

## SMALLPOX (VARIOLA)

An acute infectious disease caused by which causative agent? Variola virus,  
How clinically characterized? By a sudden onset of fever, headache, backache, vomiting and sometimes convulsions, especially in children.

What happens on the third day of fever? A typical rash appears which is centrifugal in distribution and passes through successive stages of macule, papule, vesicle, pustule, and scab with subsequent scarring

It was one of the greatest killer disease. In 1967, WHO began an intensified worldwide campaign to eradicate smallpox.

When The World Health Assembly did confirmed the global eradication of smallpox? In May 1980.

All countries have discontinued routine vaccination against smallpox. However WHO maintains a reserve stock of smallpox vaccine and vaccination needles - sufficient to protect how much population if an emergency arise? More than 200 million people

Smallpox eradication surveillance

Despite the absence of smallpox, surveillance of "rumours" continues in order to sustain public confidence in the eradication of the disease. However, the final chapter of the smallpox story remains to be written, as the smallpox virus has not been completely destroyed. Stocks are still held at government research centres. Where are those centers? In the Russian Federation and at the United States.

## CHICKENPOX (VARICELLA)

### Problem Statement

The global annual chickenpox disease burden includes 4.2 million severe complications leading to hospitalization and 4,200 deaths.

What are the Factors which influence the severity of disease and outcome in populations? They include the proportion of cases among infants, pregnant women and other adults, the prevalence of immunocompromising conditions including HIV infections

The incidence and severity of herpes-zoster disease increases with age, with marked increase after 50 years of age, which correlates with which factor? Ageing related decline in cell mediated immunity. Among adults who reach 85 years of age, it is estimated that approximately half will have suffered at least one episode of herpes zoster

### Epidemiological determinants

#### Agent factors

(a) AGENT: What is the causative agent of chickenpox? V-Z virus is also called "Human (alpha) herpes virus 3". Primary infection causes chickenpox. Recovery from primary infection is commonly followed by the establishment of latent infection in the cranial nerves, sensory, ganglia, and spinal dorsal root ganglia, often for decades, without clinical manifestations. How herpes zoster develop? When the cell-mediated immunity wanes with age or following immuno-suppressive therapy, the virus may reactivate,

resulting in herpes zoster. It is, a painful, vesicular, pustular eruption in the distribution of one or more sensory nerve roots.

(b) SOURCE OF INFECTION: Usually a case of chickenpox. **Where virus is found?** The virus occurs in the oropharyngeal secretions and lesions of skin and mucosa.

(c) INFECTIVITY: **What is the period of communicability of patients with varicella?** It is estimated to range from 1 to 2 days before the appearance of rash, and 4 to 5 days thereafter

(d) SECONDARY ATTACK RATE: Chickenpox is highly communicable. **What is the secondary attack rate in household contacts?** It approaches 90 per cent

### Host factors

(a) AGE: **Chickenpox occurs primarily among children of how many age?** Under 10 years of age.

(b) IMMUNITY: One attack gives durable immunity; second attacks are rare.

(c) PREGNANCY: Infection during pregnancy presents a risk for the foetus, **what is that?** Congenital varicella syndrome.

Infants, whose mothers had chickenpox during pregnancy, have a higher risk of developing herpes zoster in the first years of life

### Environmental factors

Chickenpox shows a seasonal trend in temperate settings and in most tropical settings, with peak incidence during winter and spring, or in coolest, driest months in the tropics. Periodic large outbreaks occur with an inter-epidemic cycle of 2-5 years. VZV is heat labile. Outside host cell, the virus survives in the external environment for only a few hours, occasionally for a day or two, **how it is readily inactivated?** By lipid solvents, detergents, and proteases

### Transmission

**How Chickenpox is transmitted from person to person?** By droplet infection and by droplet nuclei. Most patients are infected by "face-to-face" (personal) contact. The portal of entry of the virus is the upper respiratory tract or the conjunctiva. Since the virus is extremely labile, it is unlikely that fomites play a significant role in its transmission.

**What is Incubation period?** Usually 14 to 16 days, although extremes as wide as 10 to 21 days have been reported.

### Clinical features

Clinical features.

The clinical spectrum of chickenpox may vary from a mild illness with only a few scattered lesions to a severe febrile illness with widespread rash. The clinical course of chickenpox may be divided into two stages:

(A) PRE-ERUPTIVE STAGE: Onset is sudden with mild or moderate fever, pain in the back, shivering and malaise. This stage is very brief, lasting about 24 hours. In adults, the prodromal illness is usually more severe and may last for 2-3 days before the rash comes out.

(B) ERUPTIVE STAGE: In children the rash is often the first sign. It comes on the day the fever starts.

