Predictors of adherence to government COVID-19 preventive measures in Calabar Municipal, Cross River State, Nigeria

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Abstract
This study explored the predictors of adherence to government prevention strategies for COVID-19 in Calabar Municipal, Cross River State, Nigeria. The study utilized a survey questionnaire to collect data on adherence to government COVID-19 preventive measures, as well as demographic factors that could potentially influence adherence. Data analysis was conducted using the One-way analysis of variance and multiple regression. The findings show only sex was significantly correlated with compliance with COVID-19 prevention measures. However, a composite analysis reveals that adherence to government COVID-19 prevention efforts is predicted by sociodemographic factors, including age, sex, occupation, religion, and educational attainment. Furthermore, people were more inclined to follow preventive measures if they were older, female, civil servants, Muslims, and had a tertiary education. These results demonstrate the necessity of tailored interventions that consider the unique predictors of adherence in Calabar Municipal, Cross River State, Nigeria. The study recommends that by adopting a holistic and context-sensitive strategy, it is possible to improve adherence to disease preventive measures, ultimately contributing to better public health outcomes in Calabar Municipal and similar communities.

Keywords: Adherence, COVID-19, government, predictors, socio-demographic

Introduction
The COVID-19 pandemic has, more than any other recent event, ushered in an unparalleled worldwide disaster with far-reaching repercussions for social, economic, and health (Ajana, 2021). The SARS-CoV-2 virus is the cause of the infectious disease known as coronavirus disease, or COVID-19. The World Health Organisation (WHO, 2020) reports that it erupted in early December 2019, in Wuhan, China. The World Health Organisation (WHO) first designated COVID-19 as a "public health emergency of international concern (PHEIC)" on January 30, 2020, and then on March 11, 2020, as a "pandemic," due to the virus' very rapid global spread (Doral & Bilge, 2020), and implemented crucial preventative and confrontational measures (Oliveira *et al.,* 2020).

After the first index case was recorded on February 27, 2020, more than 68,000 cases of those infected with the disease were confirmed and, as of November 30, 2020, 1173 people had died from the COVID-19 pandemic in Nigeria (Jacob & Okeke, 2022). To manage the pandemic, various countries' stakeholders have put legislation into place and provided comprehensive guidelines on disease-preventive measures such as avoiding crowds, using face masks, and isolating oneself from social situations (Chan *et al.*, 2021). In reaction to the COVID-19 outbreak, Nigeria developed and executed a comprehensive, multisectoral strategy (Jacob & Okeke, 2022). The COVID-19 containment and mitigation efforts seem to have, at least partially, reduced the virus's ability to spread, leading to a mild to moderate pandemic in Nigeria (Jacob & Okeke, 2022). Nigeria has been praised for its strong, forceful, and qualified response to COVID-19. (Abubakar *et al.*, 2020). As such, the battle against COVID-19 depends not only on the work of health professionals but also on the coordinated efforts of all citizens of a nation who embrace the advised disease-preventive behaviours (Chan *et al*, 2021). State authorities imposed various limitations on civil freedoms in response to the pandemic to halt the virus's spread (Piwko, 2021). They included using alcohol gel when access to water and soap is not accessible and washing your hands with soap and water whenever you can (Oliveira *et al.*, 2020). Other precautions that have been recommended in addition to these include frequent hand washing, wearing face masks, and—most importantly—social separation and isolation (Onyeaka *et al.*, 2021).

Despite these regulations, people's voluntary compliance and cooperation are frequently necessary to adopt disease-preventive methods (Chan *et al.*, 2021). There are variations among countries with respect to the precise metrics associated with compliance with COVID-19 prevention measures (Folayan *et al.*, 2023). McElfish *et al.* (2021) discovered that view about the COVID-19 vaccine and vaccination trust, in general, differ considerably throughout sociodemographic categories. Disparities in adherence to protective measures scores were observed across sociodemographic variables and risk perception dimensions (Carlucci *et al.*, 2020). It has been demonstrated that psychosocial, health, and sociodemographic characteristics are significant determinants of participation in preventive health practices (Choi *et al.*, 2022).

