

# Meningitis in an Irish community

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Accepted 21 June 1988.

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## SUMMARY

*A series of 26 cases of meningitis occurring in one year in a defined area is presented. The clinical features, and complications are reviewed. Neisseria meningitidis occurred twice as commonly as Haemophilus influenzae, suggesting that the pattern of infection differs from that reported in England and Wales. An incidence of 4.6/100,000 for N. meningitidis is reported exceeding rates of infection in previous UK "epidemics".*

## INTRODUCTION

Acute pyogenic meningitis continues to be responsible for morbidity and mortality in the community despite the availability of effective antibiotic therapy. Debate concerning the timing of lumbar puncture has made acute meningitis a controversial subject once again.<sup>1</sup> The disease itself is also changing rapidly, with an alteration in the relative contributions of the different pathogens. In the past *Neisseria meningitidis* was the most common pathogen isolated,<sup>2</sup> but in the period between 1984–5 *Haemophilus influenzae* became the predominant organism isolated in cases of meningitis in the United Kingdom.<sup>3</sup> The incidence of *N. meningitidis* rises to a peak every ten to twelve years. This phenomenon occurs in countries of the developed world, where peak incidence reported may be as high as 95/100,000 (Faroes 1981).<sup>4</sup> This contrasts with the dramatic epidemics which occur in the "meningitis belt" of Africa where incidence may exceed 1000/100,000.<sup>5</sup> Recent medical and media attention has been focused on an upsurge in meningococcal meningitis.<sup>6</sup> Although this represents an increase in the incidence of sporadic cases of meningitis the term "epidemic" is inappropriate.

There are no previous surveys of acute non-viral meningitis and meningococcal septicaemia in an Irish community. We therefore present the clinical features, laboratory results, and outcome from a series of patients resident in the Southern Health and Social Services Board Area, Northern Ireland.

## METHODS AND PATIENTS

Twenty-six cases of acute pyogenic meningitis arising in the area of the Southern Health and Social Services Board between August 1984 and August 1985 were studied. The area has a population of 286,600 and is served by three main hospitals, Craigavon Area Hospital, South Tyrone Hospital, and Daisy Hill

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Hospital. All cases presenting to these hospitals are included. In addition to this, the medical records departments of the regional referral centres in Northern Ireland were consulted to find cases arising in the area but presenting elsewhere. Two additional cases were found by this means. The case records of the patients identified were obtained and a series of standard items abstracted and recorded on computer database. The diagnostic criteria for inclusion in the study were (a.) Culture of bacteria or fungi in the CSF, (b.) Culture of bacteria or fungi in the blood with  $>0.4 \times 10^9/1$  white blood cells in the CSF, or (c.) Culture of *N. meningitidis* in the blood.

## RESULTS

Twenty-six patients (10 females and 16 males) presented with pyogenic meningitis, of whom 22 were children under the age of 12. There was one case of neonatal meningitis (*Escherichia coli*). This gives a crude incidence of 9.1/100,000. More than half of the cases presented from January to March. In only one occasion, a sibling, was there any evidence of direct contact between cases. This child who presented with a purpuric rash was the brother of a boy with *N. meningitidis* septicaemia. Although there was no confirmation by bacterial culture his case was included with a diagnosis of invasive meningococcal disease.

The length of prodromal illness was less than 24 hours in eleven cases and less than 72 hours in a further seven. In six cases the patient had been unwell for up to a week, and the single case of cryptococcal meningitis presented after a period of six weeks of ill health.

Consciousness was impaired in nine cases and four had convulsions before or shortly following admission. In only fourteen was meningism recorded. Eight patients with meningococcal septicaemia had a characteristic purpuric rash.

Predisposing factors were present in three cases. One young girl developed a fatal meningitis following coagulase negative Staphylococcal colonization of her ventriculo-peritoneal shunt, and one man with pneumococcal meningitis had sustained a skull fracture in a road traffic accident six years previously. The patient with cryptococcal meningitis had normal granulocyte counts and immunoglobulin levels: antibodies to the human immunodeficiency virus were not detected. He was, however, a keen pigeon breeder.

All but one of the patients had a positive culture in either CSF or blood. Seven cases had positive blood and CSF culture, 14 had positive CSF culture alone, and 3 cases of *N. meningitidis* were diagnosed by blood culture alone.

*N. meningitidis* was the most common organism isolated (13 cases): five of these were found to be group B and three group C, one organism would not agglutinate any of the typing sera available and in four grouping was not performed. This implies an incidence of 4.6/100,000 for *N. meningitidis* during the period of study. *H. influenzae* type B was responsible for five cases and *Streptococcus pneumoniae* for three. Other organisms isolated included *Streptococcus pyogenes* (2 cases), *E. coli* (1 case), *Staphylococcus albus* (1 case) and *Cryptococcus neoformans* (1 case).

Culture of blood and CSF, together with peripheral neutrophilia were the most useful laboratory tests. Nine of the patients had a CSF glucose of less than 1.0 mmol/l. An organism was demonstrated on direct examination of the CSF in less than half of the cases. This is usual in cases of meningococcal septicaemia, but was also found for other pathogens. A rise in CSF white cell count was found less

often in cases of meningococcal disease mainly due to patients presenting with the septicaemic form of disease. In four patients, examination of the CSF on admission was completely normal. In two this was expected since their presentation was predominantly septicaemic, but in a further two cases no explanation could be found. These were all later culture positive. The details of the laboratory investigations are set out in the Table.

