REVIEW

# Oral Manifestations of Various Viral Epidemic, Endemic and Pandemic Diseases throughout the History - A Dental Clinician's Encyclopaedia

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## Abstract

**Introduction:** Over the years, the human race has been through a myriad of epidemic and pandemic outbreaks. Time and again such waves of numerous unknown and unseen infections have put the lives of millions of people at stake. Most notably, many of these are proven to be viral in their origin. It is hence imperative for researchers to understand the pathogenicity of such disease-causing agents in order to create vaccines and select therapeutic drugs for such outbreaks. In such a scenario, the typical signs and symptoms depicted by a particular disease plays an important role in determining the approach needed to tackle them. While the clinical presentation of any disease helps in forming an overall diagnosis after the onset of a disease, the oral manifestations may give some insight into the health condition even before the actual symptoms start to appear. Oral cavity is a region which presents certain pathognomonic signs and symptoms that may help detect the lesions associated with many health conditions at an earlier stage. Thus, making dentists prime contributors towards early diagnosis and timely treatment initiation.

**Aim:** The main aim of this article is to understand and comprehend the different characteristic features peculiar to these viral lesions which in turn will help in easy identification of the disease outbreak at an initial stage, thereby giving enough time to the healthcare specialists to come up with a plan to tackle the same.

**Methodology:** Information was gathered through electronic searches of databases such as PubMed and Google Scholar, for Oral manifestations, epidemic, pandemic, viral diseases.

**Results:** Oral cavity serves as an early indicator of systemic health, manifesting pathognomonic signs and symptoms preceding general clinical presentation. Specific oral manifestations associated with viral infections provide valuable clues for early diagnosis and intervention.

**Conclusion:** Understanding and recognizing oral manifestations of viral lesions are pivotal in initiating prompt treatment and public health measures during disease outbreaks. Dentists play a critical role in early detection and surveillance, contributing significantly to effective disease management strategies.

**Keywords:** outbreak, epidemic, oral health, pandemic, systemic health, viral

## Introduction and Background:

An epidemic is described as a rise in illness cases that is greater than what is typically anticipated for that population in that location[1]. When a disease's spread becomes exponential, the World Health Organization (WHO) declares it a pandemic. This means that the growth rate skyrockets, and each day there are more cases than the day before. The virus's designation as a pandemic has nothing to do with its virulence, the population's immunity, or disease severity. It means that a virus has spread across a large area, affecting multiple countries and populations.

Outbreaks like these are known to disrupt the harmony of the world. The health of thousands of individuals gets laid in jeopardy. Those already suffering from a chronic illness face the utmost hit, as the healthcare system gets unstabilized due to the sudden onset of these epidemic and pandemic diseases. Not limiting to this, individuals having preexisting health conditions or comorbidities usually have to take a greater

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brunt of such newly emerged disease outbreaks. In both of the above conditions, it is necessary to identify these diseases in their early stages to keep the healthcare facilities functioning smoothly and to provide the best healthcare to the mass population[2]. Early identification will allow the researchers and healthcare providers to initiate early triage, to distinguish the diseases from diseases with similar pathogenicity and to create a treatment plan for the same while allowing the system to run without causing any disturbances[3].

A majority of these diseases, which are known to be the root of the global healthcare crisis, exhibit a variety of systemic signs and symptoms. These can be spotted in a single organ or spread across multiple organs. The oral cavity is no exception. Oral health is known to be linked to overall health and vice versa[4]. They exhibit a variety of signs and symptoms that can aid in the early detection of a plethora of diseases, including viral infections[5]. Owing to this, dental professionals must have a thorough understanding of the signs and symptoms associated with a health condition in order to differentially diagnose such conditions when and where they appear.

The world has witnessed a number of viral epidemics and pandemics ranging right from measles which can be said to be comparatively less aggressive in its nature to the life threatening COVID-19. The purpose of this article is to highlight the oral manifestations of the viral diseases with the potentiality to cause outbreaks, so as to aid early detection and timely treatment initiation if humans are inflicted by these pathogens in future.

**Oral manifestations of COVID-19:**

Severe acute respiratory syndrome coronavirus 2 (SARSCoV2) is a single chain RNA virus that causes COVID19, a novel coronavirus disease. The disease was discovered in December 2019 followed by a quick spread, prompting WHO to declare it a worldwide pandemic. Fever, shortness of breath, pneumonia, multiple organ failure, and death are among the mild to severe clinical manifestations[6–8]. Previously, it was assumed that the absence of oral involvement distinguished COVID19 exanthema from other viral exanthem. SARS-CoV-2 has, however, been detected in the patients' saliva along with the receptors needed by SARS-CoV-2, ACE-2 receptors. These have a higher density on the dorsum of the tongue and salivary glands compared to buccal mucosa or palate[9].

One of the first oral symptoms of novel coronavirus disease (COVID19) was dysgeusia. Aphthous-like lesions were observed on the oral mucosa. These appeared as multiple shallow ulcers with erythematous halos and yellow-white pseudomembranes on keratinized and non-keratinized mucosa. These lesions were seen to heal in a period of 5 to 15 days[10,11].

