronavirus. A total of 25 questions covering four domains of symptoms, prevention, epidemiology and transmission were used to assess the participants’ knowledge of COVID-19. The options were “yes,” “no,” or “I don’t know.” For every correct answer, one point was assigned; while a wrong or I don’t know response attracted zero points. Therefore, the total knowledge score ranged from 0–25, where a higher score was indicative of a greater knowledge of the disease.

The four attitude and the four practice related questions were adaptations of previous studies (Olum et al., 2020; Rahman & Sathi, 2020; Zhong et al., 2020). Participants were asked to choose a “no,” or “yes” response to the practice questions. Zero points were assigned to a non-practice and one point to each preventive practice. Hence, the total practice score ranged from zero to four, with a higher score indicating greater compliance with preventive practices. Participants were asked to choose “yes,” “no” or “not sure” to the attitude questions. Zero points were assigned to a “no” or “not sure” response, while one point was assigned to a “yes” response. A higher score indicates a positive attitude while a lower score indicates a negative attitude.

The four attitude and the four practice related questions were adaptations of previous studies (Olum et al., 2020; Rahman & Sathi, 2020; Zhong et al., 2020). Participants were asked to choose a “no,” or “yes” response to the practice questions. Zero points were assigned to a non-practice and one point to each preventive practice. Hence, the total practice score ranged from zero to four, with a higher score indicating greater compliance with preventive practices. Participants were asked to choose “yes,” “no” or “not sure” to the attitude questions. Zero points were assigned to a “no” or “not sure” response, while one point was assigned to a “yes” response. A higher score indicates a positive attitude while a lower score indicates a negative attitude.

All the questionnaires used in this study were in English language.

**Data processing**
A frequency check was run on the obtained data to check for any missing data. The distribution of the continuous data was checked using the Kolmogorov-Smirnov test. Age, pretest knowledge, and post-test knowledge data were normally distributed (P>0.05). Therefore, parametric statistical tools were used for the analyses.

**Statistical analyses**
The IBM Statistical Package for Social Sciences (IBM SPSS) statistical software, version 20 was used for analyses. A paired t-test was used to summarize the pretest and post-test knowledge level of the participants. Partial correlation statistics was employed to test the correlation between knowledge level and practice, while controlling for attitude. Test of association was further done using an independent t-test, chi-squared
A total of 141 participants completed the pretest assessment. The majority of them were males (111, 78.7%) and had tertiary education (101, 71.6%) with a mean age of 39.28±9.18 (Okoro et al., 2020b). More than half of the participants (75, 55.2%) reported that their major source of information was from the World Health Organization or the Nigeria Center for Disease Control (NCDC). Among those who believed that there are confirmed cases of COVID-19 in Nigeria, 43 (31.6%), 18 (13.2%) and 75 (55.2%) received their information from the WHO website or NCDC website/text messages; social media/friends; and multiple sources, respectively. The association between information source and belief that there are confirmed cases of COVID-19 in Nigeria is statistically significant (p<0.01). A statistically significant association was also found between educational qualification and those that believed there are cases in Nigeria, those who believed that there are cases in other parts of the world, and those who believed that the world will win the fight against the virus.

Table 2 shows the association between knowledge and socio-demographic characteristics. Higher educational qualification was significantly associated with a higher knowledge of the disease. Other demographic characteristics showed no significant association with knowledge.

