Original Article

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# SARI by COVID-19 in Ituiutaba-MG: analysis of the demographic, clinical and mortality profiles in the first 13 epidemiological weeks of 2021

## SRAG por COVID-19 em Ituiutaba-MG: análise do perfil demográfico, clínico e de mortalidade nas 13 primeiras semanas epidemiológicas de 2021

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**Abstract**

*Introduction:* Epidemiological waves of COVID-19 have been observed in Brazil from studies that evaluate the profile of the notifications in different databases. This is useful to better understand the dynamics of the virus and disease, and the adoption of effective sanitary measures to control hospital supplies and the organization of the medical care. *Objective:* To describe the demographical, clinical, and hospitalization features of the laboratory-confirmed patients COVID-19 treated at the health service of Ituiutaba-MG until the 13th epidemiological week of 2021. *Methods:* Cross-sectional study was performed by comparing the profile of hospitalized and deaths of patients by consulting the individual registration forms for severe acute respiratory illness (SARI) cases, test-confirmed of COVID-19, and death certificate. Demographical, clinical, and hospitalization data were analyzed by descriptive statistic, considering relative frequency (%), mean and confidence interval. For the non-homogeneous distributions, median and interquartile shift were used. The comparison between the hospital discharge and death groups were performed by the T and Mann-Whitney tests. *Results:* From the total of 292 evaluated notifications, 138 patients died, with the prevalence of men, aged over 65 years of race who declared themselves as white, with cardiovascular disease and/or diabetes as a comorbidity, and who were hospitalized for more time and needed intensive care unit and to use ventilatory support. *Conclusions:* The data revealed that the age and comorbidity factors are preponderant to a higher severity of the COVID-19.

**Keywords:** SARS-CoV-2; epidemiological surveillance; comorbidity

**Resumo**

*Introdução:* Ondas epidemiológicas da COVID-19 têm sido acompanhadas no Brasil a partir de estudos que avaliam o perfil das notificações nos mais diferentes bancos de dados, os quais permitem a compreensão da dinâmica do vírus e da doença, bem como a adoção de medidas sanitárias de maior eficácia, controle de insumos hospitalares e estruturação do atendimento médico. *Objetivo:* Descrever as características demográficas, clínicas e de hospitalização de pacientes com confirmação laboratorial de COVID-19 atendidos no serviço de saúde de Ituiutaba-MG até a 13ª semana epidemiológica de 2021. *Métodos:* Estudo transversal comparando o perfil de pacientes hospitalizados e de óbitos consultando as fichas de registro individual para casos de Síndrome Respiratória Aguda Grave (SRAG), o exame diagnóstico confirmatório e a certidão de óbito. Dados demográficos, clínicos e de hospitalização foram analisados por estatística descritiva, considerando a frequência relativa (%), a média e o intervalo de confiança, e para as distribuições não homogêneas, a mediana e o desvio interquartílico. A comparação entre os grupos de alta hospitalar e óbito foi realizada por meio dos testes T e Mann-Whitney. *Resultados:*

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Do total de 292 notificações avaliadas, 138 pacientes foram a óbito, com prevalência de homens, idade acima dos 65 anos, de raça declarada como branca, com alguma das comorbidades (doença cardiovascular e/ou diabetes), e que apresentaram maior tempo de hospitalização, necessidade de unidade de terapia intensiva e uso de suporte ventilatório. *Conclusões:* Os dados revelam que os fatores idade e comorbidade são preponderantes para maior severidade da COVID-19.
**Palavras-chave:** SARS-CoV-2; vigilância epidemiológica; comorbidade

## Introduction

COVID-19 is an acute respiratory disease caused by the new coronavirus (SARS-CoV-2), responsible for the pandemic that began in March 2020[1]. In the same month, the first death was recorded in Brazil, and since then, peaks of national epidemiological waves were registered in July 2020, March 2021, and February 2022[2]. This pattern was also observed in the southeastern region as well as in Minas Gerais (MG), its macro-regions and municipalities.

