"Literature Review"

Detection of HIV Using Saliva

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Abstract

Saliva is a biofluid that is secreted by both the major and minor salivary glands in the oral cavity. It is a crucial component in the digestive process and plays a vital role in maintaining oral health. This fluid is commonly referred to as mirror biofluid, as it indicates the current pathophysiological state of the human body. Over the past decade, saliva has been widely utilized as a diagnostic tool for detecting both oral and systemic diseases. Its non-invasive nature and ease of collection make it an attractive option for healthcare professionals. Saliva is an easily collectible, non-invasive, and safe material that can be utilized as a valuable medium for detecting infectious diseases.

The objective of this literature review is to assess the efficacy of oral fluid testing as a diagnostic tool for the detection of HIV. A comprehensive literature review was conducted utilizing PubMed databases, focusing on English language articles and relevant keywords. Saliva-based biomarkers have proven to be an effective means of diagnosing and tracking the progression of HIV, as well as monitoring the efficacy of treatments. This is a significant advancement in the field of HIV research and has the potential to significantly improve patient outcomes.

Keywords: saliva, saliva-based biomarker, HIV

INTRODUCTION

Saliva is a unique biofluid present in the oral cavity that plays a vital role in protecting, lubricating, and hydrating the cavity. Both major and minor salivary glands secrete this fluid. The major salivary glands are responsible for most saliva production, contributing up to 90% of the total secretion, while the minor salivary glands account for the remaining 10%. It is secreted by several major salivary glands, including the parotid, submandibular, and sublingual glands, as well as numerous minor salivary glands found throughout the oral cavity. These minor glands are in the lips, cheeks, palate, and tongue, producing smaller amounts of saliva than the major glands. The combined secretions of all these glands result in the production of saliva, which aids digestion, lubricates the mouth, and helps prevent tooth decay.

Saliva primarily comprises water, accounting for approximately 99% of its composition. The remaining 1% is comprised of both organic and inorganic compounds. The organic compounds consist of proteins such as amylase, uric acid, albumin, lysozyme, and IgA, while the inorganic compounds include calcium, fluoride, sodium, atrium, and magnesium. Saliva is recognized as a "mirror biofluid" of the body due to its ability to reflect the overall condition of the body. The composition of saliva is indicative of various physiological and pathological changes that occur within the body, making it a valuable diagnostic tool in clinical settings.

Saliva is a practical diagnostic tool that offers a range of benefits, including easy collection, non-invasiveness, affordability, and safe handling. It has been increasingly used in determining health and disease conditions, thus making it an indispensable tool in the medical field. According to recent reports, a saliva-based test has demonstrated potential in detecting markers for various diseases. This includes microbial, viral, fungal, immunological, systemic, and molecular markers.

Acquired immunodeficiency syndrome, more commonly known as AIDS, is a severe disease that results from the human immunodeficiency virus (HIV)
infection. This pandemic has affected millions of people worldwide for the past thirty years. In 1997, the World Health Organization (WHO) and the National AIDS Control Organization (NACO) referred to diverse modes of HIV transmission. HIV can be transmitted through several means, including sexual intercourse (both anal, vaginal, and oral) with an infected partner, regardless of their gender. Additionally, transmission can occur through exposure to infected blood, blood products, organs, tissues, or contaminated syringes and needles. Artificial insemination is also a mode of transmission. Furthermore, an infected mother can pass the virus to her child during pregnancy, delivery, or breastfeeding, which is recognized as perinatal or vertical transmission. It’s essential to be aware of the different methods of transmission to prevent the spread of HIV. All over the world, HIV is mainly transmitted through sexual activity. HIV is found in blood and other body fluids, including semen, vaginal fluid, and saliva. Dental health specialists are increasingly interested in the possibility of HIV transmission through oral fluids, especially considering the increasing number of patients suffering from this disease. Since 1986, researchers have investigated the assessment and diagnostic utility of saliva for detecting HIV antibodies because saliva is a body fluid that contains antibodies that are important for diagnosis. Saliva collection is non-invasive, affordable, quick, easy, and painless compared to venipuncture. The objective of this literature review is to assess the efficacy of oral fluid testing as a diagnostic tool for the detection of HIV.

