Influenza vaccination and prevention in children

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2025

Definition of flu

- Definition might be different according to Flu alert status

- Classic definition:

1)Fever
2)Cough or sore throat
3) One of the following items:

- malaise(ill appearance?)
- Neck pain(calf tenderness?)(muscle pain)
- Shivering
- Mucusal irritation
- Hx of contact to suspicious flu case

- Definition during pandemic:

Illness with both of the following:
1)T>38 c
2)cough,sore throat,or dyspnea+constiutional s&s

Differences of findings in pediatric age group

More common features in pediatric patients:

- More sudden onset
- Anorexia
- Abd. Pain & GI s&s
- Very high fever
- Cervical LNP
- Specially in younger kids: non obvious respiratory s&s
- Newborn period: like sepsis
- Febrile convulsion

General Influenza Prevention

- Handwashing with soap and water is the most appropriate way to prevent infection by an influenza virus. Other preventive measures are to avoid touching of eyes or nose before washing hands, and to avoid sharing personal items with another person during an influenza outbreak.
- Patients with influenza who are clinically stable and are able to convalesce at home are instructed to stay at home to avoid spread in the community.

Infection Control

1 CLEAN

Wash your hands often.

Scrub your hands for at least 20 seconds with soap and water or use an alcohol-based hand cleaner.

2 COVER

Cover your cough.

Use a tissue to cover your mouth and nose when you cough or sneeze.

Don't have a tissue? Your sleeve will do.

3 CONTAIN

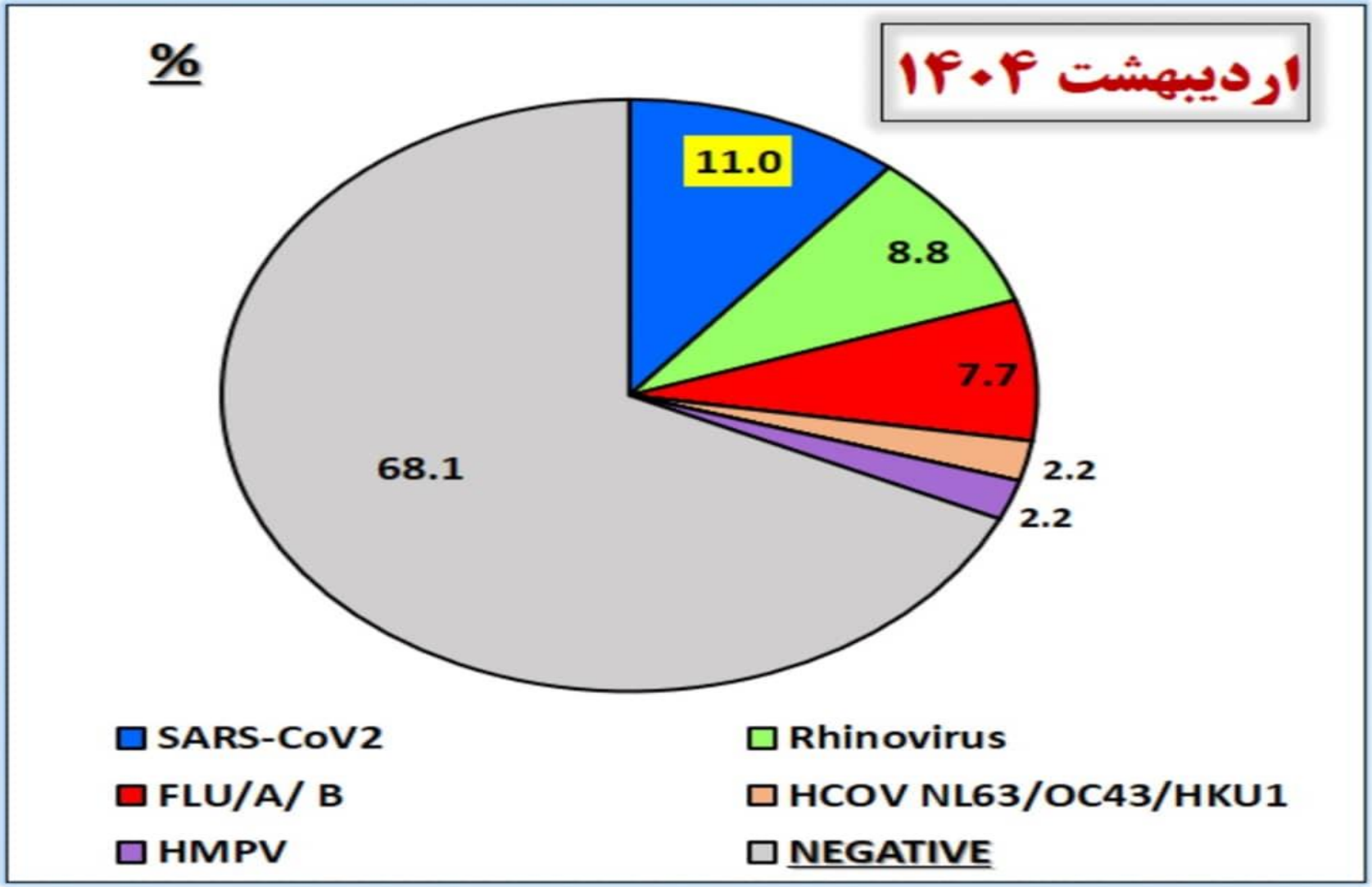
Contain germs by steering clear of others who are sick.