**Table 1.** Socio-demographic characteristics of the participants (N=141).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Those that believe there are cases in Nigeria</th>
<th>Those that believe there are cases in the world</th>
<th>Those that believe there will be successful control</th>
<th>Those that believe there will be victory</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n(%)</td>
<td>χ²</td>
<td>p</td>
<td>n(%)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F(n=30)</td>
<td>109(80.1)</td>
<td>4.64</td>
<td>0.07</td>
<td>28(20.7)</td>
</tr>
<tr>
<td>M(n=111)</td>
<td>27(19.9)</td>
<td>16.74</td>
<td>&lt;0.01</td>
<td>41(30.4)</td>
</tr>
<tr>
<td>Source</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W/N(n=44)</td>
<td>43(31.6)</td>
<td>16.74</td>
<td>&lt;0.01</td>
<td>41(30.4)</td>
</tr>
<tr>
<td>Sf(n=22)</td>
<td>18(13.2)</td>
<td>0.01</td>
<td>0.91</td>
<td>0.62</td>
</tr>
<tr>
<td>xple(n=75)</td>
<td>75(55.2)</td>
<td>0.91</td>
<td>0.01</td>
<td>75(55.2)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pry(n=9)</td>
<td>30(22.1)</td>
<td>0.01</td>
<td>0.91</td>
<td>0.62</td>
</tr>
<tr>
<td>Sec(n=31)</td>
<td>99(72.8)</td>
<td>0.91</td>
<td>0.01</td>
<td>99(72.8)</td>
</tr>
<tr>
<td>3rd(n=101)</td>
<td>75(55.2)</td>
<td>0.91</td>
<td>0.01</td>
<td>75(55.2)</td>
</tr>
<tr>
<td>t-test</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age yrs</td>
<td>39.28±9.18</td>
<td>0.23</td>
<td>0.82</td>
<td>0.61</td>
</tr>
</tbody>
</table>

n=number, F=female, M=male, W/N=WHO/NCDC, sf=social media/friends, xple=multiple, pry=primary, sec=secondary, 3rd=tertiary, yrs=years, χ²=chi-squared test, p=p-value.
Table 2. Association between knowledge and demographic characteristics.

<table>
<thead>
<tr>
<th>Demographic Characteristic</th>
<th>Frequency</th>
<th>Knowledge score</th>
<th>t/F</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>30</td>
<td>19.50±3.57</td>
<td>0.264</td>
<td>0.792</td>
</tr>
<tr>
<td>Male</td>
<td>111</td>
<td>19.30±3.78</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary</td>
<td>9</td>
<td>14.22±3.90</td>
<td>15.891</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Secondary</td>
<td>31</td>
<td>18.03±8.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tertiary</td>
<td>101</td>
<td>20.20±3.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Source of information</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WHO</td>
<td>7</td>
<td>18.86±4.14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCDC</td>
<td>37</td>
<td>19.62±2.86</td>
<td>1.580</td>
<td>0.197</td>
</tr>
<tr>
<td>Sf</td>
<td>22</td>
<td>17.82±4.69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple</td>
<td>75</td>
<td>19.69±3.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 and below</td>
<td>18</td>
<td>18.56±4.00</td>
<td>0.910</td>
<td>0.405</td>
</tr>
<tr>
<td>31–40</td>
<td>65</td>
<td>19.15±3.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>above 40</td>
<td>58</td>
<td>19.79±3.69</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SF=social media/friend, NCDC=Nigeria Center for Disease Control, WHO=World Health Organization.

Table 3. Baseline knowledge of COVID-19 among participants (N=141).

<table>
<thead>
<tr>
<th>COVID-19 knowledge items</th>
<th>No/I don't know n (%)</th>
<th>Yes n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Symptoms include</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fever</td>
<td>11(7.8)</td>
<td>130(92.2)</td>
</tr>
<tr>
<td>Cough</td>
<td>17(12.1)</td>
<td>124(87.9)</td>
</tr>
<tr>
<td>Weakness</td>
<td>54(38.3)</td>
<td>87(61.7)</td>
</tr>
<tr>
<td>Body pain and headache</td>
<td>42(29.8)</td>
<td>99(70.2)</td>
</tr>
<tr>
<td>Breathing difficulty</td>
<td>51(36.2)</td>
<td>90(63.8)</td>
</tr>
<tr>
<td>Sore throat</td>
<td>52(36.9)</td>
<td>89(63.1)</td>
</tr>
<tr>
<td>Vomiting</td>
<td>29(20.6)</td>
<td>112(79.4)</td>
</tr>
<tr>
<td>Loss of smell (anosmia)</td>
<td>85(60.3)</td>
<td>56(39.7)</td>
</tr>
<tr>
<td><strong>Preventive measures include</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular hand washing with soap and water</td>
<td>1 (0.7)</td>
<td>140(99.3)</td>
</tr>
<tr>
<td>Use of alcohol-based hand sanitizer</td>
<td>7 (5.0)</td>
<td>134(95.0)</td>
</tr>
<tr>
<td>Avoiding going to crowded places</td>
<td>5(3.5)</td>
<td>136(96.5)</td>
</tr>
<tr>
<td>Wearing a face mask in public places</td>
<td>5(3.5)</td>
<td>136(96.5)</td>
</tr>
<tr>
<td>Coughing into bent elbow or tissue and immediately discarding it</td>
<td>15(10.6)</td>
<td>126(89.4)</td>
</tr>
<tr>
<td>Keeping distance of at least 1 meter from people</td>
<td>10(7.1)</td>
<td>131(92.9)</td>
</tr>
</tbody>
</table>

