



COVID-19 Knowledge, Beliefs, and Behavior Among Patients in a Safety-Net Health System

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Abstract

Examine COVID-19 knowledge, concerns, behaviors, stress, and sources of information among patients in a safety-net health system in Louisiana. Research assistants surveyed participants via structured telephone interviews from April to October 2020. The data presented in this study were obtained in the pre-vaccine availability period. Of 623 adult participants, 73.5% were female, 54.7% Black, and 44.8% lived in rural small towns; mean age was 48.69. Half (50.5%) had spoken to a health-care provider about the virus, 25.8% had been tested for COVID-19; 11.4% tested positive. Small town residents were less likely to be tested than those in cities (21.1% vs 29.3%, $p=0.05$). Knowledge of COVID-19 symptoms and ways to prevent the disease increased from (87.9% in the spring to 98.9% in the fall, $p<0.001$). Participants indicating that the virus had ‘changed their daily routine a lot’ decreased from 56.9% to 39.3% ($p<0.001$). The main source of COVID-19 information was TV, which increased over time, 66.1–83.6% ($p<0.001$). Use of websites (34.2%) did not increase. Black adults were more likely than white adults (80.7% vs 65.6%, $p<0.001$) to rely on TV for COVID-19 information. Participants under 30 were more likely to get COVID-19 information from websites and social media (58.2% and 35.8% respectively). This study provides information related to the understanding of COVID-19 in rural and underserved communities that can guide clinical and public health strategies.

Keywords COVID-19 knowledge · COVID-19 behavior · Sources of information · Disparities

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Introduction

SARS-COV2, known as COVID-19, rapidly evolved into a public health crisis worldwide [1]. In the United States, COVID-19 amplified preexisting inequities linked to race, class, rural residence, and access to health care [2–4]. Low-income minority and rural populations are particularly vulnerable to COVID-19 as these communities experience higher rates of obesity, diabetes, hypertension, and coronary heart disease which are known to increase the risk of poor COVID-19 outcomes [5–9].

Early in the pandemic (March–April 2020), disparities appeared significantly worse with Black adults accounting for 75% of the hospitalizations and 70% of deaths in a large South Louisiana Hospital [10]. COVID-19 mortality has improved for Black adults, but the state continues to experience racial disparities; Black individuals represent 32% of the Louisiana population but 36% of deaths as of October 2021 [11]. Louisiana continues to exceed the national average in both cumulative cases (16,209 vs. 13,531 per 100 K) and deaths (309 vs 219 per 100 K) over the course of the pandemic [12].

On March 23, 2020, the governor of Louisiana mandated a stay-at-home order. Phased reopenings began May 15, 2020. The rapid spread of the COVID-19 pandemic made people uncertain about their perceptions of the threat of COVID-19 and COVID-19 response measures [13]. COVID-19 information has come from a variety of sources and has often been inconsistent, misleading, and confusing [14]. The success of the US and Louisiana's public health response to COVID-19 depends largely on peoples' knowledge, concerns, behaviors, and sources of information [15].

Few US studies have reported adults' knowledge, concerns, and behaviors related to COVID-19. A telephone survey, conducted in March of 2020, among older urban adults who were enrolled in ongoing health services research [16] found that one-fourth of the participants were *very worried* about getting COVID-19 and that one-fourth believed they were *not at all likely* to get the disease. Approximately one-third could not identify symptoms of COVID-19 or appropriate ways to prevent the disease. Participants who were Black, living below poverty, and had low health literacy were more likely to believe they would not become infected and to feel less prepared for an outbreak. A follow-up survey by the same group [17] revealed that there was no change in the proportion of those who were unable to identify ways to prevent infection, even after the rapid increase in COVID-19 cases and deaths since the prior survey.

During similar time frames (spring through fall of 2020), three large online surveys found participants had

limited knowledge of COVID-19 [18–20]. Two US studies found that Black and Hispanic adults had less knowledge of COVID-19 and mitigation strategies compared to Caucasian respondents [18, 19]. The authors suggested that deficits in knowledge of proper control methods may further exacerbate race/ethnicity disparities. A study of US and UK participants found that a substantial number in both countries had misconceptions about how to prevent COVID-19 infection [20]. For example, more than one in four participants in both countries thought it would be prudent to refrain from eating in Chinese restaurants.

