Misconceptions around Invasive Meningococcal Disease and Meningococcal Vaccines

Jenny O’Connor1, Julie Thornton2, Catherine Heffernan3, Emily Edmundson4, Sarah Goffin5

1. Goring and Woodcote Medical Practice, 2. Essex Partnership University NHS Foundation Trust, 3. London School of Health and Tropical Medicine, 4. Hounslow and Richmond Community Healthcare NHS Trust, 5. Sanofi Pasteur UK

Abstract
Meningococcal meningitis is a subset of Invasive Meningococcal Disease (IMD) that affects 1.2 million per annum globally,1 with children under 5 years old being the most likely to contract IMD.2 Whilst IMD caused by meningococcal strains A, B, C, W and Y can be prevented through vaccination, common public misconceptions regarding both meningitis and meningococcal vaccination have been shown to have a negative impact on vaccine coverage rates (VCRs).3

Herein we discuss some of the common misconceptions about meningitis and meningococcal vaccines, as well as strategies that healthcare professionals (HCPs) can utilise to help support public understanding of these topics and help improve VCRs.

MYTH There is just one type of meningitis
The biggest challenge with this myth is that people may believe that a single meningococcal vaccination may protect against all types of meningitis, including all of the different bacterial sub-strains. Whilst meningitis serves as an umbrella term, it can be caused by viruses, bacteria, fungi or parasites (see ‘Table 1’).

Table 1. Pathogens that can cause meningitis

Pathogen | Examples
--- | ---
Bacteria | Neisseria meningitidis, Streptococcus pneumoniae, Haemophilus influenzae type b
Viruses | Herpes Simplex Virus, Human Immunodeficiency Virus, Mumps Virus
Fungi | Cryptococcus, Candida, Blastomyces
Parasites | Angiostrongylus cantonensis, Baylisascaris procyonis

Meningitis can be caused by a variety of different pathogens (Table 1). Of the 12 identified N meningitidis serogroups, 5 serogroups (A, B, C, W and Y) are responsible for most cases of IMD and are currently preventable with vaccination.4 Numerous vaccines help prevent common pathogens. The measles, mumps, rubella (MMR) vaccine helps protects against meningitis due mumps virus.5 Mumps cases doubled in the last few years due to vaccine hesitancy (nhs.uk).6 In addition, before the pneumococcal vaccine, 50 children under the age of 2 years old died each year, with one-third of these deaths as a result of meningitis.

While some meningitis types currently have no specific vaccines, preventive measures such as good respiratory hygiene and minimising overcrowding could help reduce the likelihood of contracting the non-vaccine strains of meningococci, pneumococci, and Haemophilus influenzae.

MYTH A rash is always present with meningitis
Whilst many individuals may be familiar with the characteristic non-blanching rash that is associated with meningitis, a rash is a very late sign and is associated with septicaemia (blood poisoning).
It is important not to wait for this and instead seek urgent medical attention as soon as symptoms develop (e.g. fever, severe headache, confusion) to ensure that the individual receives prompt treatment. Meningitis can kill in less than 24 hours7 and is associated with long-term sequelae in up to 20% of survivors.8

MYTH Meningitis is easy to diagnose
Whilst meningitis may have certain characteristics such as the photophobia and non-blanching rash that may aid diagnosis, these are not present in all cases and thus patients and carers may not seek treatment. ‘Table 2’ indicates typical CSF findings for both viral and bacterial meningitis as an example of biochemical differentiation. Early stages can be hard to recognise and often get mistaken for flu with fever and headache.9 In addition, the symptoms can overlap with COVID-19.10

Seek medical help urgently if you suspect meningitis.

Table 2. Typical CSF findings in infectious meningitis11

<table>
<thead>
<tr>
<th>Cause of meningitis</th>
<th>White blood cell count (x10⁶ cells/L)</th>
<th>Predominant cell type</th>
<th>CSF: serum glucose (normal: 50-110)</th>
<th>Protein (g/L) (normal: 0.2-0.4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viral</td>
<td>50-1000</td>
<td>Mononuclear (may be neurophilic early in course)</td>
<td>≤0.5</td>
<td>≤4.0-4.8</td>
</tr>
<tr>
<td>Bacterial</td>
<td>100-5000</td>
<td>Neutrophilic (mononuclear after antibiotics)</td>
<td>&lt;0.5</td>
<td>0.5-2.0</td>
</tr>
</tbody>
</table>

MYTH Meningococcal vaccine can cause meningococcal disease
A common misconception is that vaccines can cause the disease they are meant to prevent. However, it is not possible to get meningitis from a vaccine. This can be an ideology feeding into vaccine hesitancy, which the WHO have cited as a top-10 threat to world health in 2018.11

Vaccines can cause mild side effects, including pain and swelling around the injection site. However, these are minor compared to the severe outcomes of meningitis. Although meningitis is relatively rare, it can result in death in 8-15% of people who contract it.12 In those who survive, up to 20% can have long-term health problems.13

Since the introduction of the Men C vaccination programme, IMD cases due to capsular group C reduced dramatically by 90% in all age groups immunised.14 In addition, cases in other age groups fell by approximately two-thirds, which might be due to decreased carriage rates.

MYTH Meningitis is always fatal
Most people will survive, however it is worth noting that rapid diagnosis and treatment is key, given that meningitis can be fatal within 24 hours.15 For those who experience complications (up to 20%), these can be severe such as amputation or deafness, and may require lifelong management.16

What can Healthcare Professionals do to Support Their Patients?
To ensure that the public is fully aware of the key aspects of meningitis, visual aids and education leaflets should be made available for parents and carers as well as adolescents and adults being vaccinated. HCPs also require adequate training on early detection of meningitis and access to early referral and treatment.

Work could also be done to support schools to send letters if cases occur, to assist parents with early detection and prevent uninfomed rumours, as well as providing text messages with link to NHS information. Parents and teenagers need to be fully informed in order to consent to vaccination.

Acknowledgements
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References
2. Laboratory confirmed cases of invasive meningococcal infection in England: October to December 2020 - GOV.UK (www.gov.uk) (accessed 11/08/2021)
18. Anderson, S., JMF conference presentation, 2019

Abbreviations
MMR: measles, mumps and rubella
PCV13: pneumococcal conjugate vaccine
WHO: World Health Organization
IMD: Invasive Meningococcal Disease
Hib: Haemophilus influenzae type B
HCPs: Healthcare Professionals
CSF: Cerebrospinal Fluid
VCR: Vaccine Coverage Rates

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