

RESEARCH ARTICLE

COMMON VIRAL INFECTIONS INCLUDING CORONA (COVID INFECTION) IN CHILDREN - A REVIEW

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Abstract

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*Key words:-*Oral Manifestation, Systemic Diseases, Viral Infection, Children Oral cavity of children is often encountered by a wide range of viral infections but receive less attention as it is generally present as an unspecific symptom of several diseases that leads to its diagnostic challenges. Thus, this article focuses on the clinical presentation i.e. both oral and systemic manifestations of the infection, their diagnosis, differential diagnosis, prevention and treatment that can give a thorough knowledge to the pediatric dentists about some commonly encountered viral infections in the child, and can help them for carrying out a multidisciplinary approach with the general practitioners and specialists for the proper diagnosis and effective treatment of the child.

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Introduction:-

The normal flora of the oral cavity usually does not cause disease, some even provides a protective effect, but if it becomes pathogenic, it can lead to the disease process. One of suchpathogenic microorganisms are viruses that can be frequently seen to cause infections and children are particularly prone to such infections, as their immune system is still in the developing stage¹. Children infected with viruses serve as highly effective incubators for viral replication and the spread of infection.

A viral disease of the oral cavity is the infectious type of pathology affecting oral tissues. Viral diseases may either occur due to cellular destruction or consequence of immune reaction following viral proteins².

The majority of viral infections tend to have oral manifestations, that may present as preliminary sign of disease, important co-symptom of viral disease, or only sign observed in such viral disease. In the oral cavity, they typically present with abrupt onset and association of solitary or multiple blister or ulcerations². Apart from oral manifestations, concomitant systemic diseases of skin, respiratory system, gastrointenstinal system, hematopoetic system, cardiovascular system, hepatic system, renal system etc. may also be observed in a few viral conditions. Hence, viral infectious diseases can be often interlinked with both oral and systemic diseases and have the potential to disseminate and cause generalized infection affecting the overall health.

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Examination of the oral cavity is very important as oral mucosa, and other structures of the oral cavity are often the first site to be affected by viral infections. And for the accurate diagnosis of the majority of viral infections and to prevent further complications, a pediatric dentistshould have knowledge about the oral impact of viral infections in childhood. Thus, this article focuses on the oral manifestation of some commonly encountered viral infections in children that are discussed below.

1.HERPES SIMPLEX VIRUS

Herpes simplex virus infections are common vesicular and ulcerative lesions affecting the oral mucosa that is mainly caused by Herpes Simplex Virus 1. Prevalence of HSV-1 is higher among females than males.HSV -1 infection is more frequent in Africans Americans than whites. It is responsible for 90% of infections³, occurring in 25% to 30% of children.Globally, its prevalence is 65.2% in Middle East and North Africa, 60.5% in <10 years old, 85.6% in children above 10 years old⁴. Worldwide, Neonatal Herpes Simplex Virus is estimated at 25%⁵. In India, it is 25% in children above 10 years old⁶.Predisposing factors are through direct contact, through infected body fluids, during birth via vertical transmission, from infected caretaker of the child, low socioeconomic status, immunosuppressed child.

Classification of Herpes Simplex Virus 1 (HSV 1):- HSV 1 can be classified into two types:-HERPES SIMPLEX VIRUS 1(HSV 1)





Primary Herpetic Gingivostomatitis

It is also known as Acute Herpetic Gingivostomatitis. Most cases of primary lesions are subclinical. It is usually seen in the age group of 6 months to 5 years of age in children.

Systemic manifestations includeprodromal symptoms like fever, irritability, malaise, nausea, vomiting, sleeplessness, cervical lymphadenopathy in which lymph nodes in cervical region are abnormal in consistency and size, and headache. These symptoms precede oral lesion by 1-2 days². Other orofacial conditions seen are Acute pharyngitis(that include sore throat, swallowing difficulties, fever with sudden onset, red pharynx, enlarged tonsils covered with a yellow and blood-tinged exudates) and Keratoconjunctivitis(causes itchy, irritated eyes, swelling of the eyelids, redness of the conjunctiva, mild pain when the child looks at a light, burning in the eyes, eyelids that are stuck together in the morning, Clear, thin fluid leaking from the eyes etc)⁷.