If you do get sick, stay at home until you're well again, so you don't spread more germs.

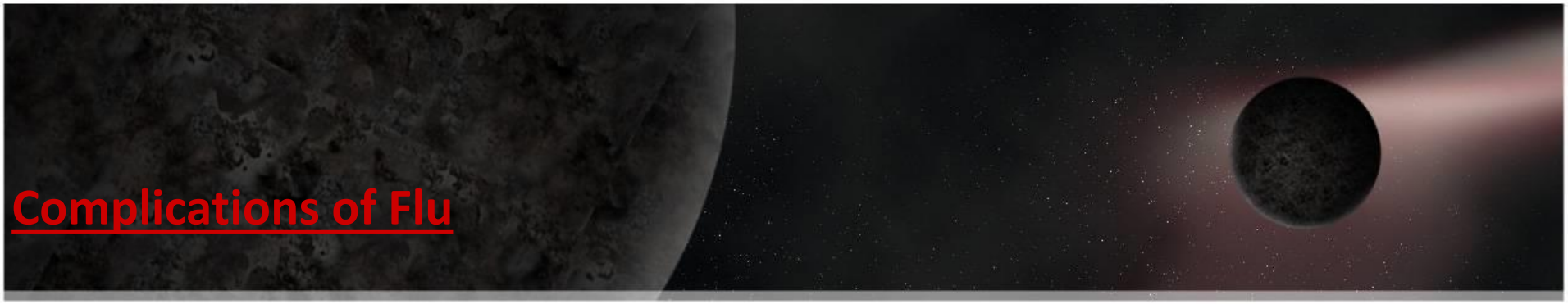
Why should we vaccinate our children againt Influenza virus?

Flu is now an unpredictable disease!

میانگین هفتگی چگالی (درصد مثبت شدن) نمونه های مشکوک به کووید۱۹ و آنفلوانزا
از ابتدای مهرماه۱۴۰۳لغایت هفته پنجم اردیبهشت۱۴۰۴-دانشگاه اهواز



تعداد نمونه اخذ شده از پایگاه های نظام مراقبت
دیده وری تنفسی چند پاتوژن در اردیبهشت ماه 1404: 91



Complications of Flu

•Most flu symptoms gradually improve over two to five days, but it's not uncommon to feel run down for a week or more. A common complication of the flu is pneumonia, particularly in the young, elderly, or people with lung or heart problems(shortness of breath, ,fever that comes back after having been gone for a day or two).

• Ear infections,

•Sinus infections,

•Dehydration, and

•Worsening of chronic medical conditions, such as congestive heart failure, asthma, or diabetes.

