We describe 10 students from a small rural secondary school with episodes resembling seizures or syncopal attacks. Several students were initially treated for epilepsy or syncope, but the temporal pattern of the attacks, the simultaneous resolution of the episodes during a school holiday, and the fact that 4 students subsequently had pseudoseizures confirmed by video-electroencephalography strongly suggest mass hysteria. Seven students were treated with antiepileptic medications, and most underwent multiple diagnostic studies. Prompt recognition of mass hysteria allows physicians to avoid unnecessary tests and treatments and to reassure those affected as well as the general public.

Mass hysteria is the simultaneous occurrence of related signs or symptoms with a psychogenic basis in multiple individuals in a group. Various neurological signs and symptoms have been described in the context of mass hysteria, including a few reports of cases with seizure-like episodes. However, earlier reports of mass hysteria with this seizure-like phenomenon generally predate the availability of modern diagnostic studies or lack details about clinical features. We describe a group of adolescents from a small rural high school who for 4 months exhibited psychogenic seizures or syncopal-like episodes. This group is remarkable not only because of the rarity of mass hysteria with neurological symptoms but also because these individuals have been more thoroughly studied than most previously described clusters.

PATIENTS AND METHODS

We investigated a group of generally healthy adolescents who developed paroxysmal episodes resembling epileptic seizures, syncope, or hyperventilation attacks in a rural coeducational North Carolina high school with an enrollment of slightly more than 300 students. The initial investigation was conducted by 1 of us (R.L.L.) under the auspices of the Occupational and Environmental Epidemiology Branch of the North Carolina Department of Health and Human Services (Raleigh) at the request of the county health department where the high school was located. The research aspects of the investigation were approved by the institutional review board for human research at Wake Forest University School of Medicine (Winston-Salem, NC). The high school’s buildings were inspected and tested for possible environmental contaminants. Several students and parents were interviewed by 1 of us (E.S.R.). The students and their parents completed questionnaires about the seizure-like episodes as well as the students’ general health and social habits.

The students’ daily schedules were reviewed to determine if there was a common pattern of classes or activities. The school nurse and several teachers who had witnessed the attacks were interviewed, and records of these episodes that were compiled by the school nurse were reviewed. In addition, we evaluated most students’ recent medical records. Several treating physicians were interviewed, paying special attention to the results of pertinent diagnostic studies such as neuroimaging and electroencephalography (EEG), physician-assigned diagnoses, and treatments.

RESULTS

Twelve teenagers, 11 girls and a boy, were initially thought to have developed sei-
zones or other paroxysmal episodes during the first few weeks of the 2002 school year. After further investigation, 2 of these individuals were clearly different from the remaining adolescents and were excluded from the final analysis. The sole boy had well-characterized absence epilepsy (starring episodes, a generalized spike and wave burst on EEG, and complete resolution of the attacks with medication). His episodes were not observed at school, and a loss of awareness while driving caused a single car accident that led to his diagnosis of epilepsy. In retrospect, his episodes started well before those of his peers. One girl was also excluded. Her episodes typically occurred while standing and resembled syncope; postural hypotension and tachycardia were demonstrated during a tilt-table EEG study. Her episodes resolved after the treatment of postural hypotension. The other 10 students shared a pattern of recently developed paroxysmal episodes resembling seizures, syncope, or hyperventilation for whom an organic underlying disorder could not be verified or who had pseudoseizures confirmed by the results of video-EEG (Table). These 10 students are analyzed in this article.

All 10 students were girls, and 5 were currently or formerly cheerleaders. Otherwise they seemed fairly typical of students in the school. One student was African American, similar to the racial mixture of the school. Four students were in the 9th grade, 3 were in the 10th grade, and 3 were in the 11th grade. Thus, it is not surprising that only 2 students shared a classroom. One girl had experienced febrile seizures as a young child; none of the others had a history of epileptic seizures. Two girls had taken over-the-counter diet pills at some point prior to the onset of the episodes, and another admitted to having tried alcohol, but none of the other students admitted to drug use. A few had tried smoking tobacco, and at least 1 used tobacco regularly. Potentially stressful factors (eg, divorced parents, parental substance abuse, history of depression, and a recent argument with a brother) were documented in a few adolescents, but the overall frequency of such problems did not seem unusual.