Despite of the signs and symptoms of SARS-CoV-2 infection being quite diverse, fever (≥37,8ºC), cough, fatigue, dyspnea, malaise, myalgia, and upper respiratory tract symptoms are the most commonly reported ones. In this regard, since the beginning of the pandemic, epidemiological, clinical evaluation, and treatment have been established based on influenza-like illness (ILI) and severe acute respiratory illness (SARI)[3]. Cases of SARI are defined based on ILI symptoms, such as dyspnea, oxygen saturation level below 95%, respiratory distress or cyanosis of the lips or face[4].

Laboratory diagnosis to confirm the presence of the SARS-CoV-2 virus is preferably carried out by using the real time reverse-transcriptase polymerase chain reaction (RT-PCR) technique and viral genome sequencing from a sample collected from nasopharyngeal swab[4].

Epidemiological studies are valuable in assisting disease surveillance and the management of states and municipalities. The increase in the number of cases and deaths can be related to countless factors such as immigration mobility[5], virus transmission speed, mutation, and influx of new variants[6], vaccination rate[7], the presence of comorbidities[8,9] and hospital overload[10]. In Brazil, epidemiological profiles are compiled from health database notifications, such as the Epidemiological Surveillance System for SARI (SIVEP-Gripe), as well as medical records and epidemiological bulletins[4].

Given the importance of the epidemiological profile regarding COVID-19 mortality, this study aimed to describe the demographic and clinical profile of patients with SARI due to COVID-19 in Ituiutaba, MG, during the first 13 epidemiological weeks of 2021. The gathered data may improve future policies and health strategies.

## Materials and methods

### Study location

A retrospective cross-sectional study was conducted with 292 patients who developed SARI due to COVID-19 in the municipality of Ituiutaba, MG. Data was obtained from the Emergency Care Unit of the Municipality of Ituiutaba (UPAMI), São José Hospital of the São Vicente de Paulo Society, Nossa Senhora da Abadia Hospital and São Joaquim Hospital. The research was approved by the Ethics Committee for Research involving human subjects (CAAE 56051721.2.0000.5152).

The data collection took place at the Municipal Health Department by accessing individual registration forms of positive SARI cases[11], diagnostic tests, and death certificates of patients who were hospitalized between January 3 and April 3, 2021, marking the beginning of the first epidemiological week and the end of the

13th epidemiological week of 2021, respectively.

### Inclusion and exclusion criteria

The inclusion criteria for this study were patients with SARI confirmed for COVID-19 with reported clinical outcomes. Data from patients with notifications that did not include personal and clinical information and confirmatory tests for COVID-19 (antigen, serology, RT-PCR and or tomography) was discarded.

Laboratory confirmation was performed by using molecular biology techniques such as RT-PCR, rapid tests for antigen detection or serological testing (detection of IgM and IgG antibodies) and through computed tomography reports identifying changes corresponding to ground-glass opacities caused by the SARS-CoV-2 virus[4]. All testing was conducted in public and private laboratories in the municipality.

### Casuistry

We collected demographic information (age, biological sex, and race), clinical data (symptoms, the presence of cardiovascular disease (CVD) and/or diabetes *mellitus* (DM)), hospitalization details (use of intensive care unit (ICU), ventilatory support, COVID-19 diagnostic testing, and length of hospitalization since the onset of the symptoms), as well as death certificates (date and cause of death) from individual notifications and death certificates. Additionally, we gathered new cases within the analyzed period through the municipality's epidemiological notification bulletins for COVID-19 to assess the number of positive cases and COVID-19 related hospitalizations between the 1st and 13th epidemiological weeks.

### Statistical analysis

The data was tabulated in Microsoft Excel 2010® and analyzed with the BioEstat 5.0 program. The normality of the data was assessed by using D'Agostino Pearson test. Categorical variables were presented as absolute frequency (n) and relative frequency (%), and the continuous variables were presented as arithmetic mean and standard deviation or median and interquartile range for informed data. The chi-square test was applied to categorical variables and their residuals were analyzed when a statistical difference was identified through contingency tables *lxc*. In 2x2 tables, with observed frequency ($n<5$) Yates correction was applied. Student's T-test and Mann-Whitney tests were used to compare ratio variables, assuming the normality of sample distributions. A 95% confidence interval was employed to assess the mean age of the study population. $p$-value $<0.05$ were considered significant.

