Hib vaccination

What is Hib?[1] [2]

Haemophilus influenzae can cause serious invasive disease, especially in young children. Invasive disease is usually caused by encapsulated strains of the organism. Six typeable capsular serotypes (a–f) are known to cause disease; non-typeable encapsulated strains can occasionally cause invasive disease.

Before the introduction of vaccination, type b (Hib) was the prevalent strain. Non-encapsulated strains are mainly associated with respiratory infections such as exacerbation of chronic bronchitis and otitis media.

The most common presentation of invasive Hib disease is meningitis, which accounts for approximately 60% of all cases. 15% of cases present with epiglottitis. The remainder is made up of cases of septic arthritis, osteomyelitis, cellulitis, pneumonia and pericarditis.

- During 2022 (January to December), there were 608 confirmed cases of invasive Haemophilus influenzae (Hi). This was a 57% increase compared to 2021 (608 in 2022 compared with 387 in 2021).
- Restrictions due to the COVID-19 pandemic were associated with reductions in a number of infections, including invasive Haemophilus influenzae disease, during 2020, with cases remaining low during 2021 and since rebounding in 2022.
- Of those serotyped, most isolates were non-encapsulated Haemophilus influenzae (80.5%; 429 of 533).
- In 2022 and 2021, there were 7 cases of invasive H. influenzae serotype b (Hib) disease, accounting for 1.3% (7 of 533) and 2.0% (7 of 344), respectively.
- In 2022, all Hib cases were identified in persons over the age of 15, while 2 of the cases in 2021 were in children under the age of 5 years.

- Most invasive H. influenzae infections (83.4%) in 2022 were in adults aged 15 years and over. This was followed by cases in infants aged less than 1 year, which accounted for 8.4% of cases in 2022 compared to 5.7% in 2021.
- While there was a slight increase in the number of cases in the 1 to 4 and the 5 to 14 years age groups from 2021 to 2022, the proportion of cases in those aged 1 to 4 years of age has slightly decreased (7.2% to 4.8% from 2021 to 2022).
- The incidence of invasive H. influenzae due to any serotype remains higher in children aged under 5 years (2.6 per 100,000 population), compared to those aged 5 years and older (1.0 per 100,000 population) but overall the total incidence remains very low (1.1 per 100,000 population in 2022 and 0.7 per 100,000 in 2021).
- There were no deaths attributed to invasive Hib disease in 2022 and 2021. The most recent deaths attributed to invasive Hib disease were in 2015, in an adult, and in 2011, in a child.
- In 2022, invasive Hib disease continued to be well controlled across all age groups.

See also the article on Haemophilus Influenzae.

What is the Hib vaccination? [1]

Expression of the polysaccharide capsule increases bacterial virulence and is associated with severe disease. Vaccination confers protection by induction of anticapsular antibodies and immunological memory. Conjugate Hib vaccines were introduced during the 1990s and are considered safe and highly efficacious.

Efficacy and coverage of Hib vaccine

The introduction of the Hib conjugate vaccine in the UK has resulted in more than 90% reduction in the incidence of invasive Hib disease.

The clinical efficacy of the conjugate Hib vaccines is estimated as 83-100%. [3] The vaccination also reduces nasopharyngeal carriage in asymptomatic carriers and therefore confers herd immunity to unvaccinated children.

One analysis has shown that approximately three quarters of meningitis deaths are preventable with the existing Hib vaccine and pneumococcal conjugate vaccine (PCV).[4]

UK programmes[1]

Conjugate Hib vaccination was introduced into the UK routine childhood immunisation schedule in 1992. In 1996, the single Hib vaccine was replaced by a diphtheria, tetanus, pertussis and *Haemophilus influenzae* type b (DTP/Hib) combination.

The original DTP/Hib combination was replaced by the current diphtheria, tetanus, acellular pertussis/inactivated polio/*Haemophilus influenzae* type b (DTaP/IPV/Hib) vaccine in 2004.

The choice of Hib-containing vaccine to be used at different ages will depend on what other immunisations the child has already received and on the availability of suitable preparations.

How common is the Hib vaccination? (Epidemiology)

The introduction of immunisation in the UK caused an immediate decline in the incidence of Hib. The control of Hib disease in the UK is currently the best that has been achieved since the introduction of the routine Hib vaccination.[5]

Cases of invasive Hib disease have declined since the introduction of the Hib conjugate vaccine in 1992 and have remained at low levels since the introduction of the 12-month booster in 2006.[2]

Preparation[1]

Hib vaccines are composed of capsular polysaccharide from cultured *Haemophilus influenzae* type b bacteria, conjugated to protein to strengthen immunogenicity.

The Hib vaccine is available as:

- DTaP/IPV/Hib vaccine.

- Hib/meningitis C (Hib/MenC) combined vaccine.

