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Presentation with gastrointestinal symptoms and high case fatality associated with group W meningococcal disease (MenW) in teenagers, England, July 2015 to January 2016

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Atypical clinical presentations associated with group W meningococcal disease (MenW) are well-described and include pneumonia, septic arthritis, endocarditis and epiglottitis/supraglottitis. Following anecdotal reports of teenagers presenting with predominantly gastrointestinal symptoms, we undertook a case review of MenW cases in 15 to 19 year-olds diagnosed in England between July 2015 and January 2016. Of the 15 cases, seven presented with a short history of nausea, vomiting and diarrhoea; five of these seven cases died within 24 hours of presentation to hospital.

The United Kingdom is currently experiencing a national outbreak of group W invasive meningococcal disease (IMD) due to rapid expansion of a single endemic hyper-virulent strain belonging to sequence type (ST) 11 clonal complex (cc) [1]. Group W IMD is associated with atypical clinical presentations, including pneumonia, septic arthritis, endocarditis and epiglottitis/supraglottitis, mainly in older adults [2]. In early 2016, enhanced national surveillance conducted by Public Health England identified two fatal group W IMD cases in teenagers who presented with predominantly gastrointestinal symptoms, prompting a review of all 15 to 19 year-olds diagnosed with group W IMD in England in the current epidemiological year. Laboratory-confirmed cases were identified through national surveillance [1] and case records were rapidly reviewed on HPZone, a national web-based case management system used by health protection teams (HPTs) to record public health events and actions.

Case series

Between July 2015 and January 2016, 15 group W IMD cases were confirmed in previously-healthy 15 to 19 year-olds (9 females, 6 males), none of whom had received a meningococcal ACWY (MenACWY) conjugate vaccine. No direct epidemiological, temporal or spatial links between cases were identified. Nine cases were confirmed by culture and eight were serotyped as W:2a, a surrogate marker for the hyper-virulent ST-11 cc (Table). For each case, all available data in the public health and surveillance records were retrieved retrospectively and summarised in the Table.

Seven teenagers (6 females, 1 male) presented predominantly with an acute (24–48 hour) history of gastrointestinal symptoms (nausea, vomiting and/or abdominal pain) together with or followed by diarrhoea in the 24 hours before attending hospital. Two cases were confirmed by blood culture and subsequently characterised as W:2a, a surrogate marker for the hyper-virulent ST-11 cc; the other five were confirmed by PCR. Four of the seven patients had been reviewed either by their general practitioner (GP) or in the Accident and Emergency Department (A and E) on the first day (n=3) or second day (n=1) of illness and sent home with a diagnosis of gastroenteritis. A non-blanching rash at presentation, leading to a consideration of IMD in the differential diagnosis, was identified in only two of the seven teenagers after arrival in hospital. At least two patients were isolated in a side-room in A and E because of diarrhoea. Five of the seven teenagers died. One had collapsed at home and died in A and E despite initial successful resuscitation. Two died with a presumed diagnosis of 'gastrointestinal sepsis' and 'peritonitis' soon after presentation to A and E and before they could be transferred to intensive care unit (ICU), while two others died in the ICU within 24 hours of admission. All fatal cases had multi-organ failure. A post-mortem report in one case noted 'necrotic intestine, shocked lung and systemic sepsis'. Of the two

Table

Summary of histories of laboratory-confirmed cases of invasive meningococcal disease, as well as infecting strain and outcomes based on public health and surveillance records, England, July 2015–January 2016 (n=15)