Impact of Influenza on Children

- ~9% develop symptomatic infection annually
- Significant morbidity in hospitalized children
  - 20% require ICU care
  - 17% with pneumonia
  - 5% require mechanical ventilation
  - 8-10% experience neurologic complication
  - 0.5% die
- Post-discharge sequelae (critical influenza)

Photo Credit: *Red Book* Online
Influenza pneumonia in a 12-year-old with respiratory failure. Courtesy of Benjamin Estrada, MD

Influenza vaccines

- Active immunisation is the basic mode of action of stimulating
the immune system of the body

- Conventional influenza vaccines induce the production of antibodies against viral antigens

- The vaccine switches the respiratory tract from the naive state to the immune state and leaves the body protected as if it had experienced a disease.

How does inactivated influenza vaccine work?

- Both humoral and cell-mediated responses play a role in immunity
- Administration of inactivated influenza vaccine results in the production of circulating IgG antibodies to the viral haemagglutinin as well as a cytotoxic T lymphocyte response
- Humoral antibody levels, which correlate with vaccine protection, are generally achieved 2 weeks after immunization and immunity usually lasts less than 1 year
  - Initial antibody response may be lower in the elderly with non-adjuvanted TIV and the immune-compromised

AUG. 6, 2025

Advisory Committee on Immunization Practices (ACIP)—United States, 2025-26 Influenza Season

- Everyone 6 months and older, with rare exceptions, should get a flu vaccine every season.
- In September 2024, the FDA approved FluMist, the live attenuated influenza vaccine, for self- or caregiver administration(if they are 18 through 49 years old),FluMist is currently available for administration by a health care provider in a health care setting (including a pharmacy) only. (has the same vaccine virus components) .
- In March 2025, the FDA approved Flublok, the recombinant influenza vaccine, previously approved for ages ≥18 years, for ages ≥9 years

PROIORITIES IN CHILDREN

- All children aged 6 through 59 months.(esp who go to daycare)
- children who have chronic pulmonary (including asthma), cardiovascular (excluding isolated hypertension), renal, hepatic, neurologic, hematologic, or metabolic disorders (including diabetes mellitus).
- Persons who are immunocompromised due to any cause (including but not limited to immunosuppression caused by medications or HIV infection).
- Children and adolescents (aged 6 months through 18 years) who are receiving aspirin- or salicylate-containing medications and who might be at risk for experiencing Reye syndrome after influenza virus infection.
- Residents of nursing homes and other long-term care facilities.
- Persons who are extremely obese .

- Patients with chronic metabolic disease (eg, diabetes), renal dysfunction, hemoglobinopathies, or immunosuppression (eg, human immunodeficiency virus [HIV])
- Persons who have any condition (eg, cognitive dysfunction, spinal cord injuries, seizure disorders, or other neuromuscular disorders) that may compromise respiratory function or the handling of respiratory secretions or that can increase the risk for aspiration

Other target groups for vaccination

1. Children and adolescents (aged 6 months - 18 years) who receive long term aspirin treatment
2. Persons who can transmit influenza to those at high-risk (e.g. schoolchildren, **health-care workers** and household members)
3. Children aged 0 – 59 months, their household contacts and out-of-home caregivers
4. Infants 6 and older up to 18 years
5. Anyone wishing to reduce risk of influenza

- For adults and older children, the recommended site of vaccination is the deltoid muscle
- The preferred site for infants and young children is the anterolateral aspect of the thigh
- Influenza vaccine should be administered during the autumn season in the Northern Hemisphere

2025-2026 VACCINE COMPONENTS

- The composition of flu vaccines has been updated. Flu vaccines for the U.S. 2024-2025 season will contain the following:
- **Egg-based vaccines**
- an A/Victoria/4897/2022 (H1N1)pdm09-like virus;
- an A/Thailand/8/2022 (H3N2)-like virus; and (Updated)
- a B/Austria/1359417/2021 (B/Victoria lineage)-like virus.

How does live attenuated influenza vaccine work?