The oral manifestation of Primary Herpetic Gingivostomatitis presents in the form of multiple small oral vesicles within a few days of occurrence of prodromal symptoms, which are thinwalled vesicles, surrounded by inflammatory base(Fig. 1). The vesicles quickly rupture leaving small, shallow, oval-shaped discrete ulcers of size 1-5 mm. Base of the ulcer is covered with grayish white or yellow plaque(Fig. 2). The ulcers then coalesce to form large irregular ulcers with erythematous surrounding². It is present on hard palate, attached gingiva and dorsum of tongue, buccal mucosa, lips and may be present on skin. Orally, incubation period of the infection is 5–7 days. Generalized marginal gingivitis is typically present(Fig.3). In severe cases, painful hermorhagic lips matted with serosanguinous fibrin-like exudates leads to difficulty in eating, drinking, swallowing. Painful Parting of the lips during mastication may be present that interferes with speech and mastication³.



Fig 1. Thin walled vesicles surrounded by inflammatory base

Fig 2. Ulcer with grayish white Fig 3.Generalized marginal acute base and erythematous gingivitis surrounding.

Recurrent Herpes Simplex Virus:-

Secondary herpes or recurrent HSV is the result of reactivation of latent virus and rarely may happen due to reinfection in seropositive individuals. They are of two types: Recurrent HSV and Recurrent herpetic labialis. Recurrent HSV is common in one-third of the patients who have experienced primary herpetic gingivostomatitis. Intraorally, it occurs in the same area (lip vermillion, gingiva, palate) as that of primary infection, during every episode of recurrence.Recurrent herpetic labialis presents as grey or white vesicles which rupture quickly leaving small red ulcerations(Fig.4) of size 1–3 mm to 1–2 cm.In 8–10% individuals, there is asymptomatic shedding of HSV in saliva and oral secretions, which may lead to transmission of infection following dental treatment. Prodromal symptoms present as lesion on lip and is preceded by tingling and burning sensation and feeling of tautness, swelling or slight soreness with subsequent development of vesicle. The lesions gradually heal within 6–10 days and leave no scars. Recurrence rate declines with age in each individual.



Fig 4:- Red ulcerations in Herpetic Labialis.

Diagnosis of HSV-1 can be done by HSV isolation, Wright Giemsa and Papanicolaustain, Antibody titer, Typical clinical features, past history of being HSV positive.Differential diagnosis includes Hand, foot and mouth disease, Herpangina, Recurrent Aphthous ulcer, Herpes Zoster, Erythema multiforme, Bullous lichen planus, Benign mucosal pemphigoid, Allergic stomatitis etc.

For prevention, vaccines are under development against HSV-1.

For symptomatic treatment, topical anaesthetic like 2% lidocaine, 0.1% diclonine hydrochloride, 0.5% benzocaine hydrochloride. To prevent recurrent herpes simplex virus agents used are 0.2 chlorhexidine gluconate, tetracycline mouthwash and elixir of diphenhydramine.For fever, Antipyretics can be given.

For gingivostomatitis, Five percent acyclovir, 3% penciclovir and 10% docosanol are applied 4 to 6 times/day can be applied. And recurrent infection can be suppressed by reducing trigger factors, such as by applying sunscreen at least half an hour before sun exposure.

First episode	Acyclovir 75 mg/kg/day p.o. ÷ 5 times/day (max 1 g/day) × 7 days, or 5 mg/kg/dose i.v. 3
	times/day \times 5–7 days
	Valacyclovir ^a 1 g p.o.b.i.d. \times 7 days, or 2 g p.o.b.i.d. \times 1 day (if \ge 12 y.o.)
Recurrent	Acyclovir 400 mg p.o. 5 times/day \times 5 days
	Valacyclovir ^a 2 g p.o.b.i.d. \times 1 day (\geq 12y.o.)

The systemic treatment of Herpes Simplex Virus is listed in the table below⁸:-

Table 1:- Systemic treatment for Herpes Simplex Virus-1.