TABLE  
*Laboratory results in 26 cases of acute meningitis*

	<i>N. meningitidis</i> (a)	<i>H. influenzae</i> (b)	<i>S. pneumoniae</i>	Others
Raised peripheral neutrophil count (>10 <sup>9</sup> /ml)	10	4	3	3
<i>CSF protein</i>				
<0.4 g/l	4	1	1	1
0.4 – 1.0 g/l	3	2	0	2
>1.0 g/l	3	2	2	2
<i>CSF glucose</i>				
<60% blood glucose	3	1	1	2
<1.0 mmol/l	4	2	1	2
Significant increase in CSF polymorphs (>0.9 × 10 <sup>9</sup> /l)	7	4	3	4
Organisms seen in CSF on microscopy	6	2	2	3 (c)
Positive blood culture	4	1	1	2
Totals	13	5	3	5

(a) includes three cases with CSF culture result only and one with no blood glucose.

(b) includes one case with no blood glucose result.

(c) Cryptococci only seen on later specimens.

During the period of the study there were two deaths: one child with meningococcal septicaemia, and another following coagulase negative Staphylococcal meningitis. Sixteen patients made an uncomplicated recovery. Four patients with meningococcal disease suffered transient sequelae; one had a respiratory arrest, one disseminated intravascular coagulation and three had significant skin necrosis. One patient with pneumococcal meningitis had congestive cardiac failure and at review was shown to have residual hearing loss. A single patient with *H. influenzae* had a sub-dural effusion.

## DISCUSSION

As expected, the most consistently useful laboratory investigations were examination of the CSF and blood culture, together with the CSF and peripheral blood white cell count. All of the patients but one were culture positive. An organism was demonstrated on a direct Gram stain in less than half of the cases. Two patients with meningococcal septicaemia had normal CSF examination, but in a further two patients no explanation for the normal initial results could be found. This emphasises the need to make use of the antigen detection methods which

have become available for early diagnosis. Most of these are cheap and easy to perform and do not depend on sophisticated equipment.<sup>7</sup> Methods include latex agglutination, co-agglutination, and counterimmuno-electrophoresis. They are of particular value when the clinical and laboratory picture is clouded by pre-admission antibiotics. Although antigen detection techniques were not in routine use during this period, these methods were later introduced.

The outcome of infection was favourable in most cases. One death occurred in a young boy with meningococcal septicaemia whose illness followed a fulminant course. The second death was in a child with an intraventricular shunt who had had repeated episodes of infection in the past.

Bacterial meningitis is a continuing cause of morbidity and mortality in children in the area of the Southern Board. This study demonstrates important differences in the relative contribution of different pathogens. Goldacre's review showed the meningococcus to be the most frequent pathogen isolated in patients with meningitis in the Oxford region during the period 1969–1973.<sup>8</sup> Isphani, studying a population in Nottingham between 1974 and 1980, demonstrated a similar pattern as did Davies *et al*, in Birmingham during the ten years 1968–1977.<sup>9, 10</sup> These figures may to some extent be distorted by the peak in the incidence of meningococcal meningitis which occurred in 1974.<sup>2</sup> During the 1980s *H. influenzae* became the most frequent pathogen reported by the Public Health Laboratory Service,<sup>3</sup> a pattern which has been present in the USA for many years.<sup>11</sup> Our report indicates that this change in incidence has not yet occurred in the population studied. The distribution of pathogens is similar to the reports compiled by the communicable diseases report for Northern Ireland suggesting that this study provides a representative picture of the disease in the whole province. The meningococcus was the predominant organism responsible for reported cases of meningitis throughout the province throughout 1985–86.

The incidence of *N. meningitidis* infection during this study exceeds that of any health district in England and Wales during the 1986 "epidemic", and is comparable to the peak incidence in several other northern European countries.<sup>11, 12</sup> The rate of 4.6/100,000 suggests that the background incidence of *N. meningitidis* is higher in Northern Ireland or that an epidemic was occurring during the period of study. The meningococci isolated were of at least three different serotypes, B, C and non-typeable, which would favour the former explanation. During the period 1975–84 the average number of deaths from bacterial meningitis in Northern Ireland was 8.7 per year. This supports the idea that bacterial meningitis is more common than is demonstrated by notifications or laboratory reports. A final solution of this problem will only be revealed by a further study.

We conclude that the pattern of bacterial meningitis is following a different trend in Northern Ireland from that seen in the rest of the United Kingdom. In the succeeding years it would be interesting to chart the changes in the pattern of disease in the community. However, current reporting strategies will not permit this since during the study period only 15 cases of laboratory proven infection from this area were actually notified. Such deficiencies are commonly found in other European countries, including the notification of meningococcal infections in England and Wales,<sup>2</sup> and the Netherlands.<sup>13</sup> There is a real need to improve the standard of reporting. The category of "acute meningitis" is vague as it does not distinguish between viral and bacterial causes or between bacterial species. It is therefore not a useful epidemiological index for clinicians. A more

comprehensive reporting system for bacterial meningitis could include personal details of the patient, the aetiological agent and its sensitivities, together with the treatment and outcome. Such a system would provide a baseline from which to evaluate potential epidemics, to plan control measures and to assist the planning and allocation of resources for infectious diseases and microbiology. The appearance of penicillin resistant pneumococci and chloramphenicol resistant *H. influenzae* means that the surveillance of antimicrobial susceptibility in organisms causing acute meningitis is of increasing importance. Without more detailed information it will be impossible to understand changes in the pattern of this important disease in our community, to advise on empiric therapy and to institute control measures when necessary.

The authors wish to thank the physicians who made their cases available for study, the laboratory staff of all three hospitals, and the medical records officers.

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