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Review Article

Diagnostic utility of saliva and its implication in detection of Covid-19 and other diseases

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ABSTRACT

Saliva is a valuable tool for early detection, better treatment, and a better prognosis. Early detection of illnesses is sometimes challenging, and it necessitates additional clinical and laboratory tests, which can delay treatment and have a significant impact on prognosis. A large range of chemicals may be found in saliva, providing useful information for clinical diagnostic purposes.
The coronavirus disease pandemic (Covid-19) is the world's largest challenge and global health disaster since World War II. Controlling the epidemic in the community and in hospitals requires a quick and precise diagnosis of Covid-19. For Covid-19 diagnostic testing, nasopharyngeal and oropharyngeal swabs are the suggested specimen types.
The collection of these specimens necessitates intimate contact between healthcare staff and patients, which increases the risk of viral transmission. As a result, nasopharyngeal or oropharyngeal swabs are not recommended for sequential viral load monitoring. Saliva specimens are simply collected by having the patient spit into a sterile container. Saliva collection is non-invasive and significantly reduces healthcare personnel' exposure to Covid-19. To develop quick chair side assays for the detection of Covid-19, more study is needed to investigate the potential diagnostic of Covid-19 in saliva.

1. Introduction

Body fluids give a broad view on the health of many organs and biological processes. The human body is made up of a range of fluids, including urine, blood, and saliva, all of which include an elevated number of proteins that have been linked to a number of systemic and oral illnesses. These fluids have found extensive clinical applications in the diagnosis and monitoring of human health. Saliva is a valuable tool for early detection, better treatment, and a better prognosis. Early detection of illnesses is sometimes challenging, and it necessitates additional clinical and laboratory tests, which can delay treatment and have a significant impact on prognosis.[1]

Saliva is a liquid released by salivary glands that aids in swallowing, inhibits the growth of harmful germs, and keeps the oral mucosa healthy by keeping it from drying out and lubricating hard food boluses. Parasympathetic and sympathetic stimulation govern salivary secretions, resulting in thick and thin saliva, respectively. These salivary contents are systemic illness indicators, and some of them have been considered as local disease markers.[2]

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1.1. Properties of saliva

1. The glycoproteins and ions in saliva modify the characteristics of saliva, allowing it to execute its diverse and numerous activities.
2. Mucins, a high-molecular-weight glycoprotein, play a key role in the viscoelastic behaviour of saliva.
3. Another key feature of saliva is bolus formation; saliva absorption into food is necessary for food particles to stay together. The lubrication qualities of saliva are important for food processing roles.
4. Statherin a, a subset of salivary proteins, also acts as a tooth lubricant, which is critical for keeping teeth from wearing and chipping while chewing.
5. Saliva is calcium supersaturated in comparison to hydroxyapatite, which protects teeth from dissolving when exposed to meals, oral fluids, and certain dietary acids.[3]

A large range of chemicals may be found in saliva, providing useful information for clinical diagnostic purposes. (Figure 1) The majority of serum components are found in whole saliva, which may be easily collected. As a result, saliva is commonly utilised to diagnose systemic illnesses.[4]

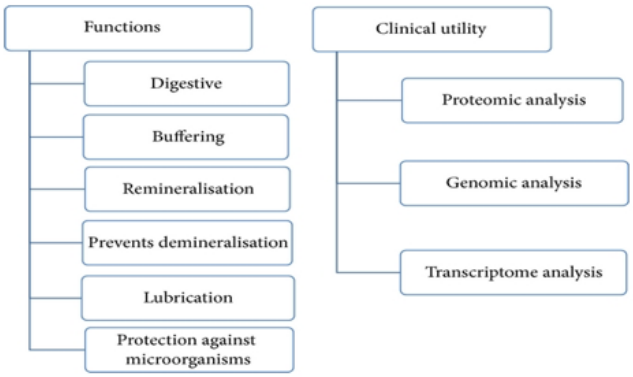

Fig. 1:

1.2. Advantages of saliva as a diagnostic fluid

1. General health monitoring and non-invasive illness diagnosis
2. The patient has no discomfort, is painless, and has no worry throughout the collection process.
3. It may be used in distant places and is straightforward to gather with the help of a modestly trained helper.
4. It is a reasonably inexpensive technique when compared to other testing
5. Saliva is a cost-effective method of screening a big population
6. Saliva can be utilised to research specific populations, such as handicapped, old, and worried, when blood sampling is a difficulty.
7. Saliva is a good choice for multi sampling.
8. Saliva testing are safer for health care providers than blood tests
9. Saliva is also less expensive to keep and send than blood
10. Furthermore, saliva is easier to handle than blood and does not clot

1.3. Limitations

1. The presence of some markers in saliva is not necessarily a reliable indicator of their presence in serum.
2. The degree of salivary flow stimulation and the technique of collection might affect salivary composition.
3. Variations in salivary flow rate and availability, as well as changes in salivary pH, impact the concentration of salivary indicators. Salivary gland function is affected by certain numerous medications, systemic disorders and radiation.
4. Proteolytic enzymes found in whole saliva can influence the stability of some diagnostic indicators.[3]