2.CHICKENPOX

Chickenpox also known as 'varicella' is very common in children. It usually occurs in children aged 3-6 years of age. It is caused by Varicella Zoster Virus. Over 90% of unvaccinated people might get infected by the virus. No gender difference nor racial predilection is present. Its prevelance is 80-90 million cases per year (globally) and 13–16/1000 child per year(in India) in temperate regions. Predisposing factors include direct contact with infected person, contaminated objects, air-borne droplet, children having no previous history of chickenpox, non-immunized children like cancer patients and children using immunosuppressant drug.

Incubation period of varicella in children is 2 weeks. Systemic manifestations mainly include maculopapular rashes or vesicular eruptions; dew drop or rose petal appearance. Rash presents as the initial sign⁹. Other symptoms like headeache, malaise, anorexia, pharyngitis and rhinitis may also be present. Vesicles that are generally itchy in nature, begins on the skin of the trunk and spread to the skin of the face and extrimities. Healing occurs when these vesicles eventually rupture, and end stage is hardened crust. Old crusted lesions along with newly formed intact vesicles are commonly seen and heals by desquamation. The disease runs its clinical course in a week to ten days, seldom leaving any after effects. Occasionally, secondary infection of vesicles results in the formation of pustules which may leave small pitting scar upon healing. Neonatal chickenpox occurs due to infection during pregnancy and may lead to congenital defect in newborn.

Oral manifestation in chickenpox may also present as the first sign of the disease⁹. They are present in the form of intraoral and perioral vesicles. Most common sites are vermillion border of lip and the palate , followed by buccal mucosa. Other than that gingiva(Fig.5), tongue(Fig.6), as well as mucosa of pharynx are also involved. Oral lesions begin as white opaque vesicles (Fig.7) of size 3mm to 4 mm or blister , which quickly ruptures and forms slightly painful or painless, flat-based ulcerswith erythematous halos and a white or whitish/yellow or brown ulcer bed . These ulcers often resemble a minor recurrent apthae¹⁰. When multiple lesions are present, because of the vesicles collapsing together, they give the appearance of bigger lesions . New vesicles continue to erupt for 2 or more days. Old ruptured lesions, intermixed with fresh clear vesicles, can be observed on the moderate and severe varicella cases.



Fig 5. Oral lesion on gingiva



Fig 6. Oral lesion on tongue



Fig7. White opaque vesicles on palate

Diagnosis can be done by Antibody testing, PCR testing, Varicella Zoster Virus DNA testing. Differential diagnosis can be Syphilis, Measles, Rubella, Meningitis etc.

Prevention can be done by varicella vaccine, introduced in 1995, prevents about 70% to 90% of infections and 95% of severe disease. Live attenuated VZV vaccine should be given in children at 12 and 18 months of age. It is usually combined with measles, mumps, rubella (MMR) vaccine.

For treatment, antiviral drugs can be given. For Children>2 years, Oral Acyclovir¹¹ is given in the dose of 20 mg per kg per dose, four times a day, up to 800 mg per dose. And for children Children< 2 years, Valacyclovir in the dose of 1000 mg TDS for 7 days and Famciclovir in the dose of 500 mg TDS for 7 days is given. Intravenous Acyclovir can be given in immunocompromised children in the dose of 500 mg every eight hours. For pain and fever, Acetaminophen can be given. Aspirin is contraindicated as it leads to Reye's syndrome.

3.MEASLES

Measles is an acute, infectious and contagious disease that occur in children younger than 5 years of age. It is caused by Morbillivirus. It is more prevalent in boys than that of girls. Asian children are highly affected; Indian (87.1%), other Asian background (86.3%), Bangladeshi (84.6%) and Pakistani (84.2%). Globally, one country and one territory in the Region of the Americas have reported confirmed cases of measles: Brazil with 54 confirmed cases and French Guiana with 2 confirmed cases (According to WHO 2021). In India, 4246 cases of measles were reported by WHO in March 2022. Predisposing factors are Unvaccinated child, Direct contact with a person, Droplet infection, Malnutritioned child etc.

Incubation Period of measles in children is 8 to 10 days. Systemic manifestations consist of prodromal symptoms that are onset of fever, malaise, cough and coryza (running nose). Conjunctivitis, photophobia, lacrimation can also be seen in such patients. Skin lesions present as Tiny red macules orpapules which enlarge and coalesce to form blotchy discolored irregular lesions and blanch on pressure.Skin lesions usually fade away within 4 to 5 days with fine desquamation.

