

REDUCING HYDROCEPHALUS RISK FACTORS



Whilst little is known about the direct causes of hydrocephalus, we do know that certain conditions/circumstances can increase the likelihood of developing hydrocephalus, such as having spina bifida, being born prematurely, or developing certain infections

NTD

We know that approximately 85% of the babies born with spina bifida will also develop hydrocephalus. Up to 72% of cases of spina bifida could be prevented if all women who could get pregnant took folic acid at the correct time and dose. By maximising the risk reduction of folic acid preventable NTDs, and improving education and public health promotion around additional risk factors for NTD, we will also help to reduce the occurrence of hydrocephalus when it occurs alongside spina bifida.

Premature birth

Congenital hydrocephalus can also occur in babies that are born prematurely, as a result of an intraventricular haemorrhage (IVH) (a bleeding into the ventricles inside the brain). More severe bleeds can result in blood clots which can block the flow of cerebrospinal fluid (CSF). This kind of haemorrhage is more common in babies that are born very early, when the blood vessels are underdeveloped and very fragile. Whilst pregnant women who are known to be at high risk of delivering early may be given medicines called corticosteroids which can help to reduce the baby's risk for IVH, most mums-to-be will not have prior warning that their baby will be born prematurely. So, in order to reduce the risk of hydrocephalus caused by IVH, we need to reduce the known risks associated with premature birth, including:

Obesity

In addition to increasing the risk of NTD (and subsequently associated hydrocephalus), being very overweight or obese also increases the risk of premature birth, thus increasing the risk of hydrocephalus as a result of IVH. Currently, more women than men in Europe are obese. Since 2010, numbers have doubled in some countries, with 1/3 of pregnant women being obese. The risks associated with obesity increase with increasing BMI, the higher the BMI, the higher the risk. Maternal obesity is a greater issue in more affluent countries, those at greatest risk being teenage mothers and women of lower socio-economic status. It is vital that more is done to educate women about achieving a healthy weight prior to conception.

Weight gain in pregnancy

Both excessive and too little weight gain during pregnancy increases the risk of adverse birth outcomes, including prematurity. Ensuring that weight is gained at the correct rate reduces the risk of premature birth.

Smoking

Smoking in pregnancy increase the risk of adverse birth outcomes including preterm birth. No amount of smoking during pregnancy should be considered 'safe', and women should ideally give up smoking before conception, or at least once their pregnancy has been confirmed. It's difficult to ascertain the number of women who still smoke during pregnancy as these statistics tend to be self-reported. Smoking during pregnancy doubles the risk of having a preterm birth, the more you smoke the more the likelihood increases. However, stopping smoking at any time during pregnancy will help to reduce the risk. Studies suggest that stopping smoking during pregnancy could prevent up to 15% of premature births. More generally, smoking negatively impacts immune function, increasing the risk of infections.

Infection

Infection increases the risk of hydrocephalus, and also increases the risk of premature birth, and subsequently hydrocephalus as a result of intraventricular haemorrhage (IVH). See section below for further information on infections. Much research needs to be done to advance our understanding of the causes, and subsequently the effective prevention of post-infectious hydrocephalus. Any number of infections may be responsible for causing hydrocephalus, and it is vital that we identify as many of these infections as possible, especially if we are to have a measurable impact on the primary prevention of hydrocephalus in the developing world. Key factors to address the risk of general global infections include:

- Effective and sustained vaccination programmes
- Improvements in nutrition (particularly maternal and child nutrition)
- Improvements in living standards
- Improvements in healthcare provision
- Reduction in poverty

Meningitis

One infection that has been identified as a causal factor for hydrocephalus is the brain infection, Meningitis, which infects the membranes around the brain and spinal cord. Bacterial meningitis remains a serious threat to global health, accounting for an estimated annual 170 000 deaths worldwide. The most effective way to protect against meningitis is to complete the recommended schedule of vaccinations. However, as with other vaccines, this does not provide 100% protection, and not all strains can be vaccinated against. There are currently vaccines for 3 types of bacteria that can cause meningitis:

- Neisseria meningitidis
- Streptococcus pneumoniae
- Haemophilus influenzae type b (Hib)

Due to the global success of the Hib vaccine, the neisseria meningitidis and streptococcus pneumoniae bacteria have become the commonest causes of bacterial meningitis in the world. Meningococcal meningitis (caused by the neisseria meningitidis bacteria), is the variant commonly responsible for cluster outbreaks, the largest burden of which occurs in an area of sub-Saharan Africa known as the meningitis belt, which includes 26 countries and stretches from Senegal to Ethiopia. There are a number of factors contributing to the outbreaks seen in this region. [For more information see the WHO factsheet.](#)

Epidemics in the meningitis belt constitute an enormous public health burden. Whilst an extensive and successful vaccine programme has been implemented within this region to target children aged 1-18 and adults under 30 years of age, available data suggests that it's during the first month of life that babies/children are at greatest risk of developing post-infectious hydrocephalus. Anyone contracting meningitis should also be treated with antibiotics as soon as possible. The risk of infection spreading is greatly increased where individuals live in close proximity to one another, or in those with already weakened immune systems, such as babies, young children and the elderly.



Chlamydia and Bacterial Vaginosis

Chlamydia is a common, sexually transmitted bacterial disease which is passed from one person to another through having unprotected sex.

Although chlamydia can be treated with antibiotics, around 70% of women with the infection don't experience any symptoms. Some women may also experience symptoms many months after having unprotected sex. So, whilst on the surface Chlamydia may not appear a serious condition, left untreated it can seriously affect a woman's future fertility. Chlamydia has been shown to significantly increase the risk for preterm birth (2-3 fold increase). Women that have chlamydia during pregnancy are also 50% more likely to also suffer from another common infection, bacterial vaginosis, which although not a serious condition, is also considered a risk factor for preterm birth as it increases the risk of premature rupture of the membranes and placental inflammation. Women who are planning a pregnancy (particularly those who have experienced previously spontaneous preterm births) may want to consider getting tested for these common infections.

Depression, stress and anxiety

The increase in women being now being diagnosed with mental health conditions has encouraged more research into the impact that mental health conditions may have on pregnancy. Depression, as well as high levels of stress and anxiety have been indicated as possible risk factors for preterm labour. It is vital that any pre-existing mental health conditions are accurately diagnosed and treated, as untreated mental health conditions may also lead to the adoption of harmful prenatal behaviours, such as poor nutrition, smoking, alcohol and other substance abuse, further increasing the risks associated with pre-term birth.

Alcohol consumption

Alcohol is a teratogen that can affect the development of the central nervous system and multiple organ systems, and can increase the risk of preterm birth. It crosses the placenta during pregnancy, affecting placental function and transport and metabolism of vital nutrients. Alcohol consumption during pregnancy can affect the foetus in a number of ways, the damage caused to the developing baby being dependent on the level and frequency of the maternal alcohol consumption and the stage of pregnancy during which the alcohol is consumed. It is not known how much (if any) alcohol consumption is 'safe' during pregnancy, but many more pregnancies could be protected by promoting abstinence during pregnancy rather than 'safe' limits.