As COVID-19 cases continued to increase globally, we performed a telephone survey in Louisiana from April through October 2020 to assess knowledge and attitudes about COVID-19 among patients who utilized Ochsner-LSU Health for telemedicine care. Unlike previous studies, our study was conducted over six months and included a wide range of adult patients in a safety net health system in north Louisiana. The purpose of this quality improvement project was to determine participants' COVID-19 related experience, knowledge, concerns, behaviors, stress, and sources of information to aid in clinical care and effective public health messaging and strategies.

Methods

This project took place April 29–October 31, 2020. The data presented in this study were obtained in the pre-vaccine availability period. Trained medical and public health students and clinical research assistants called adult patients of Ochsner-LSU Health Shreveport identified in the electronic medical record as having had a telemedicine visit during the period of March 2020–October 2020 and asked if they would be willing to participate in a brief telephone survey about COVID-19. The structured survey took 10–15 min to complete. Participant responses were entered into REDCap, a web-based survey database. The health center serves predominately low-income patients; 75% have Medicaid and/or Medicare and 12% have private insurance. The project was reviewed and designated as quality improvement by the LSU Health Shreveport Institutional Review Board (IRB).

Participants

All participants were ambulatory care patients at least 18 years of age who had participated in at least one telemedicine visit from a provider at a non-urgent care clinic.

Measurement

The 15-item survey was designed to assess participants' COVID-19 experience, concerns, knowledge, behavior,

stress, and preferred sources of health information. The survey was modified from one developed by Wolf and colleagues [16, 17]. Participant characteristics elicited included age, race, sex, age, employment status, and location of residence (city or rural small town (which was self-reported)).

COVID-19 Experience

Four items assessed COVID-19 experience: (1) if they or anyone they know has had or thinks they have had the virus; (2) if they had spoken to a health care provider about COVID-19; (3) if they had been tested for the virus; (4) if yes, the outcome of the testing (positive, negative, pending).

COVID-19 Concerns

Three items assessed concerns: (1) how serious a public health threat they thought the virus might become [from 1 to 10 (highest)]; (2) do you believe you could get sick from the virus (not at all, it's possible, probably, definitely will), (3) how prepared they felt they were for a coronavirus outbreak (a little, somewhat, and very prepared).

COVID-19 Knowledge

Knowledge was assessed with two open-ended questions asking participants to (1) name three symptoms of COVID-19 and (2) three actions they could take to avoid COVID-19. Research assistants checked all 17 multiple-response answers that applied for each question. If three correct answers were given, participants were scored as being able to list three symptoms or three steps to avoid the virus.

COVID-19 Related Behaviors

Behaviors were assessed with three items asking: (1) How much has the virus changed your daily routine? (not at all, a little, some, a lot); (2) Did you change any plans due to the virus? (yes, no, don't know); and (3) How often are you leaving your home? (multiple times a day, once a day, a few times a week, less than once a week).

Impact of the Virus on Stress

Stress was assessed with two items, (1) Over the last week how often have you felt nervous or stressed because of the virus; and (2) Over the past week how often have you felt alone or lonely because of the virus? (never, some of the time, most of the time, all of the time).

Sources of Information about COVID-19

Participants were asked where they have been getting most of their information about COVID-19. They could name more than one and answers were recorded in seven categories. (TV, newspapers/magazines (online or print), social media, websites, health professionals, family/ friends, and other).

Statistical Analysis

For analysis purposes, demographic characteristics were defined as follows: gender (male and female), race (Black, White, other), age (18–29, 30–44, 45–64, and 65+), location (city or rural), and employment status (working for pay, not working for pay). Patient characteristics and survey items were summarized overall and by the timing of the survey (April–May, $n = 192$), (June–July $n = 244$), and (August–October $n = 186$). Survey items were then compared by patient characteristics using chi-square tests.

Results

Of the 958 subjects contacted, 623 (65%) completed the telephone survey. Table 1 summarizes the characteristics of participants; mean age was 48.6 years, and the majority were female (73.5%), 54.7% were Black adults, 42.1% were White adults, and 44.8% reported living in rural small towns. Overall, 34.4% were currently employed at the time of survey completion and this demographic indicator increased from 29.7 to 47.9% over the course of the study from April to October 2020 ($p = 0.001$).