Oral lesions precede the cutaneous lesion by 2 to 3 days. The most common site is buccal mucosa, and they can also be present on palate, gingiva and throat. The typical oral manifestation of this disease is the Koplik's spot⁷(Fig. 8) that is present in about 97% of the cases. These are small, irregularly shaped flecks that appear as bluish white specks surrounded by bright red margins and described as 'grains of salt' on red background. Other oral manifestations are Candidiasis or white patches on the tongue and mouth, Angular Chelitis causing pain and inflammation on one or both corners of the mouth(Fig.9), gum infection characterized by pain, interdental necrosis and bleeding from gums leading to Necrotizing Ulcerative Gingivitis(Fig.10), Enamel Hypoplasia(Fig.11)causing disturbed growth of organic matrix that take the form of lines, furrows, pits, or large areas of missing enamel.









Fig 8. Koplik spots in Fig9.Angualr Chelitis measles

Fig 10. Necrotizing ulcerative gingivitis

11. Enamel Hypoplasia

Fig

Diagnosis is done by real-time polymerase chain reaction (RT-PCR), Vero/hSLAM cells for isolation of measles virus and genetic and sequencing analysis. Typical clinical features and past history can also be useful. Differential Diagnosis include Small pox, Chickenpox, Kawasaki disease, Rubella, Necrotizing ulcerative gingivitis, Enamel Hypoplasia, Dengue, Systemic Lupus Erythematosus, Serum sickness etc.

For prevention, MMR(Measles Mumps Rubella) vaccination is done. First dose is given in children >1 year and second dose is given in children aged 12 to 15 months. For children under 18 months of age, Human Immunoglobulin is given intramuscularly. Its dose is 250 mg under 1 year and 500 mg above 1 year.

For treatment, no specific antiviral therapy is available for measles in children. Isolation of patient should be done. Plenty of water intake is necessary to prevent dehydration. Symptomatic treatment is done by Analgesic, anti-pyretic like acetaminophen or ibuprofen to control pain and fever.

4.MUMPS

Mumps also known as 'Epidemic Parotitis' is an acute contagious viral infection, characterized chiefly by unilateral or bilateral swelling of the salivary glands. In children, it usually occur in the age group of 5-9 years. It is caused by Paramyxovirus. It is present more in boys than girls. Whites are mostly affected more by Mumps. Globally, total mumps cases was estimated at 268,924 in 2020. In India, 40-726 cases per 100,000 population per year are affected by Mumps.Predisposing factors are direct contact with infected person, droplet spread, unvaccinated individuals, immunocompromised child etc.

Systemic manifestations include prodromal symptoms like low –grade fever, malaise, lack of appetite and headache. After 1 day of initial symptom occurrence, earache, tenderness of parotid gland are present and enlargement of parotid gland is also seen. Unilateral involvement of parotid gland is seen in one-fourth of the patients. One parotid gland often enlarges a few days after the other. Pain, fever and tenderness quickly diminish once maximum parotid gland swelling has occurred. Within 1 week, the affected parotid gland returns to its normal size.

Oral manifestation of mumps present as trismus i.e inability to open the mouth. Trismus is commonly referred to as lockjaw and in mumps it is caused due to the infection leading sustained spasm of the muscle of mastication. Orifice of stensen's duct appears to be red and swollen. Tongue gets swollen¹²(Fig.12). Swelling of the floor of the mouth can also be seen(Fig.13). Patient complains of pain on salivation without purulence.



Fig.12 Swollen tongue



Fig.13 Swelling on the floor of mouth

Diagnosis can be done by test for serum anti – mumps immunoglobulin M (IgM) antibody.Reverse transcription polymerase chain reaction (RT-PCR) is useful for the confirmatory diagnosis. Clinical diagnosis can also be done by checking for the signs and symptoms.Differential diagnosis include Epstein-Barr virus, Parainfluenza virus types 1 and 3, Influenza A virus, Coxsackievirus, Adenovirus, Parvovirus B19, Human Immunodeficiency Virus etc.

For prevention, MMR vaccination is done in 12 to 15 months of life and is again repeated in 4 to 5 years of age.