1.4. Saliva in COVID-19

The Coronavirus Study Group of the International Committee on Taxonomy of Viruses has classified a coronavirus as 2019 novel Coronavirus (2019-nCoV) and severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has been expanding globally, creating the coronavirus illness 2019. (Covid-19). Although the infection's method is uncertain, it is reproduced in cells in the lower airways. The most crucial clinical symptom is the occurrence of a respiratory distress syndrome, which can vary from moderate malaise to death, with the prognosis being poorer in older patients with comorbidities. The loss of taste and smell were also noted as symptoms. On April 18th, there were 2,261,034 cases recorded worldwide, with 154,726 fatalities. Researchers at RUCDR Infinite Biologics at Rutgers University have discovered that saliva is a feasible bio sample source for COVID-19 detection when compared to nasopharyngeal or oropharyngeal swabs. According to them, saliva is a good source for extracting viral RNA for COVID-19 detection. Saliva samples contain secretions flowing down from the nasopharynx by the action of cilia lining the airway, as well as saliva generated by major and small salivary glands.

In a situation when a large number of people need to be screened, saliva would be a viable non-invasive specimen type. The use of saliva specimens reduces waiting time, eliminates the need for healthcare personnel to collect saliva specimens, and, most significantly, findings are accessible much sooner, which is critical in busy clinical environments.

Covid-19 can be passed from patient to patient without coughing or other respiratory symptoms, either directly or indirectly, through saliva. In the identification of respiratory viruses, saliva specimens have a high specificity and sensitivity. More research is needed to assess the potential diagnostic of Covid-19 in saliva and its influence on viral transmission, which is critical for developing quick diagnostic tests and effective preventive methods.[5]

Saliva also serves as an excellent alternative sample for broad population-level screens in the detection of respiratory virus infections due to its non-invasive nature and cost savings.

Saliva collection reduces the danger of hospital transmission to health care personnel and other patients because it does not require the participation of health professionals. Dental practitioners are at a high risk of transmitting airborne infectious diseases due to repeated exposures to aerosols and potentially infectious droplets in their working environments, but because salivary samples eliminate the waiting time, chair side COVID-19 saliva screening will be seen as a brilliant way to protect them. All of this can be suggested for dental health care workers and dental practitioners, including the use of personal protective equipment and infection control standards. In the dental clinic, further interventions include the efficient use of rubber dam isolation high-volume suction equipment, and adjunct chemotherapeutic medicines. Preoperatively, a mouth rinse with 0.2 percent povidone-iodine or 0.5 percent-1 percent hydrogen peroxide may be administered to reduce the virus load in the oral cavity. More research is needed to confirm the accuracy of COVID-19 diagnosis using saliva as a test specimen.[5]

1.5. Saliva in various diseases

1.5.1. Autoimmune diseases sjogren's syndrome

Sjogren's syndrome (SS) is an autoimmune exocrinopathy that affects the adrenal glands. Sjogren's syndrome has an unknown cause. Antinuclear antibody, rheumatoid factor, anti-SS-B antibody, and anti-SS-A levels are all increased in polyclonal hypergammaglobulinemia, according to serum chemistry. Furthermore, higher salt and chloride concentrations, IgG, IgA, albumin and lactoferrin concentrations, and a reduction in phosphate concentrations were seen in the saliva of SS patients. The decreased salivary flow is the most essential characteristic of salivary diagnostic for this illness.[6]

1.5.2. Oral cancer

The start and progression of malignancy can be linked to somatic mutations of tumor-specific DNA in saliva, plasma, or other bodily fluids. Tumor specific DNA was found in 100 percent of individuals with oral tumours in their saliva. Tumor-specific DNA, on the other hand, was found in 80 percent of plasma samples from patients with oral tumours, and in 86 percent–100 percent of patients with tumours in other locations. Tumor-specific DNA found in saliva has the potential to be used to diagnose oral malignancies. Tumor-related viruses' DNA, such as HIV and the human herpes virus (HHV), can be found in saliva and linked to oral cancers.[7]

1.5.3. Cardiovascular diseases

Salivary C-reactive protein (CRP) levels were observed to correlate with plasma CRP levels collected from blood samples of a group at risk for cardiovascular problems. Heart troponin (cTn) is a biomarker for cardiac cell necrosis that is detectable in saliva. The levels of cardiac troponin (cTn) in the saliva are used to diagnose AMI patients (Acute Myocardial Infraction).[8]

1.5.4. Infectious diseases

By using a polymerase chain reaction (PCR) assay, saliva samples were analysed for the presence of Helicobacter pylori infection, which is linked to chronic gastritis and peptic ulcer illness. The sensitivity reported was about 84 percent. The findings also revealed that H. pylori is more prevalent in saliva than in faeces, suggesting that the oral route may be a significant mode of infection transmission in industrialised nations.

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2. Conclusion

Saliva is an important biological fluid that has the potential to revolutionise early diagnosis. Saliva has several advantages over other bodily fluids as a diagnostic tool for oral and systemic illnesses, and it can provide an accurate diagnosis based on particular biomarkers. Patients with COVID-19, both symptomatic and asymptomatic, can be identified using saliva, which has the benefit of being less intrusive, less expensive, and more rapidly collected. Because saliva may be collected by a person or by the children's parents, the danger of infection for healthcare professionals is reduced. Saliva from children with COVID-19 can be used as an alternative biological fluid for screening and diagnosis, and saliva plays an essential role in studying how the infection behaves in children.

3. Source of Funding

None.

4. Conflict of Interest

None.

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