One student began having seizure-like attacks in mid-August 2002. During the following few weeks, both the number of affected individuals and the overall frequency of the episodes increased steadily. By October, episodes occurred up to 4 times per school day. With 2 exceptions, each student had only 1 episode in a given day. The number of attacks per adolescent varied from 1, in 3 girls, to 30 or more in 1 student, and most of the attacks occurred in 4 of the students. By December, the frequency of these attacks began to decline; after a 2-week holiday break, during which there was limited student contact, only the index subject and 2 other students continued to have periodic attacks for several more months. Most of the attacks occurred at school, but several girls reported occasional episodes in other settings, including 2 whose initial attack occurred while in church. According to the teachers, the attacks were unlikely to occur during a classroom session and often developed between classes in the hallways, in the cafeteria, or during breaks when most of the students were in the school yard. They also believed that the episodes were less likely to occur on rainy days when the students remained inside. A review of the nurse’s notes tends to support this observation: about half of the episodes with a documented time of occurrence took place around lunchtime.

The appearance of these attacks was not identical across individuals, nor did each student consistently exhibit the same pattern with each attack (Table). All 9 questionnaire respondents noted headache and dizziness, although not necessarily at the time of their attack. Eight reported numbness and tingling or shortness of breath. Seven of 9 respondents reported muscle jerking or twitching, and another reported muscle tightness. Eight students experienced reduced responsiveness during at least some of the attacks, and 7 described anxiety, lightheadedness, or overt hyperventilation. The school nurse witnessed several attacks and did not consider them to be typical of epileptic seizures, noting the lack of a recovery period afterward, the appearance of the episode, and the fact that a couple of individuals cringed in response to smelling salts. The mothers of 2 other girls indicated that they could “talk her out of it” as the episode started to develop.

All but 1 of the students saw a physician for evaluation and treatment of the episodes, and most saw 1 or more neurologists in consultation. Six of the 9 students who provided medical records were initially thought to have epilepsy, possible epilepsy, or “spells” by a physician. The other 3 individuals were suspected to have syncope or hyperventilation. Physicians suggested panic attacks, depression, or anxiety in 4 students (some records listed more than 1 possible diagnosis). Numerous diagnostic studies were performed (Table). Six individuals underwent 10 standard EEGs, and 4 of these 6 subsequently had a video-EEG study as well. The EEG result was normal or showed only nonspecific changes in 5 individuals. All 4 girls who underwent video-EEG during a typical episode were shown to have pseudoseizures, including the student said to have isolated spikes on a routine EEG. Seven students were treated with 6 different antiepileptic medications (4 with valproate sodium, 3 with levetiracetam, 2 with carbamazepine, and 1 each with zonisamide, topiramate, lamotrigine, and oxcarbazepine).

Mass hysteria is strongly suggested in these 10 students because of the tendency for the episodes to occur at school, the absence of an adequate organic explanation for them, the fact that video-EEG proved 4 of the girls to have pseudoseizures, and the near simultaneous development and resolution of the attacks. A strong female predominance has been noted in previous reports of mass hysteria, and children and adolescents are affected more often than adults.1–3 Some episodes of mass hysteria are triggered by otherwise harmless odors or by the onset of symptoms in 1 or 2 prominent individuals.1,2,3 Although we did not identify specific environmental triggers in the school, the fact that the index subject and several other girls were cheerleaders could have encouraged additional students to develop similar episodes.
Bartholomew and Wessely⁴,⁵ divide mass hysteria into 2 major categories: mass anxiety hysteria and mass motor hysteria. As in our group, mass motor hysteria tends to last for weeks or months and is often precipitated by stress or social situations. This type of hysteria is characterized by dissociation, motor changes (eg, twitching, shaking, or contractions), and histrionic behavior. Mass anxiety hysteria, in contrast, typically arises from the perception of a false threat and has a short duration, often a day or less. These individuals exhibit anxiety and so-