COVID-19 knowledge items

<table>
<thead>
<tr>
<th>No/I don't know</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>-----------------</td>
<td>------</td>
</tr>
<tr>
<td>Quarantining new inmates for 14 days</td>
<td>23(16.3)</td>
</tr>
<tr>
<td>Quarantining close contacts of a confirmed case</td>
<td>10(7.1)</td>
</tr>
<tr>
<td>Isolating and treating confirmed cases</td>
<td>21(14.9)</td>
</tr>
</tbody>
</table>

It can be spread by

<table>
<thead>
<tr>
<th>n (%)</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eating wild animals</td>
<td>63(44.7)</td>
</tr>
<tr>
<td>Respiratory droplets</td>
<td>39(27.7)</td>
</tr>
<tr>
<td>Touching contaminated surfaces and touching the mouth/eyes/nose</td>
<td>27(19.1)</td>
</tr>
</tbody>
</table>

Epidemiology includes

<table>
<thead>
<tr>
<th>n (%)</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most cases are not severe</td>
<td>70(49.6)</td>
</tr>
<tr>
<td>Old age and underlying medical conditions like Diabetes and HIV are risk factors</td>
<td>30(21.3)</td>
</tr>
<tr>
<td>Children and adults can equally be infected</td>
<td>42(29.8)</td>
</tr>
<tr>
<td>Symptom onset is from 1–14 days</td>
<td>28(19.9)</td>
</tr>
<tr>
<td>There is a known vaccine or drug for treating it</td>
<td>75(53.2)</td>
</tr>
</tbody>
</table>

Total score

<table>
<thead>
<tr>
<th>Min-Max</th>
<th>Mean±S.D</th>
</tr>
</thead>
<tbody>
<tr>
<td>9–25</td>
<td>19.34±3.72</td>
</tr>
</tbody>
</table>
However, zero-order correlations showed that there was a statistically significant, moderate, positive correlation between knowledge and practice ($r(139) = 0.375, n = 141, p < .001$), indicating that attitude had influence in controlling for the relationship between knowledge and practice.

A majority (83, 58.9%) reported avoiding crowded places and 119 (84.4%) reported wearing a face mask. When asked about respiratory hygiene, 124 (87.9%) regularly washed their hands with soap and water or coughed into their bent elbows or a tissue. Finally, 117 (83.0%) maintained distance of at least 1 meter when in public places.

**Table 4. Pretest and post-test knowledge score.**

<table>
<thead>
<tr>
<th></th>
<th>Mean±S.D</th>
<th>Mean±S.D</th>
<th>t-test</th>
<th>df</th>
<th>p-value</th>
<th>95% C.I</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>lower</td>
</tr>
<tr>
<td>Pretest</td>
<td>19.5±3.66</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>upper</td>
</tr>
<tr>
<td>Post-test</td>
<td>23.07±2.20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paired differences</td>
<td>-3.57±3.26</td>
<td>-12.68</td>
<td>133</td>
<td>&lt;0.001</td>
<td>-4.13</td>
<td>-3.02</td>
</tr>
</tbody>
</table>

**Table 5. Correlation between COVID-19 knowledge and preventive practices towards it.**

<table>
<thead>
<tr>
<th>Control variables</th>
<th>Practice correlation significance (2-tailed) df</th>
<th>Knowledge correlation significance (2-tailed) df</th>
<th>Attitude correlation significance (2-tailed) df</th>
</tr>
</thead>
<tbody>
<tr>
<td>none</td>
<td>.375 .000 139</td>
<td>.489 .000 139</td>
<td>.441 .000 139</td>
</tr>
<tr>
<td>attitude</td>
<td>.203 .016 138</td>
<td>.100 .000 138</td>
<td>.000 .000 139</td>
</tr>
</tbody>
</table>

* = Zero-order correlations.