Herpetiform/zosteriform lesions manifest as painful, unilateral, round yellowish-gray ulcers with an erythematous rim on both mucosa types. They were discovered to be associated with systemic symptoms. One case was also reported demonstrating the appearance of geographic tongue following recovery[11–13]. Ulcer and erosive lesions appeared as painful lesions after a latency time of 4 to 7 days with irregular borders on the tongue, hard palate, and labial mucosa[14].

EM-like lesions appear as blisters, desquamative gingivitis, erythematous macules, erosion and painful cheilitis with hemorrhagic crust in patients with cutaneous target lesions in extremities. These lesions were seen after 7 to 24 days after the systemic symptoms set in[15].

Other symptoms like angina bullosa-like lesions[16], Melkerson-Rosenthal syndrome[17] and atypical sweet syndrome 18 were also seen. In patients with Kawasaki-like disease, oral lesions like cheilitis, glossitis, erythematous and swollen tongue (red strawberry tongue)[19].

Necrotizing periodontal disease was seen in a case with fever, submandibular lymphadenopathy, halitosis and oral lesions (painful, diffuse erythematous and edematous gingivitis with necrosis of inter-papillary areas)[20].

Vesicles and pustules[21], petechiae on lower lip, palate and oropharyngeal mucosa[22], nonspecific lesions (mucositis)[23] and post inflammatory pigmentation[24] were also reported.

Older age and severity of COVID-19 disease was one of the most common factors predisposing to the occurrence of oral lesions in the course of the disease. As an adjunct to age and severity, lack of oral hygiene, opportunistic infections, stress, underlying diseases like diabetes mellitus and immunosuppression, trauma, vascular compromise and hyper-inflammatory response secondary to COVID-19 are the other important factors influencing the appearance of oral lesions in COVID-19 patients.

**Oral manifestations of H1N1 flu or Swine flu:**

The H1N1 influenza A strain that caused the 2009 human flu pandemic is sometimes referred to as "swine influenza" or "H1N1 influenza A". It is also known as swine-origin influenza virus A (S-OIV). The new swine flu virus is essentially a genetic mashup of two unidentified viruses that were both discovered in pigs. S-OIV can spread from person to person and cause the typical influenza symptoms like cough, fever, sore throat, malaise, and headache[25]. Since the H1N1 virus has two primary surface antigens, H1 (Haemagglutinin Type 1) and N1 (Neuraminidase N1), it was given the moniker "H1N1 flu" in 2009 as opposed to the more generic term "swine flu"[26]. Gastrointestinal manifestations appear to be more common with H1N1 infections[27]. However, there are no reports of oral manifestations of this virus.

**Oral manifestations of Ebola virus:**

Ebola virus (EBV) was first isolated in the Yambuku outbreak in 1976 and was named after the Ebola River in the Democratic Republic of the Congo[28]. EBV's natural hosts are fruit bats located in the African jungle belt and humid rain forests of Central and Western Africa. The anthropo-zoonotic agent is transmitted into humans and non-human primates via infected bushmeat or direct contact with infected bats or fruit partially eaten by virus-carrying bats. This transmission causes the new host to develop hemorrhagic fever[29].

EBV's oral manifestations include gingival bleeding and odynophagia. Non-specific oral mucosal lesions can manifest as whitish or reddish patches or aphthous ulcerations[30,31]. Gingival bleeding occurs only in the late stages of EBV. However, the oral signs and symptoms are nonspecific, making early diagnosis difficult.

**Oral Manifestations of Mumps:**

Mumps is a contagious disease caused by the mumps virus, which belongs to a group of viruses known as paramyxoviruses. Mumps was earlier known to be a common childhood disease, however after the availability of mumps vaccine in 1967, the number of cases reduced significantly[32].

Symptoms present approximately 2 to 4 weeks after the initial exposure to the virus. The general symptoms of mumps include headache, fever and fatigue. The oral symptoms of this disease manifest as severe swelling in the parotid gland that causes puffy cheeks and a tender, swollen jaw (parotitis). The orifices of the submandibular (Wharton duct) and parotid (Stensen duct) ducts become red and swollen with pinpoint petechial hemorrhages. Obstruction of these inflamed ducts by edema or cellular debris results in pain during mastication[33]. There is a bilateral earache which lasts about 1 week.

Differentiation of mumps from other salivary gland diseases can sometimes be difficult because of the similarity of the parotitis-like symptoms with obstructive salivary gland disorders. A suspicion of a diagnosis of mumps is the presence of prodromal symptoms which include flu-like symptoms; low-grade fever, malaise, anorexia, and headaches.

**Oral Manifestations of HIV:**

The human immunodeficiency virus (HIV) is an enclosed retrovirus with a single-stranded RNA genome that has two copies. It causes acquired immunodeficiency syndrome (AIDS); the last stage of the HIV infection. The patient may suffer the first signs of infection for two to four weeks after HIV enters the body[34]. Oral symptoms are one of the first and most important clinical indicators of HIV infection since they can appear in up to 50% of HIV-infected people and in up to 80% of patients who are at the AIDS stage[35].