History and clinical features	Initial assessment[a]	IMD suspected	ICU	Outcome	Confirmation[b]	Final diagnosis
2 days D and V, stomach cramps lethargy, no rash	Saw GP on Day 1 and sent home with gastroenteritis diagnosis; sudden deterioration Day 2 with rapid progression in A and E; initially diagnosed with abdominal sepsis	N	N	Died in A and E	Blood culture	Septicaemia
1 day vomiting then diarrhoea and sore limbs; no rash	Saw GP on Day 1, sent home with gastroenteritis diagnosis; came to A and E later same day	N	N	Died in A and E	PCR blood	Septicaemia
1 day with D and V, influenza-like illness, and rapid deterioration	Profoundly septic with seizures on admission on Day 1, then became comatose	N	Y	Died in ICU next day	PCR blood	Septicaemia
3 days of D and V, headache and dehydration	Went to A and E on Day 2, sent home with gastroenteritis diagnosis; returned next day with rapid deterioration and multi-organ failure.	N	Y	Died in ICU same day	Blood culture	Septicaemia
2 days with headache and vomiting followed by 1 day diarrhoea	Found collapsed at home on Day 3 and rushed to A and E; petechial rash on back observed at A and E.	Y	N	Cardiac arrest in A and E. Died.	PCR blood	Septicaemia
1 day D and V, fever[c], headache	Hospital admission on Day 1; initial blood culture and CSF meningococcal PCR negative; developed rash after hospital admission and blood sample subsequently sent for PCR analysis tested positive (reported 12 days after onset)	N	Y	Survived	PCR blood	Septicaemia
1 day D and V, abdominal pain	Saw GP on Day 1, went to A and E next day; hypotensive, tachycardic, petechiae on face	Y	Y	Survived	PCR blood	Septicaemia
Generally unwell for 1 week; fever[c], short of breath, general aches (no rash)	Presented to A and E with transient ischaemic attacks, developed pulmonary embolism	N	N	Cardiac arrest in A and E. Died.	Blood culture	Septicaemia
1 day of fever[c], mild headache, nausea (no rash)	Admitted on Day 1 for 24 hours only; diagnosis confirmed by blood culture after discharge	N	N	Survived	Blood culture	Septicaemia
2 hours fever[c], sore throat, stiff neck and headache, with purpuric rash	Presented directly to A and E, admitted to ICU but improved within 3 days	Y	N	Survived	CSF culture	Meningitis and septicaemia
Fever[c], neck pain, aches – improved, then had painful wrist joint 3 days later	Saw GP on Day 4 with painful wrist and was referred to hospital; wrist washed out	N	N	Survived	PCR joint fluid	Septic arthritis
3 days fever[c], vomiting, hip and elbow joint pain	Admitted to hospital on Day 4 and treated with IV antibiotics, no orthopaedic intervention	N	N	Survived	Blood culture	Septic arthritis
1 day of fever[c], malaise and respiratory distress	Radiologically confirmed pneumonia on Day 1	N	N	Survived	Blood culture	Pneumonia
2 days fever[c], headache, coryza followed by 1 day vomiting and coughing blood	Radiologically confirmed pneumonia on Day 3	N	N	Survived	Blood culture	Pneumonia
5 days sore throat, fatigue, lethargy, lymphadenopathy; no fever, no rash	Seen at hospital on Day 5 and blood cultures taken but was not hospitalised; received ambulatory IV antibiotics	N	N	Survived	Blood culture	Atypical

A and E: accidents and emergency department; CSF: cerebrospinal fluid; D and V: diarrhoea and vomiting; GP: general practitioner; IMD: invasive meningococcal disease; ICU: intensive care unit; IV: intravenous; N: no; NT: non typeable; PCR: polymerase chain reaction; Y: yes.

[a] Days are numbered from the day of symptom onset which is Day 1.

[b] All culture isolates were subsequently confirmed as W:2a, a surrogate marker for the hyper-virulent sequence type 11 clonal complex, apart from one patient with pneumonia (serotyped as NT/NT/NT).

[c] Temperature was not reported.

patients who survived, both had short histories of vomiting and diarrhoea for less than 24 hours, went directly to A and E and were seriously unwell at presentation, requiring aggressive resuscitation and ICU admission.

Of the remaining eight cases (3 females, 5 males), seven cases were confirmed by blood (n=6) or cerebrospinal fluid (n=1) culture and six were subsequently characterised as W:2a, a surrogate marker for the hyper-virulent ST-11 cc; a blood culture from one patient with pneumonia was serotyped as NT/NT/NT. Among these eight individuals, two had the more characteristic clinical presentations of septicaemia – fever followed by rapid clinical deterioration (neither had a non-blanching rash) – and one died soon after presenting to A and E. A third teenager presented to A and E within hours of developing symptoms consistent with bacterial meningitis, was treated quickly and recovered without complications.