## Results

The study involved data from 292 patients stratified into individuals who were discharged from the hospital (n=154), and those who died (n=138) due to COVID-19. Antigen testing (n=209, 71.6%) was the most frequently recorded diagnostic method in notifications to confirm COVID-19 cases **(Table 1). Figure 1** shows the evolution of the number of new cases between the 1st and 13th epidemiological week of 2021. The number of new cases in the 9th epidemiological week was about twice as high as in the 1st week, reflecting higher rates of hospitalization for SARI during that period.

**Table 1** – Distribution of laboratory-confirmed with COVID-19 by different types of diagnosis between first and 13th epidemiological weeks, Ituiutaba-MG, 2021

| Test for diagnosis | % (n) |
|---|---|
| RT-PCR | 9.9 (29) |
| Antigen | 71.6 (209) |
| Serology test | 5.5 (16) |
| Tomography | 12.7 (37) |
| NI | 0.3 (1) |

NI: Not informed.

Evaluating the percentage frequency of hospitalizations due to SARI across age groups, we observed that most cases occur in individuals over 60 years of age (n=164; 56.2%), in self-identified white individuals (n=164, 59.6%), and in males (n=165, 56.5%) (Table 2). Additionally, the mean age in years of individuals who were discharged from the hospital was lower (58 years; 95% CI: 55.8-60.7) when compared to cases that resulted in death (68 years; 95% CI: 65.1-70.1, p<0.01).

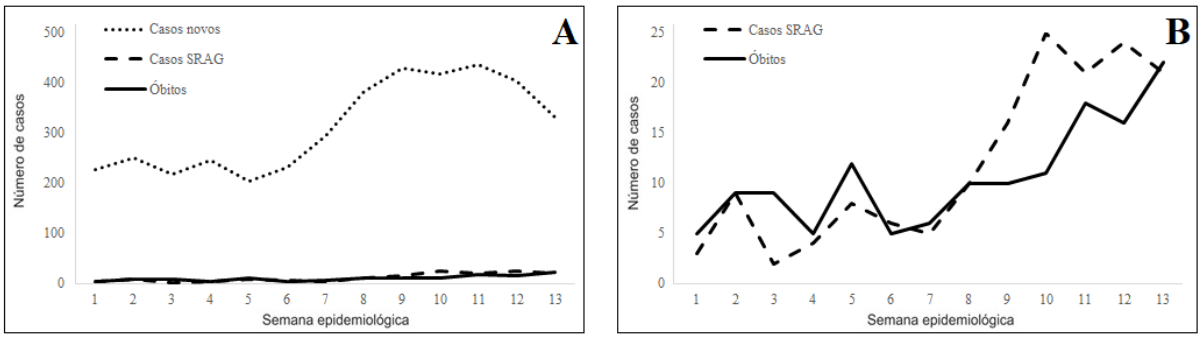


**Figure 1**. **(A)** Number of new cases, hospitalization by SARI and death confirmed by COVID-19 by municipality's epidemiological notification bulletins in the first 13 epidemiological weeks of 2021. **(B)** Detail of stratification for SARI cases and death confirmed of COVID-19 in the first 13 epidemiological weeks of 2020, MG.

Statistical analysis did not reveal a difference between the investigated symptoms, comparing hospital discharge and death. However, characteristic symptoms of SARI, such as respiratory discomfort (n=206, 70.8%), dyspnea (n=208, 71.5%), and low oxygen saturation (n=255, 87.6%) were reported more frequently **(Table 2)**. Regarding the prevalence of comorbidities (CVD or DM), there was no significant difference ($p$>0.05) between hospital discharge and death. Nevertheless, a higher frequency of patients with CVD and DM (n=44, 36.1%, $p$<0.01) was observed among those who died **(Table 2)**.