As postulated by Omotoso, *et al.* (2021), educational level (up to tertiary), being a clinical healthcare worker, and having a good knowledge of COVID-19 influences satisfactory adherence. Close contact between people makes it easy for COVID-19 to spread, and education can help lessen the disease's impact by promoting healthy habits, avoiding dangerous situations, and using preventive services. Beliefs, knowledge, wisdom, and thought are all formed and developed with the aid of education according to Zolfaghari (2015). According to Zouine (2024), highly educated people can take preventative action to avoid diseases early because they typically know more about a variety of health conditions. Furthermore, Anwar, *et al.* (2020) observed that younger educated individuals in Bangladesh exhibit improved understanding, perspectives, and behaviours around COVID-19 compared to older, illiterate individuals. A person's likelihood of adhering to COVID-19 preventative measures increases with their level of education. As a result, compared to those who attended colleges and higher education, those who were illiterate, could read and write, and had finished primary school were less likely to follow COVID-19 preventive measures closely (Abeya *et al.*, 2021). Similarly, Tamirat and Abute (2021) found that those who with only primary education were less likely than those with higher educational status to follow COVID-19 preventative practices. One explanation could be that when an individual's educational level rises, their awareness of COVID-19 prevention and control will also rise, increasing the possibility that they will take action to follow COVID-19 preventative guidelines.

The compliance of individuals with COVID-19 prevention measures is also greatly influenced by their occupation, place of employment, economic background, and occupational pay, whether high or low. Abeya *et al.* (2021) in their study of adults in Ethiopia found that compared to farmers, merchants were less inclined to take precautions against COVID-19. In research on healthcare workers, Mohamad *et al.* (2022) found that HCWs employed by district health offices and health clinics had higher odds of non-compliance than HCWs employed by hospitals. Similarly, there was a strong correlation between non-compliance and HCWs employed by public health departments. Healthcare workers classified as laboratory personnel, health attendants, or others were at a heightened risk of noncompliance. According to Ditekemena *et al.* (2021), the likelihood of noncompliance was higher among participants who were students or unemployed. Healthcare personnel who responded to the survey acknowledged practicing good preventive behaviour, most likely due to their prior training and awareness of COVID-19 and other disease prevention measures. Comparable outcomes were reported by Alshammari *et al.* (2021) who noted that compared to other groups, 65.5% of healthcare professionals were found to have good disease prevention practices. Healthcare workers, as opposed to community members, paid greater attention to the COVID-19 preventive measures guidelines, according to Sialubanje *et al.* (2023).

People's health is impacted by gender since it shapes behaviour (Anaam & Alsahali, 2023). A study on gender variations found that women are less likely to detect all of the primary

signs of the virus, report depressive symptoms more frequently, and engage in the best COVID-19 preventative practices. (Pinchoff *et al.*, 2020). The study found that the lack of knowledge among young women is likely the reason why men and women have different perspectives on crucial symptoms of COVID-19. On the other hand, males in all age groups were less likely than females to follow the preventative measures (Urbán *et al.*, 2021). Carlucci *et al.* (2020) found that differences in sociodemographic characteristics indicated that women had a higher probability than men to engage in protective behaviours. Females were more likely than males to practice prevention (59.6% vs. 50.1%) (Alshammari, *et al.*, 2021). Shushtari *et al.* (2021) reported that men could underestimate their chance of catching COVID-19 and disregard preventive measures like staying home.

Religion is a significant consideration of health (Barmania & Reiss, 2020). As noted by Dajani *et al.* (2022), though its potential to promote mental health is undoubtedly a significant part of its broader potential, religious devotion may also be useful to improve public health by promoting actions that actively prevent or reduce the spread of disease. Nurmansyah *et al.* (2022) reported that, unlike before the pandemic, when Indonesian Muslim communities freely used mosques or fields for Eid rituals and tarawih, the COVID-19 pandemic altered Muslim prayer-observance behavioural patterns and standard operating procedures. According to Yoosefi *et al.* (2021), clerics chastised healthcare institutions for their disregard for spirituality and religion in the fight against and management of COVID-19, as well as for creating health protocols. In the framework of COVID-19, Dajani *et al.* (2022) suggest that actions that are consistent with prophetic hadiths could motivate Muslim communities to take part in vaccination campaigns and social distancing. Furthermore, Muslim communities (especially those in LMIC populations) can be more inclined to adopt social distancing if it is connected to customs and hadiths that are familiar with the Islamic heritage (Dajani *et al.*, 2022).