For treatment of mumps, no specific antiviral therapy is present. As the illness is generally benign and self-resolving, treatment is mostly symptomatic and supportive. To control pain and swelling, non-aspirin analgesic and antipyretic should be given. Bed rest is recommended. Patient is advised to avoid sour foods and drinks as it can aggrevate salivary gland discomfort.

5.<u>HUMAN IMMUNODEFICIENCY VIRUS</u>

Human Immunodeficiency Virus was first recognized in children in 1983. In children, it is usually seen in age group of less than 13 years. Oral manifestations are among the earliest and most important indicators of HIV infection and it is quite commonly seen in pediatric HIV infection. Each day, some 1500 children under 15 years of age become infected with Human Immunodeficiency Virus (HIV). Although pediatric HIV can be prevented, but for some HIV infected children survival rate is very less. Under 15 years of age, no sex predilection is yet available in the literature. High incidence of HIV has been seen in black and Hispanic children. Globally, AIDS accounts for 3% of deaths in children under five years of age (According to World Health Organization). In India(third largest HIV infected country), HIV accounts for approximately 2.39 million.

Predisposing factors are transmission of HIV during pregnancy or at birth, blood transfusion, needle sharing, exposure to infected saliva, through dental treatments, infected needles used in drug abused children etc.

Systemic manifestation include prodromal symptoms such as failure to thrive, chronicor recurrent diarrhea and lymphadenopathy. Morbidity and Mortality in children can be the most common cause of pulmonary disease.

Impaired hemostasis and cytopenias are also seen. Dilated cardiomyopathy has been reported in 3-33% of HIV infected children¹³. Increased cardiothoracic ratio, with evidence of lateral bronchial displacement due to left atrial enlargement and pulmonary plethora in association with hepatomegaly is seen in cases of Dilated Cardiomyopathy. HIV associated nephropathy is a renal disease induced by HIV in pediatric patients. Significant proteinuria and rapidly progressive renal insufficiency in the setting of poorly controlled HIV infection is often marked by low CD4 counts and elevated HIV- RNA levels. HIV virus can also cause direct damage to the brain leading to HIV encephalopathy as viral/host interactions lead to CNS damage by the release of soluble neurotoxic factors.

Oral manifestation of HIV is most commonly presented as Candidiasis¹⁴(Fig. 14). Candidiasis being the most common lesion, are the clinical predictors of HIV. The other common oral manifestation is primary herpetic gingivostomatitis causing oral lesions on oral mucosa ,gingiva, vermillion border.In HIV, severe chronic painful recurrent lesions(Fig.15) appear as crater- like ulcers with well-defined raised white borders and have a gray-white pseudomembrane. Oral hairy leukoplakia(Fig.16), that is very common typical feature in adult patients are not so frequently found in HIV positive children. Oral warts(Fig.17), hyperpigmentation, Herpes labialis and angular chelitis can also be present. In HIV positive children, gingivitis is more frequently seen than periodontitis¹⁵. The gingival and periodontal diseases associated with HIV include linear gingival erythema , necrotizing ulcerative gingivitis , periodontitis and necrotizing stomatitis. Kaposi's sarcoma in mouth is rarely seen whereas depappilation of the tongue is more commonly found. HIV infected children are more prone to dental caries than children not affected with HIV due toreduction in salivary antibodies, reduction of salivary flow rate , continuous medicinal use of sucrose , deficient oral hygiene and parental irresponsibility. The Decayed Missing Filled Teeth indices is also comparatively higher than that of children not affected with HIV. The oral problems can cause difficulties in eating and other functional limitations.









Fig.14 Candidiasis in HIV positive child

Fig.15 Chronic painful recurrent lesions on lips

Fig.16 Oral Hairy Leukoplakia

Fig.17 Oral wart present on labial mucosa

Diagnosis can be done by viral testing. HIV DNA ,PCR , RNA PCR testing is done to confirm the diagnosis. Antibody test like ELISA (Enzyme- Linked immunoabsorbentAssay) or Rapid test is done. Screening during pregnancy to prevent mother – to – child transmission of HIV can be done for diagnosis by asking about maternal HIV testing in pregnancy , labour or postpartum period. Differential diagnosis include Cytomegalovirus, Herpes Simplex Virus, Candidiasis, Burkitt Lymphoma, Cryptococcosis, Cryptosporiodiosis, Toxoplasmosis etc.