**Table 2 –** Demographic and clinical characterization on the patients with SARI by COVID-19 between the 1st and 13th epidemiological week stratified by hospital outcome (hospital discharge and death), Ituiutaba-MG, 2021

| Variables | Hospital discharge n (%) | Death n (%) | Total n (%) | p-value* |
|---|---|---|---|---|
| **Age (years)** | | | | |
| Mean ± SD | 58.3 ± 15.3<br>95%CI (55.8 a 60.7) | 67.8 ± 14.7<br>95%CI (65.1 a 70.1) | | **<0.01*** |
| 20-29 | 2 (1.3) | 1 (0.7) | 3 (1.0) | - |
| 30-39 | 17 (11.0) | 4 (2.9) | 21 (7.2) | - |
| 40-49 | 33 (21.4) | 13 (9.4) | 46 (15.8) | - |
| 50-59 | 32 (20.8) | 26 (18.8) | 58 (19.9) | - |
| 60-69 | 32 (20.8) | 24 (17.4) | 56 (19.2) | - |
| 70-79 | 22 (14.3) | 37 (26.8) | 59 (20.2) | - |
| ≥ 80 | 16 (10.4) | 33 (23.9) | 49 (16.8) | - |
| **Sex** | | | | |
| Male | 86 (55.8) | 79 (57.2) | 165 (56.5) | **0.809** |
| Female | 68 (44.2) | 59 (42.8) | 127 (43.5) | |
| **Race** | | | | |
| Yellow | 1 (0.7) | 0 (0.0) | 1 (0.4) | **0.661**† |
| White | 81 (59.1) | 83 (60.1) | 164 (59.6) | |
| Brown | 47 (34.3) | 44 (31.9) | 91 (33.1) | |
| Black | 8 (5.8) | 11 (8.0) | 19 (6.9) | |
| **Symptoms** | | | | |
| Respiratory distress | 108 (70.1) | 98 (71.5) | 206 (70.8) | **0.793** |
| Diarrhoea | 29 (18.8) | 22 (16.1) | 51 (17.5) | **0.535** |
| Dyspnea | 107 (69,5) | 101 (73.7) | 208 (71.5) | **0.424** |
| Abdominal pain | 5 (3.2) | 0 (0.0) | 5 (1.7) | - |
| Sore throat | 19 (12.3) | 22 (16.1) | 41 (14.1) | **0.362** |
| Fatigue | 32 (20.8) | 32 (23.4) | 64 (22.0) | **0.596** |
| Fever | 69 (44.8) | 58 (42.3) | 127 (43.6) | **0.672** |
| Loss of smell | 27 (17.5) | 16 (11.7) | 43 (14.8) | **0.160** |
| Loss of taste | 30 (19.5) | 15 (11.0) | 45 (15.5) | **0.044** |
| Saturation (less than < 95%) | 133 (86.4) | 122 (89.0) | 255 (87.6) | **0.487** |
| Cough | 95 (61.7) | 91 (66.4) | 186 (63.9) | **0.401** |
| Vomiting | 9 (5.8) | 8 (5.8) | 17 (5.8) | **0.999** |
| **Comorbidity** | | | | |
| CVD | 61 (44.8) | 69 (56.6) | 130 (50.4) | **0.712** |

| Variables | Hospital discharge n (%) | Death n (%) | Total n (%) | p-value* |
|---|---|---|---|---|
| DM | 35 (25.7) | 44 (36.1) | 79 (30.6) | |
| CVD or DM | 46 (33.8) | 25 (20.5) | 71 (27.5) | |
| CVD and DM | 25 (18.4) | 44 (36.1) | 69 (26.7) | |
| None | 65 (47.8) | 53 (43.4) | 118 (45.7) | **<0.01** |

The relative frequency for the variables, "Race" (n=137 in hospital discharge), "Symptoms" (n=137 in death) and "Comorbidity" (n=136 for hospital discharge and n=122 for death) were calculated based on the data that medical records informed, ignoring "missing". †p-value calculated by Exact Fisher test; *$p$<0,05 (significant difference). IC95%: confidence interval; SD: standard deviation; CVD: cardiovascular disease; DM: Diabetes *mellitus.*

The need for ICU (n=73, 54.8%, $p$<0.01) and the use of invasive ventilatory support (n=27, 21.9%, $p$<0.01) were more prevalent among individuals who died **(Table 3).** Additionally, regarding the length of hospital stay, the hospitalization period of patients who passed away was longer in days (median=10) when compared to those who were discharged from the hospital (median=7, $p$<0.01) **(Table 3)**.