The likelihood of a high level of compliance with COVID-19 prevention measures rises with age (Abeya *et al.*, 2021). Due in part to their perceived decreased vulnerability to a severe COVID-19 illness, young persons were less likely than those 30 years of age or older to adopt preventative measures (Urbán *et al.*, 2021). Compared to adults, LICs and LMICs also have a larger percentage of younger populations that were not following COVID-19 preventive measures well (Folayan *et al.*, 2023). As Tamirat and Abute (2021) noted in their study, compared to other age groups, individuals over 40 years old were more likely to follow the COVID-19 preventive guidelines. Shushtari *et al.* (2021) reported that individuals between the ages of 39 and 48 were more likely to use more disinfectants, avoid contact with others in general, and refrain from kissing and hugging friends, relatives, and acquaintances. They argued that older people may adhere more if they believe themselves to be at more risk and more vulnerable. On the other hand, the widespread assumption that youth won't get COVID-19 could result in lower adherence to COVID-19 preventive guidelines.

Understanding the characteristics of people who ignore public health issues associated to COVID-19 initiatives is essential to developing successful public health campaigns during the present and upcoming pandemics (Nzaji *et al.*, 2020). Therefore, we hypothesized that variables such as age, gender, occupation, educational attainment, and religion will affect adherence to COVID-19 preventive measures.

Methods

Study design, setting, and, population

This was a community based cross-sectional study using a questionnaire conducted between February and March 2023 in Calabar Municipal, the capital of Cross River State,

Nigeria. All residents in Calabar municipal aged 18 years and above who gave verbal consent participated in the study.

Sample size determination

The Sample size was established using the single population proportion calculation while accounting for the following statistical assumptions: margin of error = 5%, percentage = 50%, and confidence level = 1.96. A total of 392 respondents were selected.

Sampling techniques

A multi-stage sampling strategy was used in the study to choose participants. In the first step, six of the ten electoral wards were chosen, and each one formed a cluster. The respondents were then selected by convenience sampling from each household.

Dependent variable

The study's outcome variable was the community's compliance with COVID-19 prevention strategies including wearing face masks, washing your hands frequently, avoiding crowded places, sneezing or coughing into the elbows, avoiding ill people, and not touching your mouth, nose, or eyes with unclean hands.

Independent variables

A number of independent variables were examined, including sex (male or female), age (18–27 years, 28–37 years, 38–47 years, 48–57 years, and 58 years or more), education level (no formal education, primary, secondary, and tertiary), religious affiliation (Islam or Christianity), and occupation (farmer, trader, artisans, civil servants).

Ethical consideration

The was approved by the Directorate of Research and Development, University of Calabar Research Ethical Review Board (UC/DR&D/RERB/56). After informing participants of the study's goal, oral informed permission was obtained.

Data analysis

The gathered data was first imported into IBM SPSS version 24 and then extracted into Microsoft Excel. While categorical data were displayed as frequencies and percentages, continuous variables with a normal distribution were displayed as means and standard deviations. A one-way analysis of variance and multiple regression was conducted at a significance level of 0.05 to test the hypotheses.

Results

A total of 392 participants were recruited for the survey comprising 184 (47%) male and 208 (53%) females (Table 1). Also, the respondents mean age was 35.8 years (±2.4) with the young adults (18 – 27 years) having the highest proportion of respondents (31%), while the older adults (48 – 57 years) made up the least proportion of respondents (11%). Regarding educational attainment most (46%) of the respondents had attained secondary education and 43% were involved in trade as their occupation were in the age bracket of 18-27 years. Furthermore, Christianity was the religion associated with the majority of respondents, accounting for 90% of the total.