**Figure 1** shows the assessment of preventive practices toward COVID-19 which was done using (1) avoidance of crowded places, (2) wearing of face masks, (3) regular hand washing with soap and water and coughing into bent elbow or tissue and immediately disposing of it and (4) keeping a social distance of at least 1 meter from people.

**Figure 2** shows the assessment of attitude toward COVID-19, which found that 124 (87.9%) believed there are cases of COVID-19 in Nigeria; 120 (85.1) believed there are cases in other parts of the world; 107 (75.9) believed there will be successful control of the virus, and 111 (78.7) believed that the entire globe will win the battle against the disease.
Figure 1. Baseline preventive practices.

Figure 2. Baseline assessment of attitude of participants towards COVID-19 (N=141).

Discussion
COVID-19 disease has affected the general population across the globe. The vulnerability risk is higher among the elderly, those with underlying medical pathologies such as diabetes mellitus, obesity, asthma, and systemic hypertension. Low immunity and immune-compromising conditions also increase the morbidity and mortality (Guan et al., 2020; Zhang et al., 2020).

Given that the prison population is associated with poor access to drugs and health services, and other immune-compromising factors, efforts are being made by the entire world, including Nigeria, to prevent and/or reduce the spread of COVID-19 among prison inmates. These efforts include the COVID-19 awareness training organized by the authority of Nigerian Correctional Service. Our study presents the results of the preventive practices and impact of awareness training on COVID-19 knowledge among correctional officers. This is the first COVID-19 awareness intervention study carried out in Nigeria among correctional officers.

Knowledge about the symptoms, spread, prevention and epidemiology of COVID-19
Our study revealed a high overall knowledge about the disease among the participants, which reflects the findings of previous studies in Egypt and Jordan (Abdelhafiz et al., 2020; Alzoubi et al., 2020). It has been documented that people who received information about a disease from organized health institutions have better knowledge of the disease than those who obtained information from friends and other informal settings (Tandi et al., 2018). Most of our participants received COVID-19
information from organized health institutions (NCDC) and multiple sources which include this institution; this may explain the high knowledge level of COVID-19 among them. Nevertheless, the specific question that assessed loss of smell (anosmia) as a symptom of the disease was correctly answered by less than half of the participants. The poor knowledge regarding this specific question may be explained by several factors including the fact that at the time of the study, evidence of loss of smell as a symptom was a recent emergence. This may be further supported by the fact that social media and other informal sources of information erroneously circulated information about the effectiveness of some medicinal products, unapproved by the WHO or any drug regulatory body, against the disease.

A little below half of the participants believed that there was vaccine against the disease even when there was none available at the time of the study. Between the time of conducting this study and now, a lot have changed about the disease. One of these changes is that vaccines are now available and the awareness is high (Uzochukwu et al., 2021).

We found that the awareness training significantly improved the participants’ knowledge about COVID-19 as there was significant evidence that participants had greater knowledge after the awareness training than before.

We also found that there was a significant moderate, positive correlation between knowledge and attitude. Preventive practices also showed significant moderate, positive correlation with knowledge. A similar relationship was documented in Bangladesh and China (Rahman & Sathi, 2020; Zhong et al., 2020). These associations can be linked to the fact that the wide media coverage of the disease covers aspects of knowledge, attitude, and preventive practices about the disease.

Educational qualification was the only socio-demographic characteristic associated with knowledge and those with higher educational qualifications had more knowledge about the disease, which echoes previous reports in Iran and Nigeria (Erfani et al., 2020; Okoro et al., 2020a). However, age, source of information, and gender showed no significant relationship with knowledge in our study. Given the wide publicity and awareness of the disease across all ages and gender, it is therefore unsurprising to find no significant relationship between these demographic characteristics and knowledge of COVID-19.

Attitudes towards the preventive measures of COVID-19
Our participants generally had a positive attitude towards COVID-19. Similarly, responses to each of the four questions asked to evaluate attitude towards COVID-19 showed that more than four-fifths of the participants believed that there are confirmed cases of the disease in Nigeria, with a similar result being reported about the presence of confirmed cases in other parts of the globe. Three-quarters of the participants believed that the disease will be successfully controlled, and a little above that believed that the world will win the fight against the disease.