- Immune mechanisms conferring immunity following administration of live attenuated vaccine are not fully understood
- Administered by the intranasal route, QLAIV is thought to result in an immune response that mimics that induced by natural infection with wild-type virus, developing both mucosal and systemic immunity
- Serum antibodies, mucosal antibodies and influenza-specific T cells may play a role
- The viral strains in QLAIV are engineered to be cold adapted (can only replicate in the nasopharynx), temperature sensitive (cannot replicate in the warm temperatures of the lower airways and lungs) and attenuated (unable to cause clinical disease)

Effectiveness of influenza vaccine

- Vaccine effectiveness depends on the similarity between vaccine strains and the strains in circulation during influenza season, as well as individual factors.
  - Influenza immunization prevents disease in 45-85% of healthy individuals
  - In the elderly vaccine effectiveness is about half of that of healthy adults; however influenza immunization decreases the incidence of pneumonia, hospital admission and death in the elderly, and reduces exacerbations in persons with chronic obstructive pulmonary disease
- Vaccine efficacy of 50% in healthy adults has been identified during select seasons of vaccine mismatch. A vaccine that is not perfectly matched can still offer protection against related viruses making illness milder and preventing complications.

Facts about inactivated influenza vaccine (TIV/QIV)

- Is an inactivated (killed) vaccine – cannot cause influenza disease in the vaccine recipient
- The virus is grown in hens' eggs, inactivated, broken apart and highly purified
- In addition to the antigen, the vaccine may contain:
  - Thimerosal (preservative in multi-dose vials)
  - Trace residual amounts of egg proteins, formaldehyde, kanamycin, neomycin, gentamicin, cetyltrimethylammonium bromide (CTAB), polysorbate 80, sodium deoxycholate and sucrose
- Check the product monograph as ingredients vary with specific inactivated influenza vaccines

Influenza vaccine dosing for specific ages

6 months up to & including 8 years of age

- 2 doses* if never been previously immunized with seasonal influenza vaccine (spaced 4 weeks apart – minimum interval)
- 1 dose only if previously immunized with seasonal influenza vaccine

9 years of age and older

- 1 dose

* This recommendation applies whether or not the child received monovalent pH1N1 vaccine in 2009-2010.

Pregnancy and breastfeeding

- TIV*/QIV is safe for pregnant women at **all** stages of pregnancy
- TIV*/QIV and QLAIV are safe for breastfeeding mothers
- QLAIV is contraindicated in pregnant women

Contraindications to TIV/QIV

TIV/QIV should not be administered to individuals who:

- Are less than 6 calendar months of age
  - Fluad® should not be administered to persons under 65 years of age
- Have had an anaphylactic reaction to a previous dose of influenza vaccine
- Have a known hypersensitivity to any component of the vaccine with the exception of egg
- Have been diagnosed with Guillain-Barré Syndrome within 6 weeks of a previous dose of influenza vaccine
- Have experienced **severe** Oculorespiratory Syndrome (ORS) within 24 hrs of receiving influenza immunization – these individuals should be assessed further prior to immunizing

ORS

- consists of one or more of the following: red eyes, acute respiratory symptoms (including respiratory distress, throat tightness and/or chest discomfort), and facial oedema. There may or may not be associated systemic symptoms, including high fever. Symptoms vary from mild to severe, resolving fully within 48 hours.

- Characteristically, the onset of symptoms is 2-24 hours after immunization, more commonly in women than in men, and particularly in the age group 40-59 years. First-time recipients and subjects with an allergic predisposition are especially susceptible. It is not clear why there is special predisposition in these subjects

- The reaction is not anaphylactic, and although an immunological mechanism has been proposed, its nature is not defined.

Egg-allergic individuals

- Egg allergy is no longer considered a contraindication for **inactivated** or **live** influenza vaccine (TIV/QIV/QLAIV)
- Egg-allergic individuals may be immunized using TIV/QIV/QLAIV without a prior influenza vaccine skin test and with the full dose of vaccine, irrespective of a past severe reaction to egg
- Egg-allergic vaccine recipients should be kept under observation for 30 minutes following the administration of inactivated influenza vaccine

Vaccine deferral

Vaccine may be deferred until later in the following situations:

- Those with **serious acute febrile illness** usually should not be immunized until symptoms have abated

Vaccine does not require deferral and can safely be given to the following individuals:

- Those with mild acute illness, with or without fever
- Individuals who are recovering from illness or are taking antibiotics