Table 1: Sociodemographic variable [N= 392]

Variable	Category	N	%
Sex	Male	184	47
	Female	208	53
Age (35.8 ±2.4)	18-27	122	31
	28-37	96	25
	38-47	64	16
	48-57	42	11
	58 years and above	68	17
Educational level	No formal education	18	5
	Primary	34	9
	Secondary	182	46
	Tertiary	158	40
Occupation	Farmer	10	3
	Trader	170	43
	Civil servant	72	18
	Artisans	140	36
Religion	Christianity	352	90
	Islam	40	10

The survey results, as depicted in Table 2, indicate that sociodemographic variables (educational level, occupation, religion, sex, and age) collectively predict adherence to government COVID-19 prevention measures ($R = .226$). However, the overall model explains only 5.1% of the variance in adherence. Despite this, the model remains statistically significant. Further analysis through regression ANOVA revealed a marginal joint linear association of the predictors on adherence to government COVID-19 prevention measures ($F(5, 386) = 4.166$; $p < .001$). The adjusted R-Square value of .039, with some shrinkage from the unadjusted R-Square of .051, suggests the model's potential generalizability to the population (S.E = 4.457). The findings suggest that when all predictor variables (educational level, occupation, religion, sex, and age) are considered together, adherence to government prevention measures improves. Thus, it can be said that adherence to these measures is significantly predicted by sociodemographic factors. Further analysis was carried out to investigate each predictor variable's unique contribution to compliance with government COVID-19 preventive initiatives. Of the five sociodemographic variables studied, only age emerged as a significant predictor ($\beta = .198$; $t = 3.867$; $p = .000$). This suggests that respondents' age significantly influences adherence to these measures, with 19.8% of the variance in adherence being attributed to age.

Figure 1 illustrates that older adults (aged 48-57 years) demonstrate a higher likelihood of adhering to government COVID-19 prevention measures, whereas young adults (aged 18-27 years) are more inclined to violate these measures. However, educational level ($\beta = .057$; $t = 1.116$; $p = .265$), occupation ($\beta = .024$; $t = .474$; $p = .636$), religion ($\beta = .058$; $t = 1.127$; $p = .261$), and sex ($\beta = .030$; $t = .612$; $p = .541$) were not found to be significant predictors. This implies that when each variable (educational level, occupation, religion, and sex) is examined independently, it does not exert a significant influence on adherence.

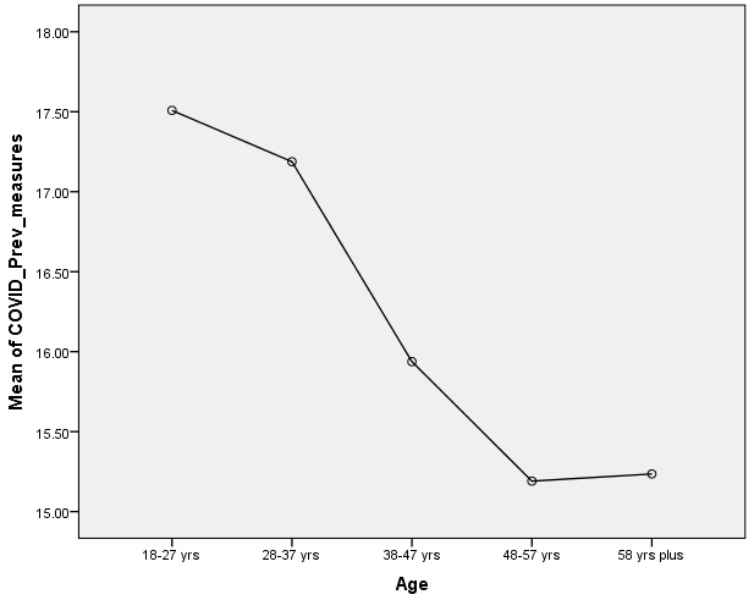

FIG 1: Age group and adherence to government COVID-19 prevention measures

We conducted a further analysis to investigate potential gender differences in compliance with government COVID-19 prevention measures. Our findings revealed that although there was no significant difference ($t(390) = .319$, $p > .05$) between genders, female respondents exhibited a lower mean value of 16.4 ± 4.3, indicating a higher likelihood of adherence compared to male respondents, who had a higher mean value of 16.6 ± 4.7.

Likewise, we conducted an additional examination to evaluate the potential impacts of religion on adherence to prevention measures. The results revealed a significant difference ($t(390) = 2.184$, $p = .030$). Respondents who identified as Islam worshippers exhibited a lower mean value of 15.0 ± 3.2, suggesting a greater probability of adherence compared to respondents who identified as Christian worshippers, who had a higher mean value of 16.6 ± 4.6.

