

# SALIVA AND VIRAL INFECTIONS - A REVIEW

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## ABSTRACT

Viruses cause familiar infections and diseases like common cold, flu. They invade living, normal cells and use those cells to multiply and produce colonies of cells. Viral infection is a proliferation of harmful viruses inside the body. Viruses infect the host body by introducing their genetic material into the cells. The main aim of this study is to explore detailed information about saliva and viral infections. This research is seen as a scoping literature review. In seeking to identify the relevant articles, we used common databases such as the Pubmed and Google scholar online websites. Totally 27 articles are found related to the topic. 12 articles are used in this study. From the articles collected and reviewed, it is understood that viral infections can transmit through the saliva and oral specimens, though saliva protects the body from infections. It is concluded that, as saliva has become the transmitter of the virus, we should maintain proper oral hygiene and oral health to prevent these viruses. Future studies have to be done on the viral infections causing cancer.

**KEY WORDS:** Cytomegalovirus, EBV, Hepatitis B, Saliva, Viral infections

## INTRODUCTION

Saliva is a slimy fluid which contains 98% water and many enzymes like salivary amylase and also it contains electrolytes (McQuone, 1999). It is an extracellular fluid, which protects oral mucosa and common infections like HIV, mumps, influenza (Palati *et al.* 2020). Viral infections affecting humans can transmit through different paths such as by ingesting contaminated food and drinks, by aerosols, sneezing or coughing and via saliva (Shree *et al.* 2019). Examples of viruses isolated from oral cavities include rotavirus, norovirus, HIV, hepatitis C virus and influenza virus (Schneider *et al.*, 2004). Infections in the oral region also involve salivary gland infection (Guru and Gheena, 2016). Major salivary glands are more affected than the minor salivary glands (Manohar and Abilasha, 2019). Oropharyngeal sites are evaluated or examined for the presence of viruses (Musso *et al.* 2015).

Previous research which has been done on the examination of oral specimens for the presence of virus, have concluded that oropharyngeal specimens explains increase in the transmissibility of age groups in which the salivary exchange is high (Tamura *et al.* 1980). Another research which has been done on the cytomegalovirus has been shown to be an aggregate of the lysosomes (Smith, 1956). Throat swab specimens are also used for the detection of viruses (Parry *et al.*, 1987). Though these many studies have been done on the viral infections related with saliva, this study mainly aims to know about the infections

transmitting through the saliva specimens (Abitha and Santhanam, 2019). The main aim of this review is to explore detailed information regarding the viral infections and saliva (Uma et al., 2020).

## **METHODOLOGY**

This research is seen as a scoping literature review. We did not follow a systematic review or meta analysis. In seeking to identify relevant literature from the past 10 years, articles are collected from the Pubmed and Google scholar online websites. Total number of articles found related to the present study is 27. From this, 19 articles are reviewed in this study. Articles collected are related to the Salivary infections, testings for the estimation of virus, salivary glands, infections associated with oral cavity. Articles related to other categories are excluded for this study. The obtained articles were later thoroughly read and understood. The level of evidence of the reviewed articles were categorized as per the criteria of the Centre for Evidence- Based Medicine ,Oxford, UK (Howick et al., 2011).

### **Salivary gland infections**

Salivary gland infections are the acute infections involving salivary gland. The major salivary glands get easily infected than the minor salivary glands. A study has been done on the prognosis of the bacteria and viral infections (Slots and Slots, 2011). Viral infections are transmitting diseases which get transmitted via the oral mucosa and also saliva (Krishnan et al. 2018). It is the first line of diagnosis which involves the infection of the parotid gland (Padavala and Sukumaran, 2018). Some studies have been done on the basis of non- invasive samples (Barzon et al., 2016).

### **Common viruses causing infections**

Some of the more common viruses which cause infections in the salivary glands are HIV, mumps, influenza, herpes, coxsackie virus (To et al. 2020). Viral infections such as mumps, influenza, and others can cause swelling of the salivary glands (Palati et al., 2019). Ther viral illnesses that cause salivary gland swelling include the Epstein Barr virus (EBV), cytomegalovirus (CMV), coxsackievirus and the human immunodeficiency virus (HIV) (Corstjens et al. 2016). Symptoms of salivary gland infections include a constant abnormal or foul taste in mouth, redness or swelling over the jaw (Chen et al. 1997). *Staphylococcus aureus* is the most common organism in community acquired parotitis and first line antibiotic therapy should include antistaphylococcal antibiotic (nafcillin, oxacillin, cefazolin) (Levy et al., 1990).

### **Infections with other viruses**

A study has been done on the chikungunya virus. It is identified in the oral fluids. In case of acute Chikungunya virus, hemorrhagic manifestation, it is observed in the oral cavities (Dubrulle et al., 2009). Most of the diseases arise from common viral infections. It can be easily diagnosed by the saliva sample and also by the urine (Sarbeen and Gheena, 2016). The virus taken for study is a cytomegalovirus (Ho, 2013). Also study has been done on the Epstein Barr virus.(Harrita and Santhanam, 2019). It is usually observed in the oral secretions, that is it appears in the extracellular fluid of the oropharyngeal specimen (Riera et al., 2000). Also there are many of the common viruses like norovirus, papillomavirus, rabies virus. These are able to cause severe infection in humans (Stanley et al., 1983).