For prevention, no vaccines are yet available but are under development. And for treatment of HIV,anti-retroviral drugs are prescribed. For infants weighing <2000 g and older than 35 weeks of gestational age, Neviparine2mg/kg dose per dose once daily and Zidovudine 4mg/kg per dose twice daily is recommended. However, premature infants younger than 35 weeks of gestational age should be dosed using expert guidance. In treatment naïve children, initial antiretroviral therapy given is lopinavir + ritonavir for children aged<3 years, efavirenz or lopinavir + ritonavir for children aged 3-6 years, atazanavir/ritonavir, efavirenz or lopinavir + ritonavir for children > 6 yrs or equal to 6 years. Along with these drugs preffered dual- nucleoside reverse transcriptase inhibitor is also given. It includes zidovudine+lamivudine or emtricitabine for age<3 months, amacabir+lamivudine or emtricitabine, zidovudine+ lamivudine or emtricitabine for age >3 months or equal to 3 months, abacavir+lamivudine or emtricitabine for age >12 years.

6.<u>COVID-19</u>

COVID-19, that has spread worldwide and became a global pandemic in the recent years is caused by a new virus, known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) thatwas identified in Wuhan, Hubei Province, China, at the end of 2019. COVID-19 was relatively rarely diagnosed in children in the beginning of its presence in the world as it was initially thought that children are less susceptible to the disease. Howeverin the later phase, with the progression of the disease and development of COVID testing techniques, it came into knowledge thatpediatric population can also be seriously affected by SARS-CoV-2. And children of any age can become ill with COVID-19 including infants.

COVID-19 is caused by Coronavirus. It is comparatively more prevalent in boys than girls. A high proportion of cases can be seen in black and Hispanic children. Globally, Children account for less than 5% of diagnosed COVID-19 infections. In India, 8% of the COVID-19 positive cases in India were contributed by people below 17 years of age.3-90% children of age group 0-10 and 7.99% children of age group 11-20 were reported to be covid positive according to Ministry of Health and Family Welfare (MoHFW).

Predisposing factors are close contact with Covid patients, via infected respiratory droplets, vitamin D deficiency, travel history to epidemic regions, Underlying medical conditions like heart disease, chronic lung diseases, neonates and premature infants, lack of oral hygiene, opportunistic infections, stress, vasculitis, immunosupression, vasculitis and hyper-inflammatory response secondary to COVID -19 etc.

A proportion of SARS-CoV-2 infected children can be completely asymptomatic while others can also be symptomatic. Incubation period of COVID-19 is 1 to 14 days and most commonly 3 to 7 days in symptomatic child.

Systemic manifestations present as fever and cough that are the initial symptoms of COVID-19 followed by dyspnea and fatigue in cases with severe pneumonia. Other symptoms are systemic rash, conjunctivitis, parotitis ,sore throat, rhinitis, stuffy nose, muscle aches, muscle soreness, headache, vomiting, and diarrhea. Ansomia (loss of smell) and ageusia (loss of taste) can be less commonly seen in children. In children, upper respiratory tract involvement is more than that of lower respiratory tract involvement¹⁶. Chest CT of covid positive child may show consolidation with halo sign within lung lobes surrounded by ground-glass opacities , slight turbidity leading to impaired lung function. In critically ill children and infants, septic shock and multiorgan dysfunction can be seen, including the nervous, blood, urinary, and cardiac systems. MIS-C occurs due to post viral immunologic reaction. It is known as multisystem inflammatory syndrome in children(MIS-C).MIS-C is defined by the Center for Disease Control and Prevention (CDC) as 'a patient lesser than 21 years of age with fever, laboratory evidence of inflammation , and clinical evidence of severe illness requiring hospitalization , including involvement of two or more organ systems¹⁷. The risk of critical illness or mortality rise when the children is having a chronic underlying disease (underlying malignancy, nephrotic syndrome, chronic disease of kidney, lung, or liver).

