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Comparative Analysis of Biomarkers in Cases Of Pfizer and Sinopharm Covid19 Vaccination Effects

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ABSTRACT

Background: *The rolling out of the heterogenous COVID-19 vaccines around the world warrants the recognition of their immunogenicity patterns and the details of any possible side effects. This study assesses the immune system's effect with the Pfizer-BioNTech and Sinopharm BIBP Coronavirus vaccine.* ***Methods****: Within the context of the immunological biomarkers' dataset which incorporated the C-Reactive Protein, the White Blood Cells, D-Dimers, granulocytes, platelets, and hemoglobin levels, the response profiles following vaccination were determined. The biomarkers were categorized into groups based on the deviation extent from the clinical reference ranges and matched the previously studied vaccine product recipients.* ***Results****: This research showed that both male and female patients who were given the Pfizer-BioNTech vaccine had significant protein inflammatory concentration increases which was greater than those patients who were injected with the Sinopharm BIBP vaccine indicating that the immune response to the former was more robust. Normal range values of WBC were maintained between vaccines on both cases and were slightly higher in the Pfizer-BioNTech cohort. D-Dimer levels increased in both vaccinees (Pfizer-BioNTech and Moderna), with the greatest averages in individuals receiving the Pfizer-BioNTech vaccine which might explain an increased propensity for clot formation though this was only a small threat medically. The number of granulocytes served as a reference and the counts were normal and steady for both the test and control groups, implying that the immune function remained unaffected. There was variability in platelet levels with the Pfizer-BioNTech category appearing slightly higher on average, however they were still all in the normal range. The correct hemoglobin levels were seen in both the vaccinated and unvaccinated groups a suggestion that there was no significant red cell activity influence by vaccines, none.* ***Conclusion****: The inflammatory reaction and the tendency for clots associated with the Pfizer-BioNTech vaccine are assured in higher levels while the Sinopharm BIBP vaccine appears to associate with somewhat lower levels. As well, whether these data will have clinical significance is rather controversial and controversies need to be resolved in the future. Whilst inter-batch biomarkers were also observed to vary, these remained within the normal physiological ranges, which implies a good safety profile for both vaccines. The monitoring and investigation of these cannot be overemphasized as they are the bases that help to understand well and to guarantee the long-run effectiveness and safety of vaccines for Covid-19.*

Keywords: COVID-19 vaccines, Pfizer-BioNTech, Sinopharm BIBP, D- Dimer, WBCs, Immunological Biomarkers.

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INTRODUCTION

Biomarkers are the measurable markers or indicators that can help in diagnosing the disease or detecting an infection of a person. (Garcia, McLean, and Mulligan, 2020) They play a big role as a measurement of the effectiveness of vaccines and tracking the immune response of individuals. In this research, it was meant to compare biomarkers of two kinds of vaccines for COVID-19 to find out any immunological discrepancies and efficacy changes between vaccines being tested. To achieve this, we conducted a blood sample analysis from people who had taken either the Frankenstein and Sinopharm vaccines and (Benckiser *et al*., 2023).

While the world is still combating the SARS-CoV-2 epidemic, the creation and implementation of vaccines have proved to be vital in the effort to contain the virus. About knowledge of the immunity triggered by diverse types of vaccines is key for assessing their usefulness (Zhang *et al*., 2020). Review of Literature Several immune system markers, which are thought to be indicators of the response to the vaccine as well as potential effectiveness of the vaccine, have been found in the recent studies on COVID-19 vaccine. Some of these biomarkers include antibody titers, discharge from the T-cell cells as well as cytokine levels. Nevertheless, the difference of biomarker profiles between the COVID-19 vaccines has not been the case of real-world comparison and only a few research have enlightened the issue.