MATERIAL AND METHODS

2.1 Searches
The Pubmed database was used for the advanced search.

2.2 Selections of the papers
The articles selected from the present study on human subjects were published in the English language. Literature reviews, letters, and animal studies were excluded from the selected criteria.

2.3 Research classifications
The articles included in this study were retrospective, cohort, case-control, and cross-sectional studies published between 2009 and 2019 on the potential and accuracy of saliva as a diagnostic medium to detect HIV.

2.4 Statement of the problem
The interesting topic is the potential and accuracy of saliva as a diagnostic medium to detect HIV.

2.5 Exclusion and inclusion criteria
The inclusion criteria are as follows:
- English language
- Clinical human studies
- Publication dates: between 2009 and 2019
- Assessed free full-text

The exclusion criteria were as follows:
- Animal study
- In vitro or in vivo study
- Studies not related with our topics
- No access to the full text

2.6 Strategy for collecting the data
Following the search results, all the articles published in English were screened by title and abstract. The final results were obtained by reading the full text to confirm the eligibility of the manuscripts.

RESULT

Manuscripts collection
The articles selected in this study followed the PRISMA guideline (Scheme 1). The electronics search by Pubmed was applied for the source of the database, resulting in 125 papers. Then, 102 manuscripts were excluded because they were published before 2009 and published in the English language. Twenty-three papers were available because of the free
full-text assessment. From these selected papers, the title and abstract were evaluated based on the interested topics, and only 10 manuscripts were eligible regarding the topics (Table 1).

### DISCUSSION

According to World Health Organization (WHO) data, in 2018, 37.9 millions of people living with HIV; 1.7 millions of people newly infected with HIV and 770,000 people was reported died. \(^{18}\) Human immunodeficiency virus type 1 and type 2 (HIV-1 and HIV-2) were determined as the causal factor of acquired immunodeficiency syndrome (AIDS). HIV-1 is known as the most virulent and pathogenic. \(^{18}\) The early detection of HIV could reduce the incidence of death and reduce the transmission of the virus. Therefore, HIV testing is a critical point in the prevention, treatment, and care of HIV. \(^{19}\)

The research was developed to detect the antigen/antibody against this virus. There are 2 kinds of detection of HIV: direct and indirect methods. The indirect method is defined as the detection of antibodies. The detection of the virus is known as the direct method. \(^{20}\) Diagnosis of
HIV could be performed using laboratory testing such as immunoassays, nucleic acid testing, which detects the viral nucleic acid (RNA, DNA) of HIV, and confirmatory assays such as Western Blotting and immunoblot. Those technologies are most cost-effective to perform in laboratory settings and high specimen throughput.21 The low cost, easy, and faster technology is required to get faster results with high specificity and sensitivity.

Rapid diagnostic test (RDT) gives quick results in less than 30 minutes. The RDT class includes lateral flow called immunochromatographic and vertical flow, known as immunofixation assays. Those assays could detect the presence of HIV 1 and 2 antibody and/or p24 antigen. This technology is accessible because it can be performed out of the laboratory by clinicians or health care professionals with high accuracy and reliability.21 Oral fluid such as saliva and serum/plasma from whole blood taken by fingerstick are the material primarily used in RDT.14

This study showed the results that saliva as oral fluid is one of the biological fluids used as a source of RDT. The utilization of saliva-based rapid tests has a sensitivity of 99.1% and a specificity of 98.8%. However, the point of care of oral fluid is less accurate compared to fingerstick whole blood specimens. The confirmation test using serum/plasma whole blood is required to confirm the false-negative results from saliva-based rapid test.12 The false negative results are due to the longstanding of antiretroviral therapy (ART). Antibody detection is the most highly method used to detect HIV infection. Within 2-3 weeks, seroconversion could be detected using the immunoassay method in most cases. However, if the patient were in the window period, the direct detection of the p24 antigen is required because this antigen is visible before the presence of the antibody. The antibody of HIV is produced after 2 weeks of infection. Whereas the antigen of HIV detectable in plasma whole blood is a minimum of 5 days after infection.22

CONCLUSION
Saliva-based oral fluid tests are a viable option for expedited screening processes. However, it is imperative to note that reactive results must be further confirmed through laboratory molecular diagnostic testing. This additional step ensures the accuracy and reliability of the results.

REFERENCES
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