Although the current DTaP/IPV/Hib vaccine contains an acellular pertussis component, the preparation does induce an effective immunological response to Hib antigens.

Administration[1]

Hib vaccines are injected intramuscularly. Upper arm or anterolateral thigh sites are recommended to minimise the risk of local reactions. Other vaccinations such as measles, mumps, rubella (MMR), MenC or hepatitis B can be given at the same time but should be injected at an alternative site and preferably in a different limb.

The Infanrix-IPV + Hib® is a combination vaccine that protects infants against diphtheria, tetanus, whooping cough, polio and *Haemophilus influenzae* type b. This vaccine requires reconstitution before being administered, whereas the alternative, Pediacel®, is in a pre-filled syringe.

There is no evidence that the immune responses elicited by the combined vaccine are any different from or equivalent to the separate vaccines.[6]

Schedule[1]

All infants should receive the primary Hib immunisation course. The DTaP/IPV/Hib vaccine is given at 2, 3 and 4 months of age.

Children also receive a booster of Hib (as Hib/MenC) vaccine at 12 months (given at the same time as MMR and PCV).

For uncertain or incomplete immunisation status- regimen as follows:[7]

- Children from first up to second birthday:
    - DTaP/IPV (polio)/Hib/HepB and PCV13 (pneumococcus) and Hib/MenC and MenB and MMR.
    - Four week gap.
    - DTaP/IPV/Hib/HepB.
    - Four week gap.
    - DTaP/IPV/Hib/HepB and MenB.
- Children from second up to 10th birthday:
    - DTaP/IPV/Hib/HepB, and Hib/MenC and MMR.
    - Four week gap.
    - DTaP/IPV/Hib/HepB and MMR.
    - Four week gap.
    - DTaP/IPV/Hib/HepB.

See also the article on UK Immunisation Schedule.

Recommendations[1]

Immigrants

Children from developing countries may not have received the vaccination. If the history is unclear, children are considered unimmunised and should complete the full UK immunisation schedule.

Splenic dysfunction or complement deficiency

These Individuals are at increased risk of invasive Hib infection:

- Children under 2 years of age should complete the primary immunisation course including Hib/MenC at 12 months, and then a MenACWY conjugate vaccine at least a month after the MenC.

- They also need a second Hib/Men C after their second birthday, with a pneumococcal booster - pneumococcal polysaccharide vaccine (PPV). (**NB**: if their previous PCV booster dose was PCV7 rather than PCV13 (before April 2010), they need two pneumococcal vaccines - give PCV13 first, with a PPV two months later.)
- Children aged 2-5, having completed the normal primary course and one booster, aged around 1 year, need a Hib/MenC booster with a PCV13 booster (as they will have had PCV7), followed by a MenACWY conjugate vaccination a month later and a PPV booster a further month afterwards.
- Children aged over 5 and adults need a Hib/MenC booster with a PPV booster, followed by a MenACWY conjugate vaccine a month later.

Patients undergoing splenectomy should ideally be offered the vaccines two weeks before surgery, or as soon as possible postoperatively.

Index cases

Unimmunised patients with diagnosed Hib infections should be immunised, as recurrence of disease can occur. Patients who have been immunised but later acquire Hib infection may benefit from a booster dose of vaccine, depending on convalescent antibody levels.

Contacts

Children who are household contacts of an index case should be fully immunised as per previous recommendations.

Contra-indications[1]

The vaccination should not be administered to individuals with:

- Confirmed anaphylactic reaction to a previous dose of the Hib-containing vaccine.
- Confirmed anaphylactic reaction to any components of the vaccine.

The following situations do not prohibit vaccination:

- History of a stable neurological condition, seizures or febrile convulsions (without neurological deterioration).

- As there is no evidence of increased risks of adverse reactions from vaccinations in preterm babies, premature infants should receive vaccinations at appropriate chronological age, according to the schedule.
- Fever, persistent screaming, severe local reactions or hypotonic-hyporesponsive episodes following previous Hib-containing vaccinations.
- Immunosuppression including HIV infection (but individuals may not achieve an adequate immunological response and may benefit from re-immunisation).
- Pregnancy or breast-feeding.

Further reading

- Slack MPE, Cripps AW, Grimwood K, et al; Invasive Haemophilus influenzae Infections after 3 Decades of Hib Protein Conjugate Vaccine Use. Clin Microbiol Rev. 2021 Jun 16;34(3):e0002821. doi: 10.1128/CMR.00028-21. Epub 2021 Jun 2.
- Zarei AE, Almehdar HA, Redwan EM; Hib Vaccines: Past, Present, and Future Perspectives. J Immunol Res. 2016;2016:7203587. doi: 10.1155/2016/7203587. Epub 2016 Jan 20.

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