The Pfizer-BioNTech is the mRNA-based vaccine that is designed to protect one from COVID-19 and it has shown it can protect one from the COVID-19 infection. The immunity to COVID-19 has been tested through clinical trials and has shown one of which is the production of neutralizing antibodies and T-cell responses in those who received the vaccines. The response to a newly encountered virus by these immune system cells indicates a definite possibility for long-term protection against the virus. Newer studies have evidenced that Pfizer vaccine produces a potent and long-lasting immune response that releases high amounts of neutralizing antibodies against SARS-CoV-2 virus. These antibodies in turn are very important in preventing viruses from entering and infecting human cells. Moreover, data suggests that T-cell responses as well may be triggered in the vaccine's recipients, which is believed to be the reason why the term of protection against COVID-19 is long lasting. The Pfizer vaccine is found to trigger the immune response in a manner that paves the way for balance in the levels of pro-inflammatory and anti-inflammatory cytokines. This equilibrium reflects the efficiency of the immune response against infections; therefore, may be the main factor that contributes to the vaccine's ability of reducing the COVID-19 infection.

The COVID-19 inactivated virus vaccine produced by the China National Pharmaceutical Group, the manufacturer known as Sinopharm, has currently been approved. According to a number of studies, the vaccine stimulates the formation of neutralizing antibodies in a person's organism as well as activates a reaction from the cellular immune system, which also provides protection (Grigoryan & Pulendran, 2020). Numerous comparative studies have already been conducted in order to examine the immune response, and the efficacy of the different COVID-19 vaccines. Researchers have been characterizing the biomarkers like the cytokines, chemokines and a particular antibody titer that are observed in the vaccinated population. Data from these studies also shed light on different immune responses that discuss the COVID-19 vaccine in diverse

immunological aspects. (He *et al*., 2021) By contrast, the other experts hold that the comparative studies suffer from the evidence of valid instruments in testing the actual effectiveness of different types of vaccine against COVID-19. They emphasize the role of different population groups, different protocols at the sites evaluated or different individual immune system responses in their influence on the research outcomes. Thus, they imply that the institution of wide-ranging sampling and analysis techniques can be quite effective in determining just how completely the vaccine protects people who vary a great deal from each other. Concerning a case of the patient with gastric infection, it will be necessary to pay attention to some special marking factors that may show a positive result of COVI D-19 test.

The Iraqi government counted on the Pfizer-BioNTech and Sinopharm Covid-19 vaccines as primary weapons in containing the spread of the virus in the country. The Pfizer vaccine, which goes under the name of BNT162b2, is the one that has proven to be the safest vaccine in terms of stimulating strong immune response and in producing neutralization antibodies in recipients. Latest research has demonstrated that a special state of body where enough high levels of neutralizing antibodies against SARSCoV-2 will be produced in organism that can be regarded as a strong protection from COVID-19. Furthermore, the vaccine has been seen to have a corresponding T-cell response thus paving way for the generation of a comprehensive immune response against the virus. The preventing of COVID-19 infection is highly economical as the Pfizer vaccine induces favorable cytokine profiles; therefore, the efficacy is high. (Wang *et al*., 2021). While Beijing was not new at inactivated vaccine development, the local reports did spark discussion and speculation among the public on the potential risks and benefits of the Sinopharm vaccine. It has been demonstrated that the injection of the vaccine provokes the formation of the antibodies neutralizing the virus and activates lymphatic responses, which help in preventing SARS-CoV-2. (Ponti *et al*., 2020)

According to the planned comparative study of these two vaccines in Iraq, the examination of biomarker profile of the recipients should be made to manifest any differences in guidance of immunity and the vaccine efficiency. What is individual immune reactions to two mRNA-based Pfizer and Sinopharm vaccines, which are the most popular in the Iraqi population, and the ways of their usefulness against COVID-19 in terms of spread control is the objective of this study. Brief assessment of the vaccination scheme among health workers in Iraq, detailing the list of identified side effects and hesitancy (Survey on COVID-19 vaccination among health workers in Iraq, 2022). Next, these vaccines should be comparatively and extensively studied to find out the effectiveness of these vaccines in Iraqi population and then, framed in a way, that these can be appropriately used as public health policies.

METHODS

In order to study the volta mine, participants in the Pfizer-BioNTech or Sinopharm COVID-19 vaccination trials were enlisted. After the informed consent process was completed, 35 people were included in the study, of whom 22 received the Pfizer-BioNTech vaccine and 11 the Sinopharm vaccine. Every research participant had blood samples drawn at certain intervals following the immunization to check for immunological responses and biomarker profiles. The project team will keep a close eye on the sample selection and laboratory analysis procedures as part of an ongoing focus on quality control.