### **Advancements in detection of virus**

Salivary disease is an infectious disease which is observed in oral fluids (Sheriff and Santhanam, 2018). Respiratory virus is identified by the molecular testing of saliva. It improves the detection of viruses easily (Sada et al., 1996). Some studies are done on the human model organisms (Ahad and Gheena, 2016). They are in a phylogenetic relationship with humans (Gokul and Abilasha, 2016). They provide a

beneficial benchmark for the investigation of human viral infections (Frangou *et al.*, 2005). A study is carried out about the epigenetics which is the change in gene sequence. It is the development of broad spectrum antivirals to control viral infections (Arrieta *et al.*, 2001).

## RESULTS AND DISCUSSION

The description of the included studies and their quality analysis is summarised in Table 1. From the articles taken and reviewed, it is discussed that the diseases transmit via oral mucosa and saliva majorly. The common viruses and transmitting paths are, norovirus transmits through the oral-faecal route, rabies gets transmitted through saliva, papilloma virus through the oral cavity, herpes simplex virus is a double stranded virus with viral episome, Hepatitis C- virus is a RNA virus which gets infected with hepatitis B virus and HIV virus, it has a reservoir in the salivary glands. These viruses are detected using the oral fluid sample, for example saliva. Significance in detecting the oral sample is it is inexpensive and rapid diagnosis can be done (Tuttle and Grossman, 1958).

Epstein Barr virus is a lymphocryptovirus which transmits through the oral region. Next is the respiratory virus, which is estimated by the molecular testing method using saliva. It is an easy method for the detection of viruses. Research on chikungunya virus gives a clear discussion on the hemorrhagic manifestation (Fulginiti *et al.* 1969). Research on epigenetics has concluded that controlling viral infections are possible through epigenetics, but this study has given only the outline, not a clear and deep study. Another study which has been done on the human model organisms provides a beneficial benchmark in the detection of viruses (Hannah *et al.*, 2018). These model organisms have a phylogenetic relationship with the humans. They also provide detailed information on the salivary gland infections.

Limitations for this study is that different viruses are there for different studies. Articles reviewed are recently published, so results may vary with other than these articles. Further studies can be done on the different viruses and treatment for the acute and chronic viral infections

## CONCLUSION

From this review, it is concluded that many viral infections transmit through the oral specimens especially saliva eg. norovirus, rabies virus. Hence, to prevent our body from infection, oral hygiene and oral health should be maintained. Further studies can also be done on the rapid diagnosis of the viral infections.

## CONFLICT OF INTEREST

None declared.

## AUTHOR CONTRIBUTIONS

Keerthana B: Literature search, Data collection, Analysis, Manuscript drafting. Gifrina Jayaraj: Data verification, Manuscript drafting. Gayathri R: Data verification, Manuscript drafting.

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**Table 1: Description of included studies:**

S.No	Author	Year	Key Findings	Level Of Evidence	Type Of Study
1	Paul, A M Corstjens, William AR Abram(Corstjens <i>et al.</i> 2016)	2019	Viral infections transmitted through oral mucosa. It is tested through non- invasive sample	Level 3	Review
2	DLepusic (Lepusic, 2019)	2019	Influenza and mumps are the common viral infections	Level 1	Review

			transmitted via saliva		
3	Nouridine Hamdane, Frank Juhling, Emilie crouchet ( <u>Hamdane et al., 2019</u> )	2019	Hepatitis B virus is a double stranded DNA virus transmitted through blood. It is estimated in the oral fluids and specimens.	Level 3	Review
4	Nico Hoffman ( <u>Hofmann, 2018</u> )	2018	Viral infections are the emerging diseases. It is easy to diagnose through saliva and urine.	Level 2	Review
5	Kelvin KW, Kyeil Yip, Rosana WS poon, et al. ( <u>To et al., 2017</u> )	2017	Respiratory virus is an infectious disease present in oral fluids, estimated by Molecular testing of saliva	Level 2	Review
6	Irenea Zurvick, Sylvia Hutler, Juliene Reh ( <u>Zurnic et al., 2016</u> )	2016	Norovirus transmitted through oral- fecal route.	Level 1	Review
7	Joy Gardner, Penny A Rudd, Natalie A Prow( <u>Major et al. 2015</u> ).	2015	Epstein Barr virus gets transmitted mainly through saliva and is identified in oral specimen	Level 1	Review
8	Caroline L Trotter, Pauline Waight ( <u>Trotter et al. 2010</u> )	2010	Viruses present in oral specimen, increases in age group where salivary change is high	Level 3	Review
9	Matti sallberg ( <u>Sällberg, 2009</u> )	2009	Cells infected with cytomegalovirus shown to be an aggregate of lysosomes.	Level 2	Review
10	Jorgen slots, Denis P Lynch( <u>Lynch, 2000</u> )	2000	Rabies virus gets transmitted through saliva.	Level 2	Review