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Neonatal meningitis: background to the studies

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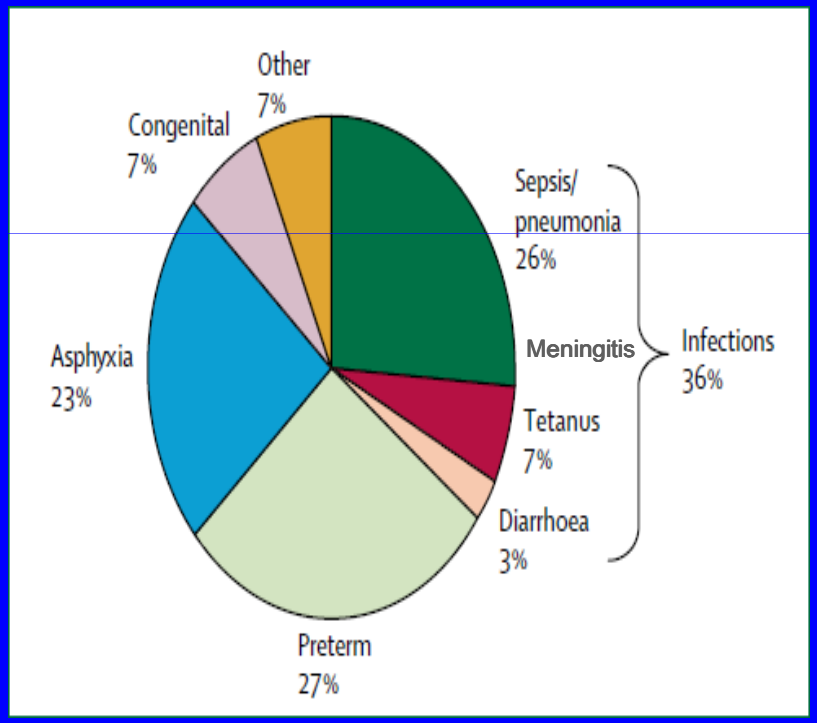
Infections in neonates: the global picture

- Burden of infectious diseases in early life is considerable:
  - 1.4 million neonates die annually of infection
  - 36% of all neonatal deaths are due to infection

  - The neonatal period has the highest incidence of infection of any age
    - including **meningitis**



Lancet 2005;365:891-900

Classification of brain infections

1. Acute bacterial meningitis

2. Acute viral meningitis

3. Acute focal infections (e.g. brain abscess)

4. Chronic bacterial meningitis

How common is neonatal bacterial meningitis?

Location	Period	Incidence /1000 live births	Low birth weight babies (< 2500g)
Leeds	1947-60	0.5	
USA	1959-66	0.46	1.36
California	1962-87	0.3	2.8
E+W	1985-7	0.2	2.5
Oxford	1984-91	0.25	
E+W	1996-7	0.2	1.7

~ 250 - 300 cases / year in the UK

UK	2010-11	?	?

Which bacteria cause neonatal meningitis?

- *Streptococcus agalactiae*
  (Group B Streptococcus)
- *Escherichia coli (E. coli)*
- *Streptococcus pneumoniae*
- *Listeria monocytogenes*

Which bacteria cause neonatal meningitis?

(% of cases)