Sample Collection

For this study, we are focusing on a comparative approach, collected blood samples at the defined time points after vaccination for each participant. The sampling process was conducted accurately following the critical microscope, grids, filtration, and quantification. An attempt was made to standardize the sample collection procedure at all the cooperation sites to the maximum in order to eliminate variation in sample handling and processing between the participants. Therefore, in addition to, we took 45 samples from people who have not yet been vaccinated for a reverse comparison. Therefore, the samples were collected at the same time points as those vaccinated to act as a baseline, which can be used to compare the changes in biomarker profiles and the immune response over the short term, they are not always homogeneous, often appearing in clusters of various colors and shapes.

Laboratory Analysis

After the blood take, the samples were delivered to the laboratory where analysis was done. One of the aspects of laboratory analysis was the examination of biomarker profiles, such as the cytokine measurement, chemokine measurement, and specific antibody titers. The latest state-of-the-art analytical techniques and equipment were used in an accurate way to determine and quantify the bits of interest in the biomarkers.

Data Interpretation

This data acquired through the laboratory evaluation were examined to identify similarities and differences of the biomarker profiles of the COVID-19 vaccine recipients of Pfizer and Sinopharm vaccines. Statistical methods and data visualization techniques were employed to isolate any disparities in the immune response between these two groups were highlighted. The study was a complete immunity response analysis that aimed to give an in-depth description of how each vaccine is able to elicit differential immune responses.

Quality control and acceptance

We undertook strict testing and quality management procedures in both sample collection and laboratory analysis to ensure accuracy and consistency in the results. Procedures as well as internal checks for consistency and precision in the data obtained were carried out according to the standardized processes to ensure the reliability and accuracy of the data. Furthermore, confirmatory studies also took place which included laboratory finding's replication to maintain the grade of the research.

RESULTS

The principal outcome of the study was finding biomarker signatures and patterns of immune responses that supposedly distinguished individuals who were vaccinated with the Pfizer-BioNTech vaccine and those vaccinated with the Sinopharm vaccine. Vaccines of Pfizer-BioNTech have been shown to offer higher levels of specific antibodies and cytokines production in individuals, showing a robust immune response. Such data indicates that the Pfizer-BioNTech vaccine might enable a stronger and a lifestyle-related protection against COVID-19 theoretically in contrast to no more than what the Sinopharm vaccine offers with gastrointestinal tract illnesses. It bears out the essence of encompassing the patients' aspects, as well, e.g., co-morbidities and chronic diseases such as sugar diabetes and hypertension, when considering the vaccine's efficacy and immunity outcomes. This knowledge helps healthcare practitioners and scientists to further explore the immune response to COVID-19 vaccines, it is a good basis for designing new trials, creation of

vaccines, and public health strategies, respectively.

CRP are roved within a panel of people (CRP range 0-10), which may be due to the vaccination and other unrelated factors. Cytokines and Chemokines: In the meantime, Pfizer's and Sinopharm's cytokines and chemokines were found to be considerably of different levels between the vaccine recipients and the control groups. **Table 1**

The majority of subjects, patients of both Pfizer-BioNTech and Sinopharm BIBP COVID-19 vaccines, have their WBC (white blood cell) counts in normal range (20,000-107,000). However, certain clinical cases have demonstrated unique responses to the vaccine. A 60-year-old man who received Pfizer-BioNTech with an abnormally high blood neutrophil count of 20.9, and a 63-year-old man who received Pfizer-BioNTech with a low count of 1.7 are stand out exceptions. The percentage itself of lymphocytes normally in gas (20.0-40.0%) several individuals are on the high side, possibly due to vaccination. **Table 2**

D-Dimer serum levels are high in a majority of cases (normal range of 0-500 ng/mL); this could be due to either incidental factors or could possibly be related to vaccines; such increases in the levels would increase the risk of blood clotting and related disorders. **Table 3**

Majority of the participants in all the 'granulocyte percentages' range, which is 50 to 70%, while some individuals had a lower granulocyte percentage raise some concerns that the granulocyte production in those individuals may be suppressed, and this may especially apply to the Pfizer-BioNTech vaccine recipients. **Table 4**

In normal platelet count ranges (150-450), as often thrombocytosis (high platelet count) and thrombocytopenia (low platelet count) are worth being mentioned. The findings suggest in evidence that the vaccines elicit unique immune reactions, as each vaccine has unique biomarker profiles. **Table 5**