Furthermore, we conducted an additional examination to investigate the potential impact of occupation on adherence to prevention measures. The analysis revealed a significant influence ($F(3, 388) = 6.097$, $p = .000$). Respondents who were civil servants demonstrated the lowest mean value of 14.5 ± 4.6, indicating a greater probability of adherence as opposed to respondents in other occupational cohorts. Conversely, artisans exhibited the highest mean value of 17.2 ± 4.2 and were likely to violate government COVID-19 prevention measures.

Equally, we conducted an additional examination to assess the effect of the educational qualification of respondents on following the government's preventive guidelines. There was no significant difference $F(3, 388) = 1.708$, $P > 0.05$. Respondents who had degrees from tertiary institutions had a lower mean value of 15.60 ± 3.42, indicating a greater chance of adherence to government measures compared to respondents who had completed post-secondary education (NCE), secondary school education, and primary school education who had a higher mean value of 15.99 ± 3.95; 16.59 ± 4.79; 16.73 ± 4.48 respectively. With this result, we can assert that respondents who obtained degrees from tertiary institutions were more inclined to comply to government prevention measures, and those with lesser educational qualifications were likely to violate them.

Table 2: Multiple regression of sociodemographic variables and adherence to government COVID-19 prevention measures

Variable		Mean	Std Deviation
Gender	Male	16.6	4.7
	Female	16.4	4.3
Occupation	Civil servants	14.5	4.6
	Artisans	17.2	4.2
Religion	Islam	15.0	3.2
	Christianity	16.6	4.6
Educational qualification	Completed primary education	16.73	4.48
	Completed secondary education	16.59	4.79
	NCE	15.99	3.95
	University degree	15.60	3.42

Source of variance	Sum of Square	Df	Mean Square	F	Sig
Regression	413.7977	5	82.759	4.166	.001
Residual	7667.835	386	19.865		
Total	8081.633	391			
	Beta Value	**t-value**			**Sig.**
Constant		11.278			.000
Sex	.030	.612			.541
Age	.198	3.867			.000
Edu level	.057	1.116			.265
Occupation	.024	.474			.636
Religion	.058	1.127			.261

R = .226; R-Square 051; Adjusted R-square = .039; S.E = 4.457

Discussion

This study highlights the significance of socio-demographic characteristics linked to government COVID-19 preventive health measures among Calabar Municipal households. The findings show that adherence to government COVID-19 prevention efforts is predicted by sociodemographic factors, including age, sex, occupation, religion, and educational attainment. Analysis of the individual contribution of each predictor variable to adherence to government COVID-19 preventive efforts revealed that age was the only significant predictor among the five sociodemographic factors examined. Results of the study indicate that young adults (ages 18 to 27) are more likely to disregard government COVID-19 prevention measures, while elderly persons (ages 48 to 57) are more likely to follow them. This finding agrees with the study by Urbán *et al.* (2021) who found that compared to those 30 years of age and older, younger people were less likely to implement preventative measures, which was partly explained by their perception of being less vulnerable to a serious COVID-19 illness. This might be partly because the emphasis on vulnerability was on the elderly especially those with co-morbidities. Moran *et al*. (2021) noted the influence of perceived vulnerabilities on adherence as they noted in their research that, people who thought COVID-19 offered a minimal risk, had little awareness of the pandemic, or weren't convinced of the need to follow public health recommendations were more likely to show poor adherence.

Several of our hypotheses were not supported by the data, sex, education level, occupation, and religion were not statistically significant in predicting adherence to COVID-19 preventative measures at the bivariate level. A similar result was found in a study by Bolarinwa *et al.* (2020) who reported, there was no correlation found between any of the chosen socio-demographic traits and following the guidelines. The results indicate that sociodemographic variables (educational level, occupation, religion, sex, and age) collectively predict adherence to government COVID-19 prevention measures. Though our results showed

that sex was not statistically significant as it agrees with Bouton *et al.* (2023) who found that noncompliance with preventive measures was not linked to sex, female respondents as our data revealed were more inclined to adhere to government COVID-19 prevention measures, while male respondents were more likely to violate them. Undelikwo, *et al.* (2020) reported a no significant difference in hand washing practices between males and females in the University of Calabar community during the Ebola outbreak in a study Men were less likely than women to follow the suggested steps across all age groups, and this was true for all four preventive strategies, which is alarming (Urbán, *et al.*, 2021). In their study in Brazil, Faria de Moura Villela *et al.* (2021) reported that men were less adherent than women when evaluating the characteristics of people with poor general adherence.