Oral manifestation of Covid positive child is usually non-specific. The most commonly seen symptoms are Chelitis, tongue swelling and dry and red cracked lips(Fig.18).Children with MIS-C presents with oral pseudomembranous candidiasis, geographic tongue, Coated tongue and swollen lips. lip fissuring and tongue papillitis can be seen in both MIS-C group and COVID 19 group¹⁸. Geographic tongue (GT) is a benign harmless transient oral condition, in which the characteristic pattern of the lesions gives the dorsal surface of the tongue the appearance of a map. The lesion persists for a period of time of several days to weeks depending on the individual and disappears only to reappear at a different location giving a different pattern. Symptomatic GT is rare in children and may produce anxiety. Oral pseudomembranous candidiasis commonly occur as adherent white plaques resembling curdled milk or cottage cheese on the surface of the labial and buccal mucosa, hard and soft palates(Fig.19), tongue, periodontal tissues, and oropharynx. The membrane can be scrapped off with a swab to expose the underlying erythematous mucosa.In MIS-C group children, strawberry tongue can be present as red strawberry tongue(Fig.20)or white strawberry tongue. It can be confused with Kawasaki disease , which can be present in a children with strawberry tongue.



Fig.18 Cracked, red lips in covid positive child

candidiasis in covid positive child

Fig 19. Pseudomembranous Fig 20. Red strawberry Fig21.White strawberry tongue tongue

Diagnosis can be done by checking for close contact of child with infected invidual, RT-PCR, CT images, lung imaging¹⁸, Chest X-ray, Electrocardiogram etc. In RT-PCR, Nasal swab is more sensitive and specific than a pharyngeal swab.CT imaging has proved to be more sensitive than RT-PCR analysis. Differential diagnosis are Kawasaki disease, Bacterial sepsis, Toxic shock syndrome ,Appendicitis , Other viral infections , Other infections like Lyme disease and rickettsial infections ,Hemophagocytic lymphohistiocytosis (HLH)/macrophage activation syndrome (MAS), Systemic lupus erythematosus (SLE), Vasculitis etc.

For prevention, Covid vaccination should be taken by everyone aged 5 years and older as recommended by CDC. COVID-19 booster shot (Pfizer-BioNTech shoul be taken by children for only children>12 years old. Other preventive measures are proper nutrition like consumption of vitamins and antioxidants, staying 6 feet away from others, avoiding poorly ventilated spaces and crowds, making the child wear mask and wearing mask themselves, using hand sanitizers, surface disinfectants, washing child's hands often, monitoring child's health regularly (watching for fever, cough, shortness of breath, or other symptoms of COVID-19), checking body temperature.

For treatment, Interferon α 2b nebulization at a rate of 200000-100000 kg / IU for mild cases and 400000-200000 kg / IU for severe cases, twice daily for 5-7 days is given to the child²⁰. Lopinavir / Ritonavir (Kaletra) (can also be given. Recommended doses are as follows: For weight 7-15 kgdose 12 mg in 3 mg / kg (12 mg / 3mg / kg); For weight 15-40 kg, dose 10 mg / 2.5 mg / kg (10 mg / 2.5mg / kg). Oseltamivir medication can be given for premature infants but should be consulted by a pediatric infectious disease specialist. Recommended doses are as follows: For infants 0 to 12 months, dose 3 mg/kg twice daily, for children older than 12 months with body weight less than or equal to 5 kg dose of 30 mg twice daily, weight between 15-23 kg dose of 45 Mg and twice a day, for a weight between 23-40 kg dose of 60 mg and twice a day. The duration of use of this drug is at least 5 days. Hydroxychloroquine medication (Hydroxychloroquine sulfate is used for infants and children) at a dose of 3-5 mg/kg per day (maximum dose of 400 mg), BID for 5 days. Ribavirin (oral) for children over 3 years of age weighing less than 47 kg 15mg/kg/day-BID, which is used for up to 14 days depending on the patient's reaction.

Conclusion:-

It has been concluded that in order to maintain the oral health during early childhood, pediatric dentists should be well aware about proper diagnosis and management of oral manifestations associated with various viral infection.Many childhood viral infections can be effectively prevented by vaccination programmes as well as antiviral therapy but their associated systemic conditions, if left undiagnosed and untreated can lead to new infections. Thus, if any systemic signs and symptom associated with the viral infection is suspected, the child should also be reffered to a pediatrician. This multidisciplinary approach between the dental and medical proffesionals will help in yielding a better result in providing effective treatment of the child.

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