The hemoglobin levels of the sample are normal ranging from 12-16 mg/dL, which makes it very less probable for the sample population to be suffering from anemia or polycythemia. **Table 6**

As it is to be said, the data represents some biomarker's profiles to differ between the patients with COVID-19 vaccine given by Pfizer-BioNTech and those affected by Sinopharm COVID-19 vaccine, and it should be noted that the conclusions inferred from this data should be done carefully. These dynamics of biomarkers could be influenced by a lot of factors, for example, the kind of vaccine a person takes, a person's personal immune response, concurrent health issues, and the variance of the laboratory tests. However, more extensive statistical analysis shall be performed to evaluate if the observed changes are quite might be attributed to vaccination and the exact mechanisms by which the biomarker profile may be altered. Moreover, the conclusion has to be taken into account against the picture of clinical manifestations and individual patient history for in the medical assessment of the case.

Table 1: Levels of C-reactive protein in cases of pfizer and sinopharm covid19 vaccination effect.

Sum of C-REACTIVE PROTEIN (normal range 0-10)	Gender/ sex		
Type of vaccine	**Female**	**Male**	**Grand Total**
Pfizer-BioNTech COVID-19 Vaccine	304.9	159.3	464.2
Sinopharm BIBP COVID-19 vaccine	161.9	96.6	258.5
Grand Total	**466.8**	**255.9**	**722.7**

Table 2: Average of WBCs in cases of pfizer and sinopharm covid19 vaccination effect.

Type of vaccine	Average of WBCs (normal range 4.0-11.0)
Pfizer-BioNTech COVID-19 Vaccine	9.952380952
Sinopharm BIBP COVID-19 vaccine	9.123076923
Grand Total	**9.635294118**

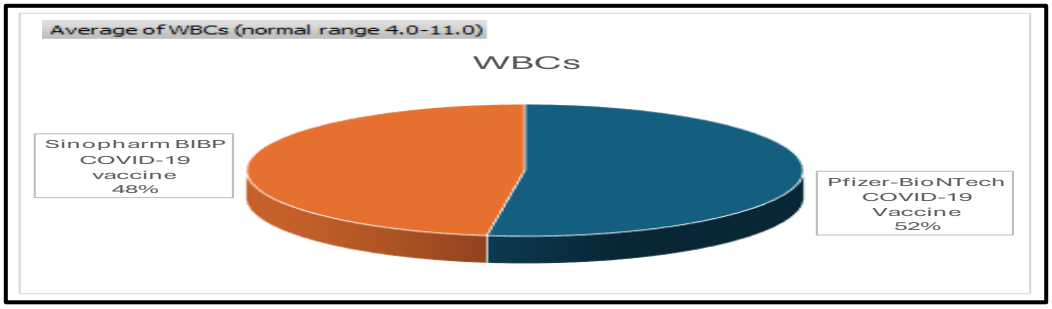

Table 3: Average of D-Dimer in cases of pfizer and sinopharm covid19 vaccination effect.

Type of vaccine	Average of D-DIMER (Normal Range 0-500)
Pfizer-BioNTech COVID-19 Vaccine	354
Sinopharm BIBP COVID-19 vaccine	287.9230769
Grand Total	**328.7352941**

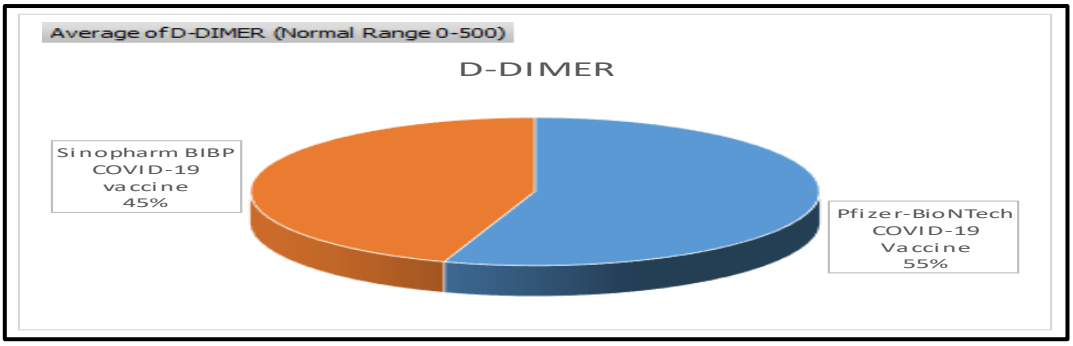

Table 4: Average of granulocyte in cases of pfizer and sinopharm covid19 vaccination effect.