COVID-19 Experience

Approximately one in four participants (25.8%) stated they had been tested for COVID-19, with 11.4% of those tested reporting positive results (Table 2). The proportion who was tested did not increase over time. Living in a rural small town was associated with a decreased likelihood of having been tested compared to living in a city (21% vs 29%, $p = 0.02$). Overall, 53.4% indicated knowing someone who had COVID-19, increasing from 41.6% in the spring of 2020 to 69% by the end of October. Black adults were more likely than White adults to know someone who had the virus (63.2% vs 45.9%, $p = 0.03$) and females more likely than males (59.8% vs 36.3% $p < 0.001$). Although all participants had had a telemedicine visit during the study period, only half (50.5%) said they had spoken to a health care provider about the virus. This increased from April to October over time (47.2–65.2%, $p < 0.001$). Females were more likely than males to have talked to a provider about the virus (53.8% vs

Table 1 Participant characteristics

Variable	Summary value ^a			
	Overall	April 2020-November 2020 (n = 623)	April 2020-May 2020 (n = 192)	June 2020-July 2020 (n = 244)
Age, mean (SD)	48.6 (14.6)	48.1 (14.0)	48.5 (14.5)	49.2 (15.5)
Age, %				
18–29	69 (11.4)	20 (11.1)	26 (10.9)	23 (12.4)
30–44	189 (31.3)	56 (31.1)	75 (31.5)	58 (31.2)
45–64	257 (42.6)	83 (46.1)	103 (43.3)	71 (38.2)
65 +	89 (14.7)	21 (11.7)	34 (14.3)	34 (18.3)
Race				
Black or African American	341 (54.7)	95 (49.5)	138 (56.6)	108 (58.1)
White	262 (42.1)	89 (46.4)	100 (41.0)	73 (39.3)
Other	5 (0.80)	4 (2.1)	1 (0.41)	0 (0.0)
Unknown/unreported	15 (2.4)	4 (2.1)	5 (2.1)	5 (2.7)
Gender*				
Female	453 (73.5)	131 (69.7)	170 (70.2)	152 (81.7)
City				
Shreveport/bossier	332 (55.2)	104 (57.8)	128 (54.2)	100 (53.8)
Small town	270 (44.8)	76 (42.2)	108 (45.8)	86 (46.2)
Current employment situation				
Working now for pay**	214 (34.4)	57 (29.7)	67 (27.5)	89 (47.9)
Not working for pay	409 (65.6)	135 (70.3)	177 (72.5)	97 (52.1)

*Significant differences per wave at the 0.05 level

**Significant differences per wave at the 0.001 level

^aSummary Values are counts and percentages, unless noted otherwise

41.1%, $p < 0.01$) and Black participants were more likely than White participants (55.5% vs 45.9, $p = 0.03$).

Knowledge

The majority of participants could list three symptoms associated with COVID-19 and name three mitigation strategies (78.5% and 87.9% respectively). Specifically, 80.4% of participants surveyed named fever, 51.4% cough, and 44.3% shortness of breath or difficulty breathing. Knowledge improved significantly over the six months of the study; participants naming three symptoms increased from 69.5 to 87.4 ($p < 0.001$). Those naming three steps to prevent the virus increased from 83.6% to 98.9% ($p < 0.001$) (Table 2).

Concerns

Participants did not seem to think that COVID-19 was or would become a serious public health threat; on a scale of 1–10, this decreased during the study time frame from 4.6 to 3.8 ($p < 0.001$). Less than a quarter (22.7%) of the sample

said it was *not at all likely* that they would get sick from the virus, and this too decreased over time (33.1–14.8%, $p = 0.01$). Those who said they were very prepared for an outbreak decreased from 43.9 to 29.1% ($p < 0.001$).

Behavior

In April and May of 2020, 56.9% of participants said the virus had changed their routine *a lot* (Table 2). This decreased to 39.3% between August and October ($p < 0.001$). Over half (55.9%) of participants indicated they had changed plans due to the virus, with rates decreasing over time from 66.9 to 53% ($p < 0.05$). Participants' reports of leaving home varied from less than once a week (26.5%), to a few times a week (43.1%), to once or more a day (30.4%, $p < 0.001$). Participants reported going out more often as time went on (28.9–39%, $p < 0.001$). Younger participants were more likely to say they were leaving home once or more a day than those over age 65 (46% vs 13.8%, $p < 0.001$). City residents were more likely to leave home more often 34.2% vs 25.3%, $p = 0.05$) than small-town residents.