These results are in accordance with the findings of previous studies in Malaysia and China, in which a positive attitude was reported (Azlan et al., 2020; Zhong et al., 2020), but differ from the findings in Bangladesh where most of the participants had a negative attitude (Rahman & Sathi, 2020).

The association between attitude and socio-demographic factors in our study revealed that the belief that there are confirmed cases in Nigeria is significantly associated with the source of information and educational qualification. Furthermore, agreement that there are confirmed cases of COVID-19 in other parts of the world, and that the world will win the fight against the disease showed significant association with educational qualification. This agrees with the findings in China (Zhong et al., 2020), in which a higher educational qualification was associated with a positive attitude. However, unlike the earlier studies, our study showed no significant association between attitude and age or gender.

Preventive practices towards the disease
Our study also found an overall high level of preventive practice towards the disease. This reflects the right measures to prevent the spread of the disease and includes wearing face masks, hand washing, avoiding crowded places, and keeping a distance of at least 1 meter away from people.

Avoidance of crowded places was practiced by 58.9% of the participants. The corresponding figures for those that wore face masks, regularly washed their hands, and maintained a 1 meter distance from people were 84.4%, 87.9%, and 83%, respectively. These findings are in consonance with the results in Uganda (Olum et al., 2020).

Additionally, the practice of hand washing in our study was similar to findings of a Malaysian study (Azlan et al., 2020), while that of wearing a face mask in public places agrees with a Chinese study (Zhong et al., 2020).

Considering the findings of our study, there is a need to improve correctional officers’ knowledge via awareness programs, which will further impact positively on their attitude and practices towards the disease. Therefore, these underscore the importance of the Nigerian Correctional Services organizing a nation-wide awareness program for all correctional officers. Furthermore, the poor preventive practice with respect to avoiding crowded places highlights the need for government to enforce stringent measures that will regulate gathering in public places such as markets and even workplaces.

Limitation
This study was conducted when COVID-19 was relatively a new disease and when the scientific community and the entire world knew little or nothing about it. Presently, there is advanced knowledge of the disease including the availability of various types of COVID-19 vaccines. Similarly, the disease is now well represented in all countries of the world. Hence, some of the concerns this study sought to address (for example, the questions about the availability of COVID-19 vaccine and the
one about the presence of confirmed cases of COVID-19 in Nigeria) are now invalid.

Conclusion
Our study revealed a high level of knowledge, practices and attitude among correctional officers towards COVID-19. Such observations reflect the efforts made by the Nigerian Correctional Service, and the government to sensitize the general population about COVID-19. The findings of this study can be a guide for awareness programs among correctional officers for effective containment of the disease.

Data availability
Underlying data
Figshare: CSV data on Attitude and preventive practices towards COVID-19 disease and the impact of awareness training on knowledge of the disease among correctional officers.csv. https://doi.org/10.6084/m9.figshare.12728192.v1 (Okoro et al., 2020b)

Figshare: Questionnaire. https://doi.org/10.6084/m9.figshare.12728375.v1 (Okoro et al., 2020d)

Data are available under the terms of the Creative Commons Zero “No rights reserved” data waiver (CC0 1.0 Public domain dedication).

Acknowledgements
We acknowledge the support of the Nigerian Correctional Service, especially Enugu State Command. We also appreciate the entire staff of the Carmelite Prisoners Interest Organization (CAPIO): Nnonso, Bar. Maria, Dr. Clara, Chijioke, Chuks, and Chukwuma. The above persons and organizations gave their permissions for their names to be included in this publication.

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Okoro J, Osundin T, Nweze B, et al.: COVID-19 pandemic, psychological response to quarantine, and knowledge of the disease among inmates in a Nigerian custodial center [version 1; peer review: 2 approved with

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http://www.doi.org/10.6084/m9.figshare.12728192.v1

http://www.doi.org/10.6084/m9.figshare.12728372.v1

http://www.doi.org/10.6084/m9.figshare.12728375.v1

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P. Ravi Shankar
IMU Centre for Education, International Medical University, Kuala Lumpur, Malaysia

This is an important study on knowledge, attitude and practice regarding COVID-19 among correctional officers at a specific command in Nigeria before and after an educational intervention.