**Table 3 –** Hospital outcome in patients with SARI between the 1st and 13th epidemiological week by COVID-19, Ituiutaba-MG, 2021

| Variables | Hospital discharge n (%) | Death n (%) | Total n=291 | p-value* |
|---|---|---|---|---|
| **Use of ICU** | 14 (9.2) | 73 (54.8) | 87 (30.4) | **<0.01*** |
| **Ventilatory support** | | | | |
| None | 24 (16.5) | 10 (8.1) | 34 (12.7) | |
| Yes, not invasive | 108 (74.5) | 86 (69.9) | 194 (72.4) | **<0.01*** |
| Yes, invasive | 13 (9.0) | 27 (21.9) | 40 (14.9) | |
| **Total hospitalization time (days)** | | | | |
| Median | 7 | 10 | | **<0.01*** |
| First quartile (25%) | 4 | 6 | | |
| Third quartile (75%) | 10 | 14 | | |

The relative frequency for the variables "Use of ICU" (n=153 for hospital discharge and n=133 for death) and "Ventilatory support" (n=145 for hospital discharge and n=123 for death) were calculated based on the data that medical records informed, ignoring "missing". *$p$<0,05 (significant difference). ICU: intensive care unit.

Overall, more than one clinical complication was reported on death certificates. The most frequent ones were: pneumonia of specified or unspecified cause (n=69, 50.0%), respiratory failure (n=46; 33.3%), septic shock (n=41;29.7%), cardiopulmonary arrest (n=28, 20.3%), Acute Respiratory Distress Syndrome (ARDS) (n=14, 10.1%), multiple organ failure (n=12, 8.7%), acute renal failure (n=12, 8.7%), and sepsis (n=5, 3.6%). In addition to clinical complications resulting from COVID-19, descriptions of systemic arterial hypertension, heart diseases, heart failure, diabetes, neoplasms, and chronic obstructive pulmonary disease were also present in 23.9% (n=33) of the death certificates.

## Discussion

In the world, Brazil currently holds the 6th position in the number of confirmed COVID-19 cases and ranks as the second country with the highest cumulative death toll[12]. The country's social and regional disparities have been further exacerbated by the onset of the pandemic and the disorganized federal response to alleviate its impacts. In addition to the challenges in implementing targeted strategic interventions for health control, the prominence of informal labor has impeded compliance with measures to restricts people's movement and congregation, heightening the vulnerability and exposure of the population to the coronavirus[13]. According to Souza et al. (2020)[14] and Paiva et al. (2021)[15], socioeconomic inequality directly affects equitable access to COVID-19 testing and healthcare, which potentially contributes to underreporting and an increase in the number of cases.

The occurrence of hospitalization due to SARI in relation to COVID-19 in Ituiutaba-MG is potentially higher than what was recorded in the evaluated medical records, considering notifications of SARI with reported clinical outcomes and a final case classification of COVID-19. A national study estimated a 59% rate of actual occurrence of hospitalizations due to SARI, adjusting for delayed notifications in the first 12 epidemiological weeks of 2020[16]. In Minas Gerais, underreporting was also observed in 2020, which aligns with the increasing number of hospitalizations in the state[17].

The diagnoses of SARI resulting from SARS-CoV-2 infection in Ituiutaba-MG were primarily obtained through rapid antigen tests. In addition to the main advantages of speed and low cost prompting this method[4], this data may also unveil unfavorable factors such as the test's low complexity and sensitivity, as well as the convoluted dynamics of supply, access, and commercialization of these products that are undertaken by both the public and private sphere. In Brazil, the shortage of testing supplies, particularly serological and molecular tests, caused by the incessant global demand, exposed pertinent issues regarding effective actions in the economy, diplomatic relations, and national management for the supply of inputs, affecting their availability in the National Unified Health System and other healthcare services[13].

The epidemiological profile of COVID-19 mortality was mostly composed by men and white individuals in Ituiutaba-MG. According to data from the 2022 Continuous National Household Sample Survey, the prevailing population in Minas Gerais (n=12,698, 61%)[18] is black and brown. The same data also shows that there are more women (n=10,773, 50.1%) than men (n=10,742, 49.9%) in the state, though the percentage difference between the sexes is small. In 2020, the number of COVID-19 cases in Minas Gerais was higher in women. However, sociodemographic mortality data reveal a similar pattern to the data that was collected in Ituiutaba-MG, where the prevalence of death was higher in men (57%)[16]. Conversely, data on the profile of coronavirus hospitalizations in Minas Gerais between 2020 and 2021 shows that those who identified themself as black, brown, and yellow accounted for 50.39% of hospitalizations and 51.3% of deaths[19]. The sociodemographic profile of hospitalizations in Ituiutaba-MG differs from the state's trend, which can be explained by factors that are associated with social construction, ultimately influencing self-reported race. It is worth noting that the reported notifications originate from both the municipality's public and private healthcare services, reducing the influence of socioeconomic factors and access to these services.