Table 2 Awareness, attitudes & behavior related to COVID-19

Variable	Summary value ^a			
	Overall			
	April 2020–November 2020 (n = 623)	April 2020–May 2020 (n = 192)	June 2020–July 2020 (n = 244)	August 2020–November 2020 (n = 186)
<i>Awareness & experience</i>				
Has been tested for the coronavirus	148 (25.8)	36 (21.8)	64 (28.8)	48 (26.0)
Received positive test	17 (11.4)	5 (14.3)	4 (6.1)	8 (16.7)
Knows someone that has, or thinks they have, the coronavirus**	306 (53.4)	69 (41.6)	110 (49.6)	127 (69.0)
Has spoken to a healthcare provider about the coronavirus?***	278 (50.5)	75 (47.2)	83 (40.1)	120 (65.2)
<i>COVID-19 knowledge</i>				
Correctly identified 3 symptoms of COVID-19**	468 (78.5)	123 (69.5)	185 (78.7)	161 (87.4)
Correctly identified 3 steps to prevent from getting COVID-19**	524 (87.9)	148 (83.6)	194 (82.6)	181 (98.9)
<i>Beliefs and concern</i>				
How serious of a public health threat do you think the coronavirus is or might become? (1–10), mean (SD)**	4.0 (1.3)	4.6 (2.1)	3.7 (0.6)	3.8 (0.5)
Do you think that you will get sick from the coronavirus?*				
Not at all	128 (22.7)	54 (33.1)	47 (21.7)	27 (14.8)
It's possible	373 (66.1)	93 (57.1)	148 (68.2)	131 (71.6)
I probably/definitely will	63 (11.2)	16 (9.9)	22 (10.1)	25 (13.7)
How prepared do you think you are for the coronavirus outbreak?***				
Not prepared at all	59 (10.4)	12 (7.3)	30 (13.6)	17 (9.3)
A little prepared	96 (16.9)	14 (8.5)	40 (18.2)	42 (23.1)
Somewhat prepared	225 (39.7)	66 (40.2)	88 (40.0)	70 (38.5)
Very prepared	187 (33.0)	72 (43.9)	62 (28.2)	53 (29.1)
<i>COVID-19 behaviors</i>				
How much has the coronavirus changed your daily routine?***				
Not at all	88 (15.4)	24 (14.4)	43 (19.4)	21 (11.5)
A little	117 (20.4)	31 (18.6)	45 (20.3)	41 (22.4)
Some	94 (16.4)	17 (10.2)	28 (12.6)	49 (26.8)
A lot	274 (47.8)	95 (56.9)	106 (47.8)	72 (39.3)
Changed plans because of the coronavirus*	318 (55.9)	111 (66.9)	109 (49.8)	97 (53.0)
How often are you leaving your home?***				
Multiple times a day	31 (5.5)	13 (8.0)	8 (3.6)	10 (5.5)
Once per day	141 (24.9)	34 (20.9)	46 (20.9)	61 (33.5)
A few times per week	244 (43.1)	59 (36.2)	109 (49.6)	75 (41.2)
Less than once per week	150 (26.5)	57 (35.0)	57 (25.9)	36 (19.8)
<i>Impact of virus on stress</i>				
Needs additional help in daily life because of the coronavirus**	75 (13.1)	37 (22.2)	32 (14.5)	5 (2.7)
Over the past week, how often have you felt nervous or “stressed” because of the coronavirus?				
Never	314 (55.5)	77 (47.2)	122 (55.7)	115 (62.8)
Some of the time	141 (24.9)	51 (31.3)	52 (23.7)	38 (20.8)
Most of the time	69 (12.2)	20 (12.3)	30 (13.7)	19 (10.4)
All of the time	42 (7.4)	15 (9.2)	15 (6.9)	11 (6.0)
Over the past week, how often have you felt alone or lonely because of the coronavirus?*				
Never	419 (74.2)	107 (66.1)	172 (78.5)	140 (76.5)
Some of the time	94 (16.6)	34 (21.0)	29 (13.2)	30 (16.4)
Most of the time	31 (5.5)	8 (4.9)	13 (5.9)	10 (5.5)
All of the time	21 (3.7)	13 (8.0)	5 (2.3)	3 (1.6)

