Pediatric Infectious Diseases

Pramoda Earla*
Department of Microbiology, Aditya Degree College [PG Courses], Andhra University, Andhra Pradesh, India

ABSTRACT

Pediatric infectious diseases are becoming a major concern now a day as there is an increase in the number of emerging microbial strains which are affecting children. It is time to wake up and take care of our future generation as we have already lost many infected children by the grace of these infectious diseases. This article is containing basic information about various types of infectious diseases, their transmission and control.

INTRODUCTION

Disease can be defined as an abnormal condition of particular function or structure within the body of particular individual and makes health condition worse. These diseases are mainly categorized as non-infectious and infectious diseases. Many of the non-infectious diseases are long-lasting and they will not transmit from one to another. Infectious diseases generally causes through pathogenic microorganisms of various kinds such as bacteria, parasites, viruses or fungi. Infectious diseases are contagious in nature and spread from one person to another by direct or indirect contact.

There has been the presence of many infectious diseases from ancient times for which people got suffered, affected and died too [1-3]. There are certain types of infectious diseases which have more dominance in both infantile and childhood stages of human life and these are generally referred as pediatric infectious diseases. Amoebiasis, AIDS, Candidiasis, Chagas disease, Cholera, Typhoid, Dental...
caries, Diphtheria, Infectious mononucleosis, Influenza, Measles, Meningitis, Mumps, Pneumonia, Polio, Whooping cough, etc.

AMOEBIASIS

Amoebiasis is a diarrheal infection, caused by parasitic protozoan named Entamoeba histolytica (anaerobic pathogen) and it has been integrated with malnutrition of children [4]. Acute diarrhea is the most often gastroenterological infection and the main cause in childhood is dehydration. It can be manifested by a sudden occurrence of three or more watery stools a day lasting for 7-10 days, fourteen days at most. It mainly occurs until 5 years in children and until 2 years in neonates. Primary causes of Amoebiasis include gastrointestinal infections, bacterial, viral, alimentary intoxications and other factors [5]. Cutaneous Acanthamoebiasis is an infrequent infection in organ recipients and immunocompromised patients. Advanced diagnosis is important as cutaneous Acanthamoebiasis can disseminate to the CNS and cause granulomatous amoebic encephalitis, which is generally fatal [6].

AIDS

Acquired immune deficiency syndrome (AIDS) is a disorder of immune system caused by virus named human immunodeficiency virus (HIV) [7]. Although there is evidence for the prevalence of Acquired Immunodeficiency Syndrome (AIDS) and Human Immuno-Deficiency Virus (HIV) is declining or stabilising in some countries, their impact remains a significant health care challenge that affects communities, families and health care systems [8]. Primary target of the HIV are CD4 cells and loss of these cells results in immune response weakening and renders the host susceptible to various infections, ultimately leading to AIDS. Success or failure of immunological treatment can be measured through an increase or decrease count of CD4 cells [9]. Oral cavity is not considered as the primary a route of transmission for HIV virus, with some exceptions like oral sex or breastfeeding [10].

CANDIDIASIS

Candidiasis is the most common fungal disease affecting skin, mucosa, nails and internal organs of children. There are more than one hundred species of Candida and almost twenty species are pathogenic for humans [11]. Infections due to Candida species remains as regular infections in neutropenic patients, but Chronic Disseminated Candidiasis is a different form of Candida infection, with the involvement of the spleen, liver and also kidneys in rare cases [12]. Candida albicans is fungal species which commonly colonizes human mucosal surfaces. C. albicans can proliferate and cause an array of infections that are often life-threatening when host defences are weak [13]. Autoimmune polyendocrinopathy-candidiasis-ectodermal dystrophy is an infrequent, autosomal recessive disease
which can be characterized by the onset of mucocutaneous candidiasis in young adulthood, followed by
adrenal insufficiency and hypoparathyroidism in a subset of patients [14]. Prevalence of Candida infection
is increasing day by day, leading to higher frequency of diseases like candidaemia and candidiasis [15].
Protection against disseminated candidiasis can be achieved by vaccination with Met6 peptide induced
antibody production [16]. Treatment of oral or esophageal candidiasis includes a first-line antifungal drug
called Fluconazole [17].