The risk factors that were consistently reported for COVID-19 severity are advanced age and the presence of

comorbidities[9]. However, the variation in approaches to assess disease severity and the lack of an objective criterion to investigate pre-existing health conditions lead to ambiguous conclusions. It is established that the age group aged over 50 years represents a risk[8], especially for individuals aged over 65 years[20]. In addition to age, the presence of comorbidities is a risk factor for mortality[8]. In this study, we observed that 50% of the evaluated notifications described cardiovascular diseases (CVD), and over a quarter had diabetes *mellitus* (DM) among individuals who progressed to death. Data from 77,000 participants aged 20 or older in the Epicovid-19 Brazil study revealed that 45% of those who were investigated had at least one chronic disease alongside advanced age[21, 22]. Therefore, the unobserved difference between the presence of CVD or DM at hospital discharge or death in Ituiutaba-MG intertwines with other variables, since age is a determinant for the onset of chronic diseases.

Besides, the prevalence among non-carriers of CVD or DM did not differ between hospital discharge and death. This result is possibly linked to the inadequacies in reporting completion[23], due to the limited capacity to handle the pandemic demand and the exhaustion of healthcare professionals[24, 25]. These gaps hinder data interpretation and the characterization of the population as it omits the profile of patients without morbidity who likely would have had a better prognosis[26]. Furthermore, the vaccine coverage during this same period was still limited. Data reveals that by the 11$^{th}$ epidemiological week of 2021 only 50% of the population aged 70 to 79 had been vaccinated[7].

A series of cases from China[27] showed that 80% of COVID-19 cases were mild with mild pneumonia being an expected complication. Other 14% progressed to show respiratory complications, including respiratory distress and low oxygen saturation, while 5% developed severe conditions such as respiratory failures, septic shock and organ dysfunction and failure. The data from this study showed that the need for intensive hospital support was higher among those who progressed to death and had cardiorespiratory and renal complications and shock, including septic and cardiogenic shock.

Among the deaths that were recorded in Ituiutaba-MG during the analyzed period, the most described complications were pneumonia, respiratory failure, septic shock, and cardiopulmonary arrest. Viral infections, including COVID-19[28, 29], seem to be linked to sepsis and septic shock. In a study[30] that involved patients with community-acquired pneumonia, nearly half of them experienced sepsis, and 4.5% experienced septic shock during hospitalization. In this sense, the data reveals that patients are exposed to subsequent events after sepsis, such as organ dysfunction, septic shock, and death. Additionally, cardiac complications are associated with SARS-CoV-2 infections[31] and risk factors include advanced age (over 60 years), pre-existing cardiovascular diseases, and the severity of pneumonia[32].

In this study, the evaluation of the epidemiological profile of COVID-19 positive patients was limited to individuals who sought public healthcare services and were hospitalized, most of whom likely presented symptoms. Besides, the number of the evaluated notifications reflected a loss of cases and data when compared to the actual panorama since the completion and closure of SARI cases were inclusion criteria adopted. Caution must be exercised to interpret the data as some variables in the medical records had missing fields. Despite the data loss inherent in notification completion having imposed limitations on the study, efforts were made to mitigate bias arising from data acquisition through health information systems like SIVEP-Gripe by evaluating local notifications and monitoring the cases' overall progression.

## Conclusion

The data from this study allowed an epidemiological assessment of the demographic, clinical, and hospitalization profile of laboratory-confirmed COVID-19 cases in the early epidemiological weeks of 2021 in Ituiutaba-MG. Briefly, deaths occurred in elderly patients (over 60 years), self-identified white men who had some form of cardiovascular disease along with diabetes mellitus. These clinical characteristics resulted in a greater need of specialized support, needing ICU care as well as the use of invasive or non-invasive ventilatory support, and consequently, longer hospitalization periods.

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