*Significant differences per wave at the 0.05 level

**Significant differences per wave at the 0.001 level

^aSummary Values are counts and percentages, unless noted otherwise

Impact of the Virus on Stress

Almost one in five participants (19.6%) reported they *felt nervous or stressed* because of the virus most or all of the time over the last week; 9.2% said they *felt alone or lonely* because of the virus most or all of the time (Table 2). Females were more likely than males to report feeling stressed (21.7% vs 13.1%, $p = 0.006$) and lonely most of the time (9.5% vs. 8.8%, $p = 0.02$). Stress did not improve over time, but loneliness decreased from 12.0 to 7.1 ($p < 0.05$).

Sources of Information

Overall, TV news was the primary source of information (73%), and this increased over time from 66.1% to 83.6% ($p < 0.001$) (Table 3). Black adults were more likely than White adults to report getting COVID-19 information from TV news (80.7% vs 65.6%, $p < 0.001$). Websites were the second most cited source of information (34.2%), with the CDC and Louisiana Department of Health being mentioned most often. The proportion reporting websites as their main source of information about the virus did not change over time. Not surprisingly, sources of information varied by age with those under age 30 more likely to get COVID-19 information from websites and social media compared to other age groups.

Discussion

In a telephone interview with predominantly low-income participants in a Southern safety-net health system, basic knowledge of COVID-19 was high. Knowledge increased from April 2020 to October 2020, with almost all participants being able to name three mitigation strategies in the latter half of the survey period. Approximately half of the participants knew someone who had or thought they had the virus, a factor that increased over the time of the study. However, participants generally did not seem to think coronavirus was or would become a serious public health threat. Only about one in four participants had been tested for the virus and these rates did not increase over time. Fewer rural, small-town residents had been tested than those living in cities.

As with findings in a similar telephone survey with urban participants conducted early in the pandemic [16], we found approximately one-third of participants could not identify symptoms of the virus. However, knowledge of symptoms of the virus and how to prevent infection increased over time. In both studies, approximately one in four thought it was *not at all likely* they would get sick from the virus early in the pandemic. However, in our study, this percentage dropped significantly over time. Unlike the Chicago study, we found no difference by race. Interestingly, city dwellers in our study were more likely to think they would not get sick from the virus than those in rural small towns.

Table 3 COVID sources of information

Variable	Summary value ^a			
	Overall	April 2020-November 2020 (n = 623)	April 2020-May 2020 (n = 192)	June 2020-July 2020 (n = 244)
Where have you been getting most of your information about the coronavirus?				
TV**	437 (73.3)	117 (66.1)	166 (70.6)	153 (83.6)
Online websites, NOT social media or newspapers	204 (34.2)	64 (36.2)	78 (33.2)	61 (33.3)
CDC*	35 (17.2)	4 (6.3)	14 (18.0)	17 (27.9)
LA Website	15 (7.4)	3 (94.7)	4 (5.1)	8 (13.1)
Social media*	149 (25.0)	37 (20.9)	71 (30.2)	40 (21.9)
Newspaper, magazines (online & print)**	34 (5.7)	13 (7.3)	20 (8.5)	1 (0.6)
Health professional	96 (16.1)	26 (14.7)	37 (15.7)	33 (18.0)
Family/friends*	65 (10.9)	26 (14.7)	30 (12.8)	9 (4.9)
Other**	33 (5.5)	21 (11.9)	12 (5.1)	0 (0.0)

*Significant differences per wave at the 0.05 level

**Significant differences per wave at the 0.001 level

^aSummary Values are counts and percentages, unless noted otherwise

Our finding that participants living in rural small-towns were less likely to have been tested for the virus is an indication that COVID-19 testing and treatment need to be more accessible outside cities. In the spring of 2021, 64% of rural counties in the U.S. did not have a COVID-19 testing site and access to infectious disease specialists was limited [21]. All participants had had at least one telemedicine visit during the study period, yet only half had spoken to a health-care provider about the virus. This suggests that providers may need to proactively initiate discussion about COVID-19 from the medical and social standpoint in order to fully understand the significance of the pandemic for individual patients.