CHAGAS DISEASE

Chagas disease, can also be called as American trypanosomiasis, generally caused by hemoflagellated
protozoan pathogen, Trypanosoma cruzi which generally transmits to humans by triatomine bugs [18-21].
Chagas disease was discovered by Brazilian scientist Carlos Chagas in 1909 [21,22], and it is named after
that scientist chagas. Diagnosis of chronic infection by Trypanosoma cruzi relies on serological methods.
Chagas disease can affect esophagus, bowel systems and heart. These organs lose normal function after
swelling. Heart is the targeted system with congestive heart failure, symptoms include feet swelling,
shortness of breath and heart palpitations [23]. There is no vaccine availability to prevent chagas disease
and treatment is restricted to limited drugs, benznidazole and nifurtimox. There is a requirement of new
effective drugs with lower side-effects [22].

CHOLERA

Cholera remains a significant cause of mortality in childhood all over the world [24]. It is an acute watery
diarrheal disease caused by gram-negative pathogen Vibrio cholerae [25,26]. Vibrio cholerae can be found
mostly in water, soil and other host organisms. It is an opportunistic pathogen and causative agent of
multidrug-resistant nosocomial infections. It is also the main cause of chronic lung infections in patients
who are diagnosed with cystic fibrosis [27-33].
Vibrio cholerae includes more than 180 serogroups and it is responsible for approximately 3-5 million
cases and an estimated 1,20,000/annum worldwide. Cholera remains a major public health problem in
few countries with poor access to proper sanitation and safe water [34,35]. Symptomatic infections include
acute watery diarrhoea and vomiting, which can rapidly lead to dehydration and finally death if not
treated immediately [36]. If rehydration management is not proper, it will lead to fatal stage within hours.
Poor hygiene behaviours, inadequate water supplies and poor sanitation are largely responsible for
cholera disease [37].
Treatment with prescribed antibiotics for patients who lost a large volume of stool during rehydration
treatment is also recommended. There is an availability of many antibiotics like doxycycline (suggested
for adults) and azithromycin (suggested for children and pregnant women). Antibiotics should be given
along with aggressive hydration to avoid secondary transmission of cholera. Patients resistance to tetracycline can be treated with doxycycline [38].

**TYPHOID FEVER**

Typhoid fever is a food and water borne microbial infection caused by non-spore forming gram negative facultative anaerobic rod shaped bacterium called Salmonella Typhi [39,40]. It is one of the most serious forms of enteric fever with estimated number of more than 21,000,000 typhoid cases and 2,00,000 deaths [41]. It has more prevalence in developing countries because of poor sanitation and antibiotic resistance [42]. Typhoid fever is an important cause of morbidity with an estimated 12-33 million cases per year [43]. Culture techniques, serology and molecular techniques plays vital role in the diagnosis of typhoid fever [44]. General preventive methods like improved general public sanitation and clean water supplies may lead to typhoid free society [45].

**DENTAL CARIES**

Dental caries is one of the most common preventable oral infectious disease affecting children all over the world [46-51]. There are many factors responsible for dental caries like poor oral hygiene, hereditary factors, concentration of bacteria in oral cavity, cariogenic diet and reduced level of fluoride in drinking water, hyperglycemia, dyslipidemia, fermentable substrates, microflora and saliva [52-56]. It is a complex, biofilm-induced disease involving oral bacteria and demineralization/remineralization process of an affected tooth [57].

Dental caries is a process of progressive demineralization in hard tissue of tooth surface by organic acids derived from sugar-containing or fermentable foods [58]. This disease develops in crowns and roots of children teeth, and arise as an aggressive tooth decay in early childhood that affects the primary teeth of infants and children [59]. Dental caries can be diagnosed by using a visual method with mouth mirrors, dental probes and daylight illumination [60]. If dental caries develops after the eruption of permanent dentition, it may lead to total damage and spread of infection throughout the body may also occur. Utmost care must be taken to reduce the formation of dental caries. Early diagnosis with proper treatment is also necessary [61,62].

**DIPHTHERIA**

Diphtheria is an infectious disease caused by pathogenic rod shaped bacterium called Corynebacterium diphtheriae [63]. Trivalent combination vaccines against pertussis, tetanus and diphtheria infections have been widely used in pediatric immunization since 1940s, resulting in a significant decline in incidence and prevalence of pertussis [64,65].
INFECTIONOUS MONONUCLEOSIS

Acute infectious mononucleosis is generally caused by viruses such as γ-herpes virus, Epstein-Barr virus or human β-herpes virus and cytomegalovirus. Primary infection of mononucleosis appears predominantly in adolescents, children and young adults \[66,67\]. Symptoms start with arthralgia, subfebrility, malaise and myalgia, similar to other common upper respiratory tract infections \[66,68,69\]. After the prodromal symptoms, tonsillopharyngitis, fever, cervical lymphadenopathy, hepatosplenomegaly and leukocytosis can develop. The positive heterophil tests and clinical features are usually sufficient to diagnose Infectious Mononucleosis \[60,70\].

