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Are Saliva Testings as Effective as PCR Testings?

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ABSTRACT

Saliva testing is a diagnostic technique that involves laboratory analysis of saliva to identify markers of endocrine, immunologic, inflammatory, and infectious diseases such as those widely associated with COVID-19. Currently, Saliva testing is not as widely used as the PCR laboratory tests from the variable COVID-19 testing sites around the globe. The purpose of this research study is to determine the effectiveness of Saliva Testing (ST) and its equal and better collecting method for SARS-CoV-2 from specimens, compared to traditional PCR Testing. To prove this, the example from seventy hospitalized patients in the United States was used. These individuals' samples were collected by Nasopharyngeal Swabbing (PCR). They were then reexamined by dividing them into 2 groups. While one group was sampled from a repeating NPS method, the other group was sampled from specimen saliva testing. Patients who had a self-collected saliva test received an average of 80% positive results, while those who repeated an NPS test received an average of 70% positive results. Similarly, 495 asymptomatic healthcare workers with possible COVID-19 exposures were tested by both nasopharyngeal (NP) swabbing and saliva testing. While 9 healthcare workers were confirmed positive from the NP swabbing, 13 participants' saliva specimens tested positive for SARS-CoV-2. Later, all 13 asymptomatic patients (including 9 participants) were COVID-19 confirmed by additional NP swabs. Studies show that saliva testing is likely to show more accurate results than NP swabbing. It was found that saliva testing was as accurate as PCR testing. It is also a viable testing method for COVID-19 diagnosis.

Keywords: Saliva testing, Nasopharyngeal Swabbing (NPS), COVID-19, UVT.

Subject: Microbiology

INTRODUCTION

Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus. They are a group of related RNA viruses that cause respiratory tract infections. Most people infected with COVID-19 have mild to moderate symptoms, but the disease can cause serious medical complications and death in some people. One can contract COVID-19 by inhaling these droplets or by touching surfaces covered with the droplets. Thus, it is the reason why COVID-19 spreads so quickly among humans. Rapid and accurate diagnostic testing is essential to control the ongoing COVID-19 pandemic. Therefore, it is important to quickly figure out who was infected to prevent further spread. A positive test early in the course of the disease allows individuals to isolate themselves, reducing the likelihood of infecting others and enabling early treatment, reducing the severity of the disease and the risk of long-term disability or death. Two covid testing methods that will be compared for this study are NPS Swabbing and Saliva Testing. Studies have proved that ST is as effective as NPS swabbing. Therefore, the purpose of this research paper is to show that there is another accurate testing method as PCR testing does for the current COVID-19 infection evaluation.

MATERIALS & METHODS

Studies have suggested that saliva testing has acceptable performance characteristics. This research is based on two studies obtained by researchers from Yale University using a proprietary protocol to process saliva specimens from two high-prevalence populations. All study participants were enrolled and sampled according to Yale University. Demographics, clinical data, and samples were collected after study participants admitted that they had it. All participants understood the study protocol and signed informed consent. All participant information and samples were collected for an individually non-identifiable study identifier. The first study was obtained on 70 hospital patients and the second study was obtained by 495 asymptomatic healthcare workers. The similarity between these two studies was that they were all exposed to COVID-19. People who participated in the first study were 70 patients, who were admitted to Yale-New Haven Hospital and tested positive for SARS-CoV-2 on nasopharyngeal and/or oropharyngeal swabs. They were re-examined by dividing them into 2 groups. While one group was sampled from a repeating NPS method, the other group was sampled from specimen saliva testing. Nasopharyngeal and salivary sample collections were attempted every 3 days throughout the clinical course. Nasopharyngeal samples were taken by registered nurses using the BD universal viral transport (UVT) system. The swab went through the patient's nose until it reached the

nostril and was left in place for several seconds to absorb secretions then slowly removed while rotating. The swabs were then placed in a sterile viral transport medium. Saliva samples were self-collected by the patient according to the method described. The precaution is that patients should refrain from food, water, and brushing their teeth until a sample is collected when waking up. Also, the patient was asked to close tightly after repeatedly spitting into the sterile urine cup until the liquid (excluding foam) was approximately one-third. They collected saliva volumes ranging from 0.5 - 20 mL. According to Yale-New Haven Hospital, "All samples were stored at room temperature and transported to the research lab at the Yale School of Public Health within 5 hours of sample collection and tested within 12 hours of sample collection". The result for this first method was that the patients who had a self-collected saliva test got 80% positive, and the patients who repeated NPS got 70% positive. The second method was looking at 495 asymptomatic healthcare workers. They were asymptomatic medical workers (no fever or respiratory symptoms) who worked in the COVID-19 ward and infirmary or were professionally exposed to COVID-19 patients, and they were all under the age of 18. Healthcare workers did both self-administered nasopharyngeal swabs and saliva tests. They did the test for up to 84 days or every 3 days until they got positive for SARS-CoV-2. Samples were stored at 4°C until transported to the laboratory. From the self-collected saliva test, 13 of them got positive. However, of the 9 participants who also collected their own NP swabs, only 2 had positive swab tests. All 13 asymptomatic patients who tested positive for saliva tests subsequently confirmed COVID-19 with additional NP swabs.

