

1. Slide 2

We will discuss briefly about the SARS Coronavirus 2, epidemiology of COVID-19 and how the pediatric disease differs from rest of age groups.

2. Slide 3

- a. Early in December 2019, there was an outbreak of acute respiratory illness in Wuhan city, China. And the number of cases kept increasing by late December.
- b. It was thought to have spread from Huanan seafood market, where various wild animals were also being sold.
- c. The disease had marked similarities to the SARS outbreak of 2002-2003. And, subsequently the etiological agent was identified as a novel corona virus; WHO labelled the disease as Coronavirus Disease 2019 or COVID-19 and International committee on taxonomy on viruses named the virus as SARS-CoV-2
- d. The virus was first isolated on 30 December, 2019 from Bronchoalveolar lavage samples sample.

3. Slide 4

- a. Coronaviruses have been causing infections in human beings previously also.
- b. These are spherical, medium sized, enveloped viruses, with positive sense single stranded RNA.
- c. They cause respiratory, gastrointestinal and central nervous system infections
- d. Coronaviruses are genotypically classified in to four subfamilies: Alpha, Beta, gamma and Delta
- e. Alpha and Beta groups cause human infections
- f. Viruses causing previous pandemics including Middle east respiratory syndrome (MERS) and Severe acute respiratory syndrome (SARS), and the current COVID-19 pandemic belong to the beta group.
- g. Genome wide analysis have shown that SARS-Coronavirus-2 shares nearly 80% and 50% sequence identity to SARS-CoV-1 and MERS coronavirus

4. Slide 5

- a. This is the structure of SARS coronavirus -2. It has nucleocapsid composed of genomic RNA and phosphorylated nucleocapsid protein
- b. On the surface, It has spike glycoprotein trimmer (S), hemagglutinin esterase (HE), membrane protein (M) and envelope protein (E)
- c. ACE-2 receptor on human cells is the target site where S protein binds and subsequently enters human cells

5. Slide 6

- a. Corona viruses have previously caused pandemics although the number of cases were not as high as COVID-19 pandemic
- b. It caused severe acute respiratory syndrome (SARS) in 2002-2003. The virus was first detected in china in November, 2002 and affected 26 countries later
- c. It infected more than 8000 people with a mortality of 10%
- d. No new SARS infections reported since 2004
- e. Later in 2012, another coronavirus caused Middle east respiratory syndrome pandemic. It first started in Saudi Arabia.
- f. Nearly 2500 cases were reported with a mortality of 35%
- g. And the current pandemic is ongoing since December, 2019

6. Slide 7

- a. Briefly recapitulating the timeline of COVID-19. It began in Wuhan city, Hubei province. And probably from the Huananseafood market.
- b. This is the publication on early cases and transmission dynamics of COVID-19
- c. This picture highlights the series of events in December and January related to COVID-19
- d. As we can see, cases of acute respiratory illness started in early December 2019. As highlighted few cases were associated with the sea food market and few were not.
- e. Early in January, WHO was notified regarding the outbreak of illness
- f. On Jan 8, china CDC announced that a novel corona virus as the causative agent for this illness
- g. By Mid-January, cases were also reported in Thailand

7. Slide 8

- a. Subsequently the number of cases increased in china and in other nations

- b. By mid-March, Outbreaks have occurred in Europe, USA and Japan
- c. WHO declared COVID-19 as pandemic on March, 11, 2020
- d. In India first confirmed case was reported in Kerala in January end
- e. Subsequently, the number of cases have been increasing exponentially

8. Slide 9

- a. As of 20th August, 2020 – Worldwide, there are about 22 million cases with nearly 8 lakh deaths
- b. In India - Nearly 3 million cases are reported with 54 thousand deaths. And these numbers are increasing day by day.

9. Slide 10

- a. Then discussing on COVID infection in children
- b. First animation – Since early January, there had been cases of COVID-19 in children in China. In this article, they have described 6 confirmed children, of whom one required intensive care.
- c. Second animation - This retrospective data showed that of 2143 children, majority were having mild illness (51%), 38% had moderate illness and only 5.8% were severe and critical
- d. And it was suggested that children are less affected and, most are either asymptomatic or mildly symptomatic
- e. Data from AIIMS Delhi, also shows almost similar findings: Children less than 10 years constitute only 3.8% of total COVID cases and nearly 12% of all cases in age group < 20 year.

10. Slide 11

- a. So why are children less affected? Multiple explanations have been given.
- b. One reason is, less exposure in children. Due to lockdowns, Children do not have much of outdoor activity and there is less contact with peers at usual hot spots for respiratory virus, including schools and day care centres
- c. They probably have strong innate immunity – related repeated viral infections and probably vaccination
- d. They have a healthy respiratory tract due to less exposure to cigarette smoke and pollution

- e. They have less frequency of underlying comorbid conditions including diabetes and hypertension and others
- f. The receptor for Coronaviruses, ACE2 receptor expression varies with age. It may have protective effect in lungs by limiting inflammation and capillary leak
- g. And the regenerative capacity of alveolar epithelium is high in children compared to older adults.

11. Slide 12

- a. The clinical features also slightly vary from adults, like less frequency of fever in children reported in various studies; Never the less most common symptoms in children include fever and cough
- b. Majority are asymptomatic or mildly symptomatic
- c. The severity classification of these children is based on WHO guidelines which includes mild, moderate, severe pneumonia and critical cases
- d. Treatment depends on severity of illness
- e. In mild cases Home management – It include symptomatic treatment including paracetamol, antihistaminic, ensuring adequate oral intake, isolation as feasible and watch for danger signs
- f. Moderate-severe cases, needs hospitalization
- g. The treatment includes - Respiratory support
- h. HCQ in moderate to severe cases
- i. Remdesivir, convalescent plasma and tocilizumab may be used in selected severe cases.

12. Slide 13

- a. Then in End of April, there was an urgent alert by pediatric intensive care society, from UK. They had seen increased number of cases requiring intensive care admissions with hyperinflammatory state resembling Toxic shock syndrome and Kawasaki disease
- b. Then few case series resembling Kawasaki like illness have come up
- c. Then a large case series Multisystem inflammatory syndrome was reported from from USA which included 186 children.

- d. Few case reports and series have been published from India too.

13. Slide 14

- a. Later this hyperinflammatory syndrome is designated as multisystem inflammatory syndrome in children temporally related to COVID-19 (MIS-C)
- b. Various pathophysiological mechanism have been postulated for MIS-C
- c. Delayed hyperinflammatory response to SARS-COV-2 infection and a post-infectious inflammatory state, are most probable mechanisms.
- d. Other proposed mechanism –inhibition of type I and III interferon response by virus initially and then delayed cytokine storm
- e. Or probably the virus acts as an intermediate trigger or portal of entry for unknown trigger
- f. So with all these mechanisms, it leads to cytokine storm and end-organ dysfunction.
- g. Frequently, Children with MIS-C present with GI symptoms and cardiovascular system dysfunction.
- h. Kawasaki disease, and toxic shock syndrome are the important differential diagnosis.

14. Slide 14

- a. Diagnosis of MIS-C is based on the criteria laid down by WHO or CDC which include clinical features, elevated markers of inflammation, evidence of COVID infection or contact and other common causes ruled out
- b. steroids and IVIG are first line drugs
- c. Other treatment options include interleukin 6 and interleukin 1 inhibitors
- d. Prognosis is good with appropriate treatment

Slide 16.

To summarize, COVID-19 is a global health problem which affects children too. Most children have mild infection but they should be appropriately monitored for severe disease. One should be aware of MIS-C and timely therapy should be administered if MIS-C is detected.