INFLUENZA

Influenza is a respiratory tract infection caused by influenza virus. It is an RNA virus composed of three general types: influenza A, B and C according to nucleoprotein antigenicity \[71\]. Influenza virus belongs to the viral family called Orthomyxoviridae with seven or eight single-stranded, negative-sense RNA segments \[72\]. Influenza A viruses are the major pathogens compared with influenza B and C. Influenza viruses are causing approximately five million cases of severe illness, 250,000-500,000 deaths annually and remains as a major infectious disease and public health challenge with a global annual attack rate estimated at 5%-10% in adults and 20%-30% in children. Birds and Mammals are the major reservoirs of newly emerging pandemic influenza viruses and immunization process remains the most effective method to prevent influenza \[73-75\].

MEASLES

Measles is a common infection in children which is vaccine-preventable, caused by Measles virus (single stranded, non-segmented, enveloped negative-sense RNA virus belonging to the family Paramyxoviridae \[76-82\]. Measles eradication is going to be a much difficult challenge \[83\] and there are no treatments available to kill measles virus. Treatment mainly aims to clear the infection from immune system and to ease symptoms \[84\].

MENINGITIS

Meningitis may be defined as an inflammatory response to infection (bacterial, viral) of cerebrospinal fluid. It can be characterized by sudden onset of febrile illness with signs and symptoms of meningeal involvement \[85\]. Most pathogenic microbes in humans are able to cause meningitis. However, Neisseria meningitides, Haemophilus influenzae and Streptococcus pneumoniae are the most common pathogens.
that cause bacterial meningitis \cite{86}. Although there is an availability of newer antibiotics and preventive strategies, meningitis remains an important source of mortality as it is one of the most significant infections in children in developing countries. Meningitis is generally a complication of a primary bacteremia in children below 2 years of age \cite{87}.

**MUMPS**

Mumps is an acute viral infection, generally characterized by enlargement of salivary and parotid glands. It is a most common disease in childhood \cite{88,89}. Mumps virus belongs to the family Paramyxoviridae. It has an incubation period of 2-4 weeks and typically causes a prodrome of low-grade fever, parotitis and malaise. Neurologic complications are the most common manifestations and generally start developing within one week. Some of the symptoms include deafness, encephalitis, facial neuritis, hydrocephalus, cerebellar ataxia, transverse myelitis and polyradiculitis \cite{90}.

**PNEUMONIA**

Streptococcus pneumoniae is a major pathogen that can cause infection in childhood. These bacteria colonize the nose and pharynx and move to the middle ear, blood and lungs, which causes bacterial meningitis, otitis media and septicemia. We are losing almost 1 million people every year because of the infection of Streptococcus pneumoniae and drug resistant Streptococcus pneumoniae is widely distributed around the world and increasing its prevalence \cite{91,92}.

**POLIO**

Polio is a viral infection which can be otherwise called infantile paralysis. It is a subgroup of family picornaviridae with three major serotypes PV1, PV2 and PV3. Immunity against all three serotypes is essential for prevention of disease. This virus generally transmitted through oral discharge from oral routes. Virus multiplies in the oral larynx and small intestine after entering human body. It usually attacks local lymphoid tissues and then enters into the main blood system, at the time of nervous system attack \cite{93}. An estimated two lakhs fifty thousand children are now alive and another five million children are walking by the grace of polio eradication initiative \cite{94}.

**WHOOPING COUGH**

Whooping cough (pertussis), a respiratory infection caused by a non-invasive pathogen Bordetella pertussis, accounts for more than three lakh deaths per year. B. pertussis localises mainly in the upper respiratory tract and produces a large array of potential virulence factors, many of which play vital role in
the pathogenesis [95-99]. Overcrowding, poor hygiene, waning immunity are the main reasons for high incidence of whooping cough. The whole cell pertussis vaccine is the generally used vaccine all over the world, consisting of a killed B pertussis strain, origin of which may differ in different parts of the world, generally given in combination with genetically inactivated diphtheria and tetanus toxoids, with or without Haemophilus influenzae type b, hepatitis B or inactivated polio virus vaccine, depending upon the manufacturer [100].

CONCLUSION

There has been the existence of many infectious diseases from ancient times, which are emerging day by day to attack our innocent pediatric population. The emergence of these pediatric infectious diseases reflects various factors like microbiological, social and political factors. Finally we need to concentrate more on prevention and elimination of all pediatric infectious diseases as these are becoming a substantial burden on future generation and demands global action and attention.

REFERENCES