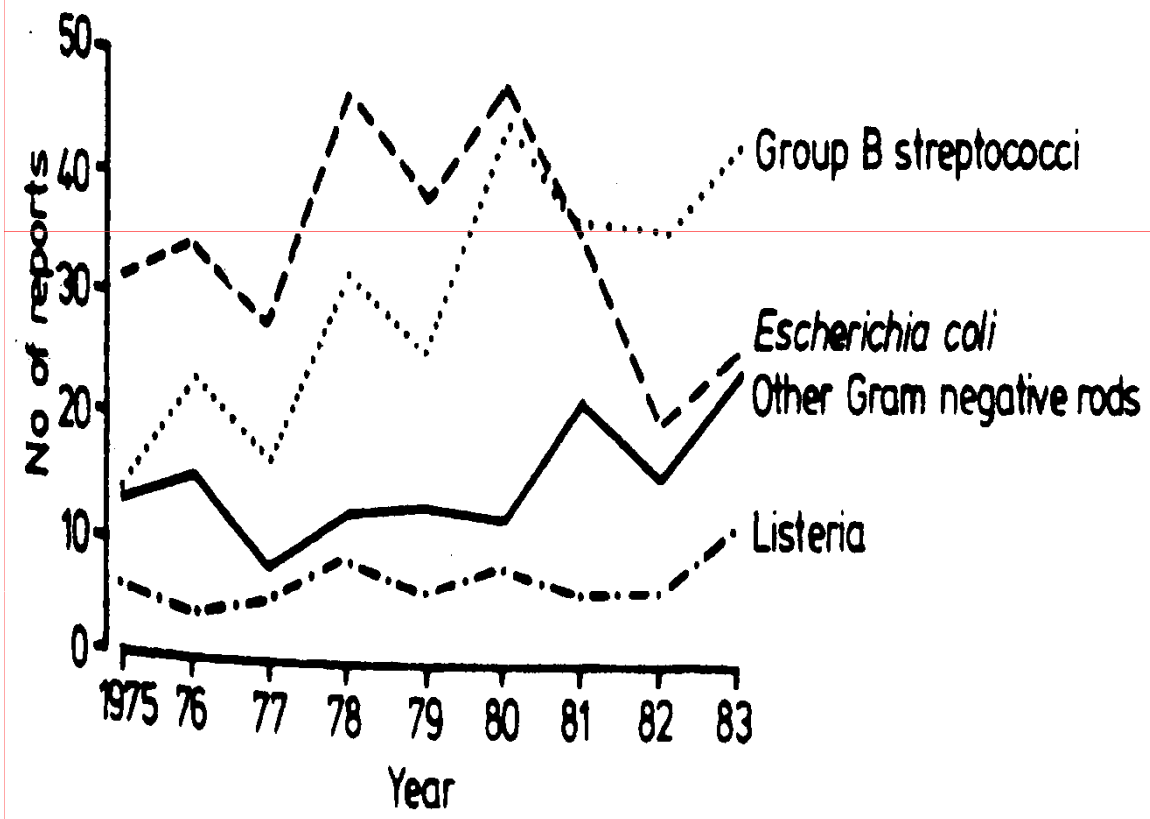


FIG 3—Organisms implicated in cases of neonatal meningitis.

	E+W	E+W	France	UK
	1985-7	1996-7	2001-7	2010-11
	39	**48**	**59**	
	26	**18**	**28**	?
	12	**8**	**4**	
	6	**6**	**6**	
	7	**5**	**2**	

What is the mortality from neonatal meningitis?

- E+W 1985-7:
  - GBS 27/112 = 22% overall 25%
  - *E coli* 18/72 = 25%

(Arch Dis Child 1991;66:603-7)

- E+W 1996-7:
  - GBS 8/69 = 12% overall 10%
  - *E coli* 4/26 = 15%

(Arch Dis Child Fetal Neonatal Ed 2001;84:F85-9)

- UK 2000-1:
  - GBS 16/109 = 12%

(Lancet 2004;363:292-4)

- UK 2010-11: ?

What is the disability due to neonatal meningitis?

	1985-7	1996-7	2011-12
	n = 274	n = 166	
severe	7%	5%	
moderate	18%	18%	
mild	24%	26%	
none	50% ⟷	51%	?

BMJ 2001;323:1-5; Eur J Pediatr 2005;164:730–4

Neonatal meningitis: can we do better?

diagnosis

- babies with meningitis have non-specific clinical signs…
- the diagnosis has to be made by performing a lumbar puncture:
  - → **L.P. needs to be part of a routine screen** for possible sepsis…….
  - → but how often are LPs performed?

Are cases of meningitis being missed?

- 63% had ≥ 1 BC, 30% had ≥ 1 LP
- Meningitis in 5% of those with an LP

Pediatrics 2004;113(5):1181-6

Neonatal meningitis: can we do better?

antibiotic therapy: current UK practice

- 45% include a cephalosporin
  - In 12%, cephalosporin as monotherapy
- 19% do not include any penicillin

Can antibiotic treatment of meningitis cases be improved?

Journal of Antimicrobial Chemotherapy (2008) 61, 743–745

Neonatal meningitis: can we do better?

risk factors for poor outcome

E.Coli (85/14)	OR (death)
Hypotension on admission	8.4
Hypotension @ 12h	36
Seizures @ 12 h	11

GBS (76/5)	OR (death)
Shock @ presentation	24
↓ platelets	42

Can the early medical management of meningitis cases be better?

GBS (237/39)	OR (death)
shock	23
coma	16
Seizures	6

coma	<0.001
inotropes	<0.001
seizures	<0.001

Improving the outcome of neonatal meningitis
can we do better?

…….probably YES!

- Better management….
  - Earlier recognition & diagnosis?
  - Earlier use of appropriate antibiotics?
  - Better early supportive care?

Bacterial meningitis in babies <90 days of age: defining the current burden of disease and identifying opportunities for improving the outcome. (NEOMEN)

Objectives:

To define

- the minimum incidence of meningitis in the UK and Ireland;
- the bacterial pathogens (and the antibiotic resistance profiles);
- the clinical presentation;
- the mortality and short-term complication rates of meningitis;
- the current management.

- To identify opportunities for improving the outcome through detailed analysis of early case management relative to an evidence based optimal standard