The manuscript is mostly well-written and presented. My suggestions for further improvement follow:

- The authors can use a structured abstract and present their findings in a more logical sequence.

- Methods section: Was the questionnaire pre-tested or assessed for ease of understanding before administration? I assume it was administered in English.

- The authors should provide more details about the training program. Who were the facilitators? What were the teaching-learning methods used? What topics were addressed?

- One of the problems with reviewing the manuscript in November 2021 is that many things have changed about the pandemic. The questions like there are cases in Nigeria and there are cases in the world do not seem very relevant now. Also, now we have vaccines and even drugs for treating the condition. The authors should address this limitation in any new version of the article and it would be useful to indicate that future versions of this study will engage with knowledge surrounding vaccines and other treatments developed since the original research was undertaken.

- The authors may have to provide an update about this article and the status of COVID-19 in Nigeria and especially among prisons in the country. A few new references can be added.

- They can provide the questionnaire used in the study as a supplementary file.

- The quality of written English is good.
Is the work clearly and accurately presented and does it cite the current literature?
Partly

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
I cannot comment. A qualified statistician is required.

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Is the argument information presented in such a way that it can be understood by a non-academic audience?
Not applicable

Does the piece present solutions to actual real world challenges?
Not applicable

Is real-world evidence provided to support any conclusions made?
Yes

Could any solutions being offered be effectively implemented in practice?
Not applicable

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** COVID-19, Knowledge, attitude, practice, education

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 10 Jan 2022

**Johnson Okoro,** Nigerian Correctional Service, Enugu, Nigeria

The abstract has been rewritten in a structured way

Questionnaire was administered in English.
The program was facilitated by the consultant psychiatrist and head of the medical department of the Nigerian Correctional Service, Enugu State Command, other mental health professionals (psychiatrists and psychologists) and research experts from the CAPIO (Carmelite Prisoners Interest Organization).

The topics addressed during the training comprised: symptoms of COVID-19, epidemiology and risk factors of COVID-19, disease transmission, and guidelines and preventive measures against it.

It was an interactive teaching method.

When the study was conducted, all the questions contained in the questionnaire were relevant at that time. It is true that some of the items in the questionnaire appear to have lost relevance with the passage of time as you correctly noted. However, nothing can be done at the stage of analysis to correct this temporal loss of relevance. Except another study will have to be conducted, which is a part of recommendation for future research in this area.

All data in respect of this study are with Emerald (the publishing journal).

Thank you

**Competing Interests:** There is no competing interest

Reviewer Report 02 November 2020

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Felix Bongomin
Gulu University, Gulu, Uganda

The present work evaluated the KAP on COVID-19 among correctional officers in Enugu state, Nigeria.

The manuscript would benefit from the following revisions:

1. "COVID-19 Disease" in the title and elsewhere in the manuscript should be revised to COVID-19, and the disease deleted.

2. The abstract lacks the number of study participants and basic demographic characteristics.
3. The Pre and post tests K assessment should be included in the abstract since it's one of the major objectives of the study.

4. The abstract has no conclusions.

5. Abstract should be organised in such a way that it flows (background, objectives, methods, results and conclusions, even though it is not structured).

6. Introduction. discovered in Wuhan is inappropriate -- first reported.

7. As a result of animal - to human transmission is not corrected... it's a speculation.

8. Table 4 can be substituted with "individual and box and whisker plot " to show a visual display of the K change pre and post tests.

Is the work clearly and accurately presented and does it cite the current literature?  
Yes

Is the study design appropriate and is the work technically sound?  
Yes

Are sufficient details of methods and analysis provided to allow replication by others?  
Yes

If applicable, is the statistical analysis and its interpretation appropriate?  
Yes

Are all the source data underlying the results available to ensure full reproducibility?  
Yes

Are the conclusions drawn adequately supported by the results?  
Yes

Is the argument information presented in such a way that it can be understood by a non-academic audience?  
Yes

Does the piece present solutions to actual real world challenges?  
Yes

Is real-world evidence provided to support any conclusions made?  
Yes

Could any solutions being offered be effectively implemented in practice?  
Yes

**Competing Interests:** No competing interests were disclosed.
**Reviewer Expertise:** Clinical Research, Epidemiology, Infectious Diseases

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.