Respondents who were civil servants had a higher likelihood of adherence to government COVID-19 prevention measures than respondents in other occupational cohorts. Conversely, artisans were more likely to violate government COVID-19 prevention measures. This can be explained by the high educational attainment of civil servants, who are aware of the lockdown and preventive measures that ensured they would not be working and helped them understand the severity of the pandemic. In contrast to others who were left to fend for themselves, civil servants were paid even though they were not working. According to Ditekemena *et al.* (2021) in a study in the Democratic Republic of Condo, healthcare personnel who responded to the survey acknowledged practicing good preventive behaviour, most likely because of their prior training and awareness of COVID-19 and other disease prevention measures. A similar result was reported in a study in Portugal where compared to individuals who worked from home, those who stayed at work had an almost five-fold higher chance of breaking the lockdown (De Noronha *et al.*, 2022).

Our survey showed that Muslims had a higher likelihood of adhering to COVID-19 preventive measures compared to Christians. The result contrasts with Dajani et al (2022) who noticed that Due to their alleged religious duties, Muslim adherents occasionally disregarded COVID-19 regulations. On their part, Algahtani *et al.* (2021) found that most participants in a study in Saudi emphasized the significance of avoiding crowded areas, shaking hands, and visiting friends and family amid the COVID-19 pandemic in terms of social and Islamic customs and, the COVID-19 outbreak also caused over 40% of people to skip the Friday congregational prayers and regular prayers at the mosque. A study by Tan, *et al.* (2022) reported that a Christian leadership conference in Kuching, Sarawak (a Malaysian state on Borneo), in late February 2020, produced another sizable COVID-19 cluster in Malaysia with about 100 people in attendance. They stated further that a pastor who attended the seminar from a different congregation was the first person to die from COVID-19 from this cluster. A study by Algahtani *et al.* (2021) in Saudi found that the decision to suspend the Hajj and Umrah as well as to bar old and chronically ill people from praying in mosques was endorsed by more than two-thirds of the population of the study, who firmly felt that it was required to stop the pandemic from spreading. In a study among selected churches in Bolgatanga municipality, Ghana, Agandaa (2022) found that just 26.8% of worshippers consistently followed all recommended protocols during the preceding five worship sessions.

The study's findings also revealed that respondents with a tertiary institution degree had a tendency to conform to government COVID-19 prevention measures, while those with lesser educational qualifications were more likely to violate them. A study by Adebayo *et al.* (2022) conducted in Nigeria also reported an association between postgraduate and graduate degrees with greater compliance with COVID-19 prevention measures than lower educational qualifications (Adebayo et al, 2022). Turk *et al.* (2023) reported in their study that self-isolation in the event of symptoms of COVID-19 and limiting physical contact with household members

were not regarded by those with lower (basic) education levels as crucial actions to reduce the virus's transmission. The study is in consonance with Anwar *et al.* (2020) who found that younger, more educated individuals in Bangladesh have greater awareness, attitudes, and practices with COVID-19 than older, less educated individuals. Omotoso *et al.* (2021) in their study revealed that those who thought that COVID-19 was not real were mostly people with a low level of educational attainment and most of these were individuals living in rural areas. To them, it was just a scheme plotted by the government and in such places, activity goes on without adhering to the covid-19 preventive measures. Regarding educational attainment, a person with only primary education and no formal education showed disregard for the public health of COVID-19 initiatives (Ngaji *et al.*, 2020).

Limitations

The research was self-reported. Bias is therefore a possibility. It's also possible that social desirability bias affected the study. The convenience sampling method was one of the study's drawbacks. Despite these drawbacks, our findings show a correlation between sociodemographic traits and compliance with COVID-19 prevention strategies.

Conclusion

The study highlights the intricacy of the influencing factors that affect adherence to health recommendations. The results highlight the necessity of focused public health initiatives that transcend a generalised strategy. Policymakers and healthcare professionals can create more successful, culturally sensitive strategies by comprehending and addressing the various aspects driving adherence. By adopting a holistic and context-sensitive strategy, it is possible to improve adherence to disease preventive actions, ultimately leading to improved public health results in Calabar Municipal and similar communities.

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