Four of the remaining five patients had other recognised 'atypical' presentations, including septic arthritis and pneumonia. The final case had non-specific symptoms lasting several days and no fever. This individual was managed with intravenous antibiotics in an ambulatory setting and blood cultures subsequently confirmed the diagnosis.

Discussion

Laboratory-confirmed group W IMD cases in England have increased from 19 cases in the 2008/09 epidemiological year to 176 cases in 2014/15, and its contribution to total IMD cases increased from 1.7% to 24% of all confirmed cases, respectively [3]. This increase has resulted from rapid expansion of a single endemic hyper-virulent strain belonging to ST 11 cc, which is also responsible for the ongoing group W IMD outbreak in Chile and other South American countries [4]. In August 2015, the United Kingdom (UK) introduced an adolescent MenACWY conjugate vaccination programme targeting 14 to 18 year-olds and new undergraduate university entrants [1].

The increase in group W IMD cases was communicated to clinical and public health colleagues through national briefing notes, peer-reviewed publications and online training materials (www.gov.uk/government/collections/meningococcal-acwy-menacwy-vaccination-programme). These communications emphasised the high case fatality and intensive care admissions, and the well-described atypical clinical presentations – pneumonia, epiglottitis/supraglottitis and septic arthritis – seen in up to a quarter of cases [2].

Although nausea, vomiting and diarrhoea are well-described symptoms of meningococcal disease [5] and are included in most public awareness leaflets and websites (e.g. http://www.mrfpaediatricguide.info/diagnosis.php.html), IMD presentation with primarily gastrointestinal symptoms, whilst previously described, is rare [6,7]. An extensive review of the literature identified only one case report in 1999 in an 80 year-old woman who presented with fever, diarrhoea and abdominal pain; those authors, in turn, had only ascertained three previous cases in young adults in the literature [8]. Consequently, for the cases presented here, IMD was often not considered at first clinical assessment and public health actions, including chemoprophylaxis and vaccination, were, therefore, often delayed and by up to two weeks in one case. There were, however, no secondary cases identified among close contacts.

Interestingly, the unusual gastrointestinal presentation was also reported in the ongoing group W IMD outbreak in Chile, where 14 of 58 group W IMD cases (24%) were initially diagnosed as gastroenteritis and eight of these 14 died [9]. Overall, diarrhoea was the only symptom that was over-represented among the 19 fatal cases (56% vs 27%, p=0.034), most of whom died within a day of hospitalisation. Early diarrhoea and absence of fever are associated with poor prognosis in IMD, perhaps due to later recognition [10,11].

We are currently following up all confirmed group W IMD cases in England and collecting more detailed clinical data from hospital records for cases presenting with predominantly gastrointestinal symptoms. We are aware of similar presentations in at least three young adults, suggesting that these findings are not confined to teenagers.

Conclusion

While atypical presentations such as septic arthritis, pneumonia, epiglottitis/supraglottitis and endocarditis are well-described for the less common meningococcal capsular groups (W and Y), clinical presentation with predominantly gastrointestinal symptoms – and diarrhoea, in particular – appears to be rare and currently associated with the hypervirulent ST-11 group W strain which, in teenagers at least, leads to rapidly progressive, severe disease and high case fatality. It is hoped that the adolescent MenACWY vaccination programme will help to control group W disease in the UK. In the meantime, as this hypervirulent strain is still spreading in South America and has now been reported in other European countries and Australia, it is important that frontline clinicians and public health specialists are aware of this unusual but severe presentation in order to provide appropriate safety net advice) [12], ensure prompt diagnosis and early treatment of cases, and timely chemoprophylaxis with vaccination for close contacts.

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Conflict of interest

None declared.

Authors' contributions

HC and SNL reviewed and summarised the case records. HC wrote the first draft of the manuscript. All authors reviewed and commented on the manuscript. All authors read and approved the final version.

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