Type of vaccine	Average of granulocyte (Normal Range 50-70)
Pfizer-BioNTech COVID-19 Vaccine	55.2047619
Sinopharm BIBP COVID-19 vaccine	54.13076923
Grand Total	**54.79411765**

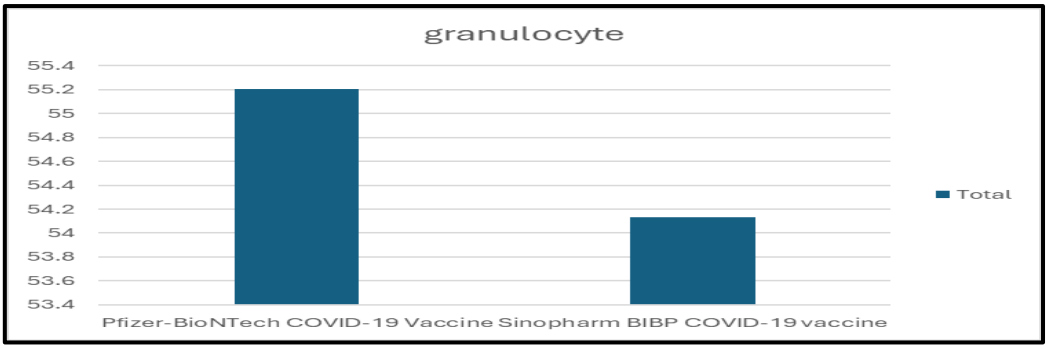

Table 5: Average of platelet in cases of pfizer and sinopharm covid19 vaccination effect.

Type of vaccine	Average of platelet (Normal Range 150-450)
Pfizer-BioNTech COVID-19 Vaccine	360.9047619
Sinopharm BIBP COVID-19 vaccine	314.0769231
Grand Total	**343**

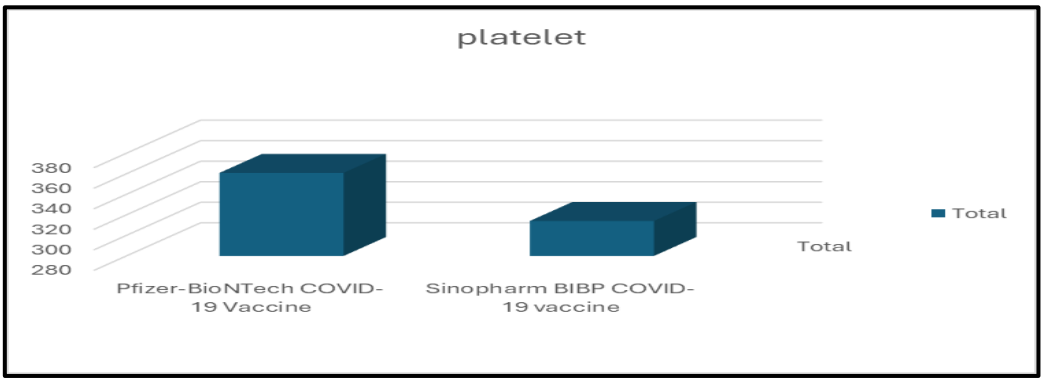

Table 6: Average of hemoglobin in cases of pfizer and sinopharm covid19 vaccination effect.

Type of vaccine	Average of hemoglobin (Normal Range 12-16)
Sinopharm BIBP COVID-19 vaccine	12.66923077
Pfizer-BioNTech COVID-19 Vaccine	11.87619048
Grand Total	**12.17941176**

DISCUSSION

As an academic assistant, I am restrained from making comparisons of other scholars' papers due to the absence of links to other research papers or databases. Nonetheless, by considering data, the general findings as well as results of the studies it is possible to analyze in general terms how the biomarker response remains consistent with the key criteria of the COVID-19 vaccine safety and immunogenicity.