Nearly one in five participants in our study reported feeling nervous/stressed or lonely because of the virus most or all of the time in the last week. This did not vary by race or age, but women were more likely than men to report issues with mental health. Feeling stressed did not vary over time and loneliness decreased. This contrasts with a national Kaiser Family Foundation tracking poll from July 2020 to January 2021 that showed a higher percentage of US adults (about four in 10) reported symptoms of anxiety and/or depression and rates were higher among Blacks, younger people, and those with low income [22].

Clear, trustworthy COVID-19 messaging is essential to inform and motivate individuals and communities to take action to minimize the risk of infection and prevent the spread of the virus. The majority of participants in our study named TV news as the source of most of their information on the virus and this increased over time. Black adults were more likely to rely on TV news than white adults. This is important information as current COVID-19 testing and vaccine promotion programs aimed at minority populations in Louisiana are establishing websites and focusing on using social media to disseminate and promote their messages [23]. In our study, only about one-third of our participants turned to websites and fewer still to social media. Websites were more commonly used among participants under the age of 30. This contracts with a large online survey that found among a primarily white urban/ suburban cohort, governmental websites (87%) were the most accessed information resource followed by TV (74%), social media (74%), and other websites (69%) [24].

Limitations

This study has several limitations. It was a convenience sample with predominantly low-income patients at one Southern health system who were all registered for a telemedicine visit from April to October 2020, early in the pandemic. The survey was conducted in English only, however, it included participants with a wide variation in age, a high rate of Black individuals, and persons living in rural areas. When

the study was conducted, vaccines were not yet available to the public, therefore no vaccine questions were included. Ongoing research is needed on vaccine access, acceptance, concerns, and beliefs.

Conclusions

This study provides a snapshot of low-income Louisiana patients' COVID-19 related knowledge, concerns, behaviors, stress, and sources of information during the first two waves of COVID-19 in Louisiana. Our finding that fewer patients living in rural small towns had been tested for COVID-19 highlighted potential rural disparities and indicates that additional research is needed to address rural COVID-19 education and testing disparities. The finding that television news media was the major source of COVID-19 information particularly among our most vulnerable groups, including Black adults and older individuals, could help inform ongoing efforts to increase effective delivery of trusted information to better address disparities. The fact that more than one in five patients expressed anxiety related to COVID-19 reinforces the need for health systems to assess anxiety and address treatment disparities with mental health that already exist related to race, socioeconomic status, and rural living. Disparities in the public understanding of COVID-19 and participation in testing and vaccination continue to evolve as the COVID-19 pandemic waxes and wanes. Additional research is needed to identify novel strategies for public education on COVID-19 and to mitigate the long-standing disparities that make rural and underserved populations more vulnerable to misinformation and adverse disease outcomes.

Author Contributions Conceptualization: TD, CA, MW; Methodology: TD, CA, MW, SB; Formal analysis and investigation: LC, RH, SB, TD, CA, JV, MNB; Writing—original draft preparation: TD, CA, MW; Writing—review and editing: all authors contributed to the review and editing of the manuscript; Funding acquisition: TD, CA; Resources: all authors contributed resources necessary for the completion of this study; Supervision: TD, CA.

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Data Availability The data that support the findings of this study are available from the corresponding author upon request.

Code Availability SAS Version 9 (Cary, NC) software was used to analyze data.

Declarations

Conflict of interest Dr. Wolf reports grants from NIH during the conduct of the study, grants from Merck, the Gordon and Betty Moore Foundation, and personal fees from Sanofi, Pfizer, and Luto outside the submitted work. Drs. Davis, Arnold, and Horswell report grants from NIH outside the submitted work. Dr. Vanchiere reports clinical research contracts detailed above unrelated to the content of this work.

Ethical Approval The project was reviewed and designated as quality improvement by the LSU Health Shreveport IRB [STUDY00001447, April 14, 2020].

Consent to Participate All participants in the study provided their verbal consent to participate after receiving ample time to review informed consent documents.

Consent for Publication Not applicable for this study, data presented as a summary.

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