### What are the distinctive features of the rash?

(a) Distribution: The rash is symmetrical. It first appears on the trunk where it is abundant, and then comes on the face, arms and legs where it is less abundant. Mucosal surfaces (e.g., buccal, pharyngeal) are generally involved. Axilla may be affected, but palms and soles are not usually affected. The density of the eruption diminishes centrifugally.

(b) Rapid evolution: The rash advances quickly through the stages of macule, papule, vesicle and scab. In fact, the first to attract attention are often the vesicles filled with clear fluid and looking like "dew-drops" on the skin. They are superficial in site, with easily ruptured walls and surrounded by an area of inflammation. Usually they are not umbilicated. The vesicles may form crusts without going through the pustular stage. Many of the lesions may abort. Scabbing begins 4 to 7 days after the rash appears.

(c) Pleomorphism: A characteristic feature of the rash in chickenpox is its Pleomorphism, that is, all stages of the rash (papules, vesicles and crusts) may be seen simultaneously at one time, in the same area. This is due to the rash appearing in successive crops for 4 to 5 days in the same area.

(d) Fever: The fever does not run high but shows exacerbations with each fresh crop of eruption.

### Complications

In most cases, chickenpox is a mild, self-limiting disease. The mortality is less than 1 per cent in uncomplicated cases. However, varicella may be accompanied by severe complications particularly in immunosuppressed patients and may also occur in normal children and adults. **What are those complications?** These include haemorrhages (varicella haemorrhagic), pneumonia, encephalitis, acute cerebellar ataxia and Reye's syndrome (acute encephalopathy associated with fatty degeneration of the viscera especially liver) Maternal varicella during pregnancy may cause foetal wastage and birth defects. **Name the birth defects** such as cutaneous scars, atrophied limbs, microcephaly and low birth weight, cataract, microphthalmia, chorioretinitis, deafness and cerebro-cortical atrophy.

### Laboratory diagnosis.

During the smallpox post-eradication era the diagnosis of chickenpox is of great importance because of its resemblance to mild smallpox. Laboratory diagnosis is rarely required as clinical signs are usually clear-cut. **Laboratory confirmation of varicella or herpes zoster (HZ) is by detecting VZV DNA using polymerase chain reaction (PCR) or isolating VZV in cell culture from vesicular fluid, crusts, saliva, cerebrospinal fluid or other specimens.** Direct immunofluorescence can also be used for rapid testing though this method has lower sensitivity than PCR.

### Control

**What are the usual control measures?** Those are notifications, isolation of cases for about 6 days after onset of rash and disinfection of articles soiled by nose and throat discharges. Several antiviral compounds provide effective therapy for varicella including **acyclovir, valaciclovir, famciclovir** and foscarnet. Acyclovir can prevent the development of systemic disease in varicella-infected immunosuppressed patients and can halt the progression of zoster in adults. Acyclovir does not appear to prevent post herpetic neuralgia.

### Prevention

#### 1. VARICELLA-ZOSTER IMMUNOGLOBULIN (VZIG)

Varicella-Zoster Immunoglobulin (VZIG) given within 72 hours of exposure has been recommended for prevention of chickenpox in exposed susceptible individuals particularly in **immunosuppressed persons.** **These include** (a) susceptible persons receiving immunosuppressive therapy; (b) persons with congenital

cellular immunodeficiency; (c) persons with acquired immunodeficiency including HIV/AIDS; (d) susceptible and exposed persons, in particular pregnant women; (e) newborns; and (f) premature infants of low birthweight. It has no therapeutic value in established disease. **VZIG is given by** intramuscular injection in a dose of 12.5 units/kg body weight up to a maximum of 625 units, with a repeat dose in 3 weeks, if a high-risk patient remains exposed. Because VZIG appears to bind the varicella vaccine, the two should not be given concomitantly.

## 2. VACCINE

A live attenuated varicella virus vaccine is safe and currently recommended for children **of what age?** **Between 12-18 months of age who have not had chickenpox.** Monovalent vaccine can be administered following one or two dose schedule (0.5 ml each by subcutaneous injection. A 2 dose schedule is recommended for all persons aged 2- 13 years. When 2 doses are administered, the minimum interval between doses is either 6 weeks or 3 months for children (12 months to 12 years of age inclusive), and 4 or 6 weeks for adolescents and adults (13 years of age and older). **Name the Combination vaccines (MMRV) can be administered to children from 9 months to 12 years.** If 2 doses of MMRV are used, the minimum interval between doses should be 4 weeks. It is preferred that the 2nd dose be administered 6 weeks to 3 months after the first dose or at 4-6 years of age. The duration of immunity is not known but is **probably 10 years.**