Globally, an estimated 38.6 million individuals with HIV-1, and around 25 million have already passed away suffering the symptoms of the virus. There were 4.1 million new HIV-1 infections and 2.8 million AIDS-related deaths in only 2005[36]. A successful management of the health conditions of HIV-infected patients depends on the early diagnosis and treatment of the disease. This requires the correlation of CD4 count with oral and systemic manifestation in HIV patients which signifies the role of dentists in the identification, diagnosis, and treatment of HIV-associated lesions[37].

The oral manifestations of HIV have been classified by EC-Clearinghouse into three groups as follows:-

Group 1: This group consists of seven oral diseases, including oral candidiasis, hairy leukoplakia, Kaposi's sarcoma, linear gingival erythema, necrotizing ulcerative gingivitis, necrotizing ulcerative periodontitis, and non-Hodgkin's lymphoma, which is significantly related with HIV/AIDS.

Group 2: This group consists of atypical ulcers, diseases of the salivary glands, and viral infections like cytomegalovirus, herpes simplex virus, papillomavirus, and herpes zoster virus.

Group 3: This group consists of lesions such as squamous cell carcinoma and diffuse osteomyelitis, these lesions are much rarer[38,39].

Dentists provide the patient with the necessary guidance for management of the disease. Anti-Retroviral Therapy (ART) allows a significant decrease in some of the oral manifestations and simultaneously decreases the mortality rate [36].

**Oral Manifestations of Measles:**

According to McDonald and Avery (1986)[40], measles is an acute contagious viral disease that primarily affects children which often manifests as an epidemic. The respiratory tract is the route of transmission of this virus after direct contact or aerosol infection. After an 8-to-10-day incubation period, malaise, fever, cough, conjunctivitis, and photophobia appear, followed by maculopapular skin lesions on the face that spread to the trunk and extremities.

According to Ribeiro et al. (2012), measles is a systemic, acute exanthematous disease that is one of the most contagious of all communicable diseases[41]. It is caused by the *Morbillivirus* of the family *Paramyxoviridae*. One pathognomonic measles lesion occurs in the oral cavity and is known as Koplik spots. They appear 1-3 days before skin manifestations. Small bluish white spots with a bright red halo that form primarily in the cheek, near the opening of the mucosa Stenon channel. These blemishes multiply and form plaques, causing generalized inflammation and swelling, as well as ulcerations in various locations (gingiva, palate, and throat).

According to Vranjac (2013)[42], measles is a viral disease with high contagious respiratory transmission. Fever, runny nose, cough, conjunctivitis, and red patches all over the body are typical symptoms that appear 7-18 days after exposure to a case. The virus can spread 5 days before and 5 days after the rashes[41].

**Oral Manifestations of Rubella:**

According to Kajiyama et al. (1982)[43], rubella, also known as German Measles, is an infectious disease with minimal or absent prodromal symptoms. It is characterized by a three-day rash, and generalized lymphadenopathy, particularly in the retro-surricilar, suboccipital, and cervical chains. Transmission occurs via nasopharyngeal secretions from infected individuals, droplets of mucus and saliva, it can also be isolated from blood, urine and feces, and it can also be transmitted via air. The transmission period is roughly one week before and at least four days after the rash appears. Its symptoms begin on the face as small light red spots that spread throughout the body, increasing in diameter over time and becoming macule papules. Rubella is reduced or absent in catarrhal symptoms. There are apparently no reports of intra-oral symptoms of the disease.

According to Castieiras et al. (2006)[44], rubella is a respiratory immune-preventable infectious disease transmission. The rubella virus causes the infection, which results in mild or absent symptoms. It is more common in children, but it can occur in adults as well. Rubella only occurs once in a lifetime. The transmission period runs from one week before to seven days after the onset of the rash (red spots on the skin), with the first week being the most dangerous. Asymptomatic disease occurs in 50% of cases. Clinical symptoms appear between 12 and 23 days after infection. The spots appear gradually in the face and the rest of the body (usually disappearing in less than 24 hours), there are swollen lymph nodes in the neck, and

there is a low fever. There is no specific treatment for rubella; antipyretics and analgesics can be used to control symptoms, with the exception of medicines containing acetylsalicylic acid at risk of bleeding, because rubella reduces the number of platelets.

## Conclusion

In conclusion, the oral cavity serves as a crucial window into the overall health of an individual, offering valuable clues that can aid in the early detection of viral diseases. Dentists, with their expertise in oral health, play a pivotal role as frontline healthcare providers in identifying characteristic features of viral lesions. By recognizing these signs and symptoms early on, dentists can contribute significantly to timely diagnosis and initiation of appropriate treatment protocols. This proactive approach not only improves patient outcomes but also facilitates the prompt implementation of public health measures to mitigate the spread of infectious diseases. Moving forward, continued research and collaboration between dental professionals and healthcare specialists are essential for enhancing our understanding of oral manifestations of viral infections and refining strategies for disease detection and management. By leveraging the insights gleaned from oral health assessments, we can strengthen our collective efforts in safeguarding public health and mitigating the impact of future epidemic and pandemic outbreaks.

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