Tables and figures (method figure)

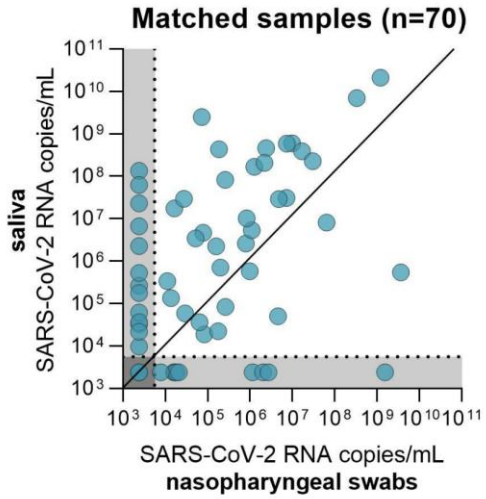

Figure 1: SARS-CoV-2 RNA titers are higher in saliva than NP swabs from inpatients.

SARS-CoV-2 RNA titers of the first available patient-matched NP and saliva samples (n = 70), with higher virus RNA concentrations, are likely to be generally detected in matched saliva samples as compared to nasopharyngeal swabs

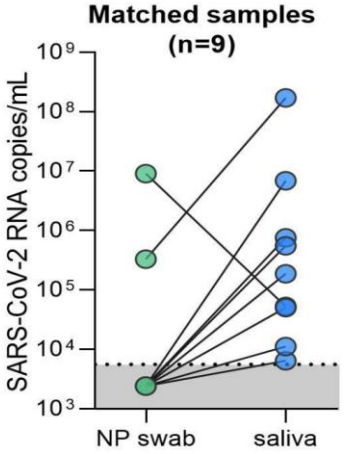

Figure 2: SARS-CoV-2 RNA copies were measured in nasopharyngeal and saliva samples collected from asymptomatic healthcare workers, and graphically at least one of the samples tested positive for the virus.

The assay detection limit for SARS-CoV-2 using the US CDC "N1" assay is a cycle threshold of 38, which corresponds to 5,610 samples/mL (shown by dashed lines and grey areas).

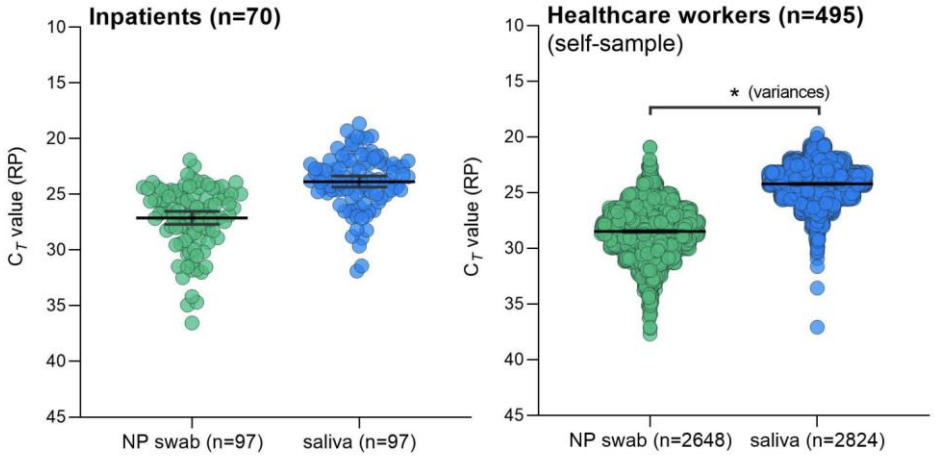

Figure 3: As a measure of sample quality, RT-qPCR detection of human RNAse P shows greater variability in the quality of self-collected nasopharyngeal swabs compared to saliva samples

RESULT

Analysis showed that these results suggest that salivary testing is not significantly less sensitive than NP swab assays, at least in the high prevalence population, and may yield somewhat less variable results. The method of analysis was evaluated with accuracy based on recent experiments from credible sources. This study proves that the saliva test is much as accurate as the PCR Laboratory test does, and found that in some ways the saliva test could be more accurate than the traditional method. The results also showed that the liquid samples from saliva are as accurate as nasopharyngeal samples from the nostrils. As mentioned in the graph, the accuracy of saliva testing was shown better than the NP swab testing from both 70 patients and 495 healthcare workers. However, since this was experimentally tested for a small population, the possibility of errors due to changes in the medical culture and technology was not fully excluded. To give a more accurate identification of this testing method, there should be more examples of comparison between NP and Saliva testing for a much broader population with diverse groups. Although these limitations have arguably not impacted the primary outcome of the study, further work could be done to seek to make possible changes and additional evidence about the efficiency of saliva testing. Then, the government and the testing sites could use saliva testing as an official method and they could broaden the testing methods and increase the efficiency of collecting the specimens and identify whether the person was infected or not. There are ways to test COVID-19. Not just swabbing, NP swabbing and saliva testing are all adequate for COVID-19 testing.

DISCUSSION

The study's findings suggest that saliva testing for SARS-CoV-2 is comparably effective to nasopharyngeal swabbing (NPS). This is significant, considering the ease and non-invasiveness of saliva collection. Saliva tests displayed higher detection rates in asymptomatic healthcare workers, indicating potential for early identification of COVID-19, which is crucial for controlling the spread of the virus. Moreover, self-administered saliva tests can reduce the need for healthcare personnel and personal protective equipment, alleviating strain on resources during pandemic peaks. However, variations in testing methods and populations necessitate further research to establish universal protocols. Additionally, the study highlights the need for broader and more diverse population samples to validate these findings across different demographics.

CONCLUSION

In conclusion, the research indicates that saliva testing is a viable and potentially more effective alternative to traditional PCR testing for COVID-19, especially in asymptomatic cases. The ease of self-administration and reduced resource requirements make it a promising tool in managing the pandemic. However, the study's limitations, including the small sample size and lack of diversity, underscore the need for further research. Future studies should focus on larger, more diverse populations and consider environmental factors that may affect saliva sample viability, to fully ascertain the efficacy of saliva testing in varied contexts.

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