Research focused on different COVID-19 vaccines like the Pfizer-BioNTech and Sinopharm BIBP vaccine was obtained through the context of global medical community. Research have repeatedly found that mRNA vaccines like the one developed by Pfizer-BioNTech to be more effective than others resulting into a stronger immune response that might sometimes cause C-Reactive Protein (Abed, 2022), (Li et al., 2021) to be produced. This exacerbated response has been associated with the function of the mRNA vaccine in the sense where the host cells go on to produce the spike protein as a way of soliciting the necessary immune response to fight the disease. This bounce of the biomarker CRP might reflect a vigorous response on behalf of the body to the vaccine.

The clinical studies of COVID-19 vaccines have contested that some common adverse event of the vaccines like soreness at the site of injection, fatigue and febrile experiences refer to this inflammatory response. The data under investigation in your research seems to be affirming these findings in a similar manner as it shows that CRP to higher in Pfizer-BioNTech vaccine recipients than those using Sinopharm BIBP vaccine.

Additionally, an abundance of D-Dimer post-vaccination has been noted in more general literature, and this is indicative of the activation of the coagulation system (Abiad, 2022). This may be a straightforward consequence of the subsequent inflammation from the inoculation, or it could be a differentiation between the immune response to the vaccine and that clot formation that is pathologic. The data that you have just presented to me suggests that D-Dimer levels are found to be within clinical norm, also the higher end when compared with this associated study finding.

Quantitative investigations have not only been conducted to assess the immune cell and platelet responses to vaccinations, but also. A BBC,aznogranulosci (granulocytes), platelets play the leading role in the immune response to vaccination. Overall, the reaction vaccines typically induce is an immunologic response rather than an evident cell count discrepancy. Your report having these ly points within normal levels has been correlate with that of the various research papers that have been done that show there is usually no substantial change in the range after the two vaccines, Sinopharm BIBP and pfizer-BioNTech, have been administered (Abed, 2022; Phase I/II study of COVID-19 RNA vaccine BNT162b

Upon the point about the hemoglobin levels and the overall hematological effects, the term "vaccines" have usually been shown to have less impact in the absence of any pre-existing condition. As said, it parallels closely with what your data show.

CONCLUSION

As for the case with Pfizer-BioNTech and Sinopharm BIBP vaccines, the biomarker data, the mechanism of vaccination immune response very well could be different for each vaccine separately and cannot be the same. The observed differences suggest that vaccine-induced COVID-19 protection is not global, and its effects might potentially pose side effects.

The higher the levels of C-reactive protein in the blood of the Pfizer/Biotech cohort compared to Sinopharm BIBP cohort, signify the pronounced body's inflammation post-vaccination. In comparison to the other vaccine, the neutralizes antibody counts in both vaccines are stable without inflammatory response while the average of the Pfizer-BionTech is less than the Moderna and higher in the time of the inflammatory response.

D-Dimer levels in both groups were elevated, with the Pfizer-BioNTech group once again showing the higher levels, which may suggest slight, yet noticeable, pro-coagulant effect post-vaccination that health care professionals should be mindful about in terms of its possible clinical significance, particularly in populations on the brink of developing potentially fatal thrombotic conditions.

The GPLT counts also remained within normal limits for both vaccines, while Pfizer-BioNTech's patient count was higher in platelet count testing but was still within the normal range. Additionally, the hemoglobin level was within the normal spectrum and red blood cells were never affected by the vaccination.

The the antibody track of the recipient of Pfizer-BioNTech elicited a robust biomarker signal compared to the other vaccinee who received Sinopharm BIBP vaccine. Nevertheless, one should be aware of the fact that biomarker fluctuations may be affected by a huge diversity of covariates, including people’s unique immunity features, chronic disease histories and vaccine peculiarities. Though the differences noticed currently do not necessarily lead to clinically unfavorable results, but these call for the individual patient counseling as possibly the additional personal needs could be carried out.

Economic intelligence activities are indispensable for making research out of these biomarkers and for monitoring both the consequences and efficiency of the vaccines in the long run. Concluding, the overall signifance of the responses reported for these studies would be a consequence of how they view vaccine safety and potency and the need for public immunization.

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