<table>
<thead>
<tr>
<th>Patient Age, y/Sex</th>
<th>Episode Description</th>
<th>Physician Diagnosis</th>
<th>EEG Results</th>
<th>Imaging Studies</th>
<th>Other Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>14/F</td>
<td>Jerking extremities, hit head with hands, bit tongue, shortness of breath</td>
<td>Epilepsy</td>
<td>EEG 1: normal; EEG 2: paroxysmal; bifrontal slowing during drowsiness; no spikes</td>
<td>CT without contrast: normal except for possible venous angioma; MRI and MRV normal</td>
<td>ECG normal; 24-h ECG 1: occasional atrial and ventricular ectopy but primarily sinus rhythm; 24-h ECG 2: occasional dropped beats, intermittent second-degree atrial ventricular block with 2:1 conduction, predominantly sinus arrhythmia</td>
</tr>
<tr>
<td>14/F</td>
<td>Jerking, eyes back, unresponsive, shortness of breath, numbness and tingling</td>
<td>Syncope, possible epilepsy, hyperventilation</td>
<td>Not done</td>
<td>CT normal</td>
<td>ECG: left axis deviation for age</td>
</tr>
<tr>
<td>14/F</td>
<td>Fearful, increased tone, breathed rapidly, shortness of breath, numbness and tingling, no loss of consciousness</td>
<td>Panic attacks</td>
<td>Not done</td>
<td>Not done</td>
<td>Not done</td>
</tr>
<tr>
<td>16/F</td>
<td>Numbness and tingling, jaw and extremities jerk, shortness of breath, legs stiffen, eyes twitch</td>
<td>Atypical epilepsy, anxiety</td>
<td>EEG normal</td>
<td>Not done</td>
<td>ECG normal</td>
</tr>
<tr>
<td>15/F</td>
<td>Generalized weakness, dizziness, numbness and tingling, unresponsive but can hear</td>
<td>“Spells” and headaches</td>
<td>EEG 1 and EEG 2: normal; video-EEG indicated pseudoseizures</td>
<td>MRI normal; CT normal except for sinus opacity</td>
<td>Not done</td>
</tr>
<tr>
<td>16/F</td>
<td>Unresponsive, shortness of breath, numbness and tingling, jerking of limbs (at other times)</td>
<td>Syncope, depression</td>
<td>Not done</td>
<td>Not done</td>
<td>Not done</td>
</tr>
<tr>
<td>14/F</td>
<td>Dizziness, fell, jerking, staring episodes</td>
<td>Stress, anxiety attack, depression, hyperventilation</td>
<td>EEG normal; video-EEG indicated pseudoseizures</td>
<td>MRI normal</td>
<td>Not done</td>
</tr>
<tr>
<td>14/F</td>
<td>Vertigo, collapse, generalized jerking, eyes roll, numbness, unresponsive but can hear</td>
<td>Epilepsy</td>
<td>EEG 1: normal; EEG 2: read as abnormal owing to isolated nonlocalized spikes during drowsiness; video-EEG indicated pseudoseizures</td>
<td>MRI normal</td>
<td>ECG normal; 24-h ECG 1 and ECG 2: rare premature atrial contractions</td>
</tr>
<tr>
<td>~15/F</td>
<td>Unresponsive, shortness of breath, jerking, eyes back, arms numb</td>
<td>Did not see physician</td>
<td>Not done</td>
<td>Not done</td>
<td>Not done</td>
</tr>
<tr>
<td>15/F</td>
<td>Face drawn, numbness and tingling, weakness, shortness of breath, unresponsive</td>
<td>Epilepsy</td>
<td>EEG 1 and EEG 2: normal; video-EEG indicated pseudoseizures</td>
<td>CT: small retrocerebellar arachnoid cyst</td>
<td>ECG 1 and ECG 2: normal; echocardiogram: mitral valve prolapse</td>
</tr>
</tbody>
</table>

Abbreviations: CT, computed cranial tomography; EEG, electroencephalogram; ECG, electrocardiogram; MRI, magnetic resonance imaging; MRV, magnetic resonance venography.

*Not all of the listed symptoms occurred with each episode.
matic complaints.\textsuperscript{4,5} As in our group, separation of the affected individuals often stops the episodes.

These attacks caused a considerable burden on the students and their families. Eight of the students reported some type of adverse social or psychological consequence to their attacks, such as ridicule from other students, inability to drive, and strained family and interpersonal relationships. In at least 1 family, anger generated by differing interpretations of the daughter's attacks contributed to the parents' separation and pending divorce. Additionally, the frequent occurrence of the episodes during school placed a strain on school personnel and disrupted the education of the other students.

Delayed recognition of mass hysteria in these students led several individuals to have diagnostic procedures and receive treatment that could have been avoided had the similarities between these individuals been noted earlier. Fragmentation of the students' medical care probably contributed to the delayed recognition. Another factor may have been the reluctance of some families to consider psychological explanations for the episodes when suggested by their physician. Although the underlying dynamics that initiate and perpetuate mass hysteria are poorly understood, its prompt recognition allows physicians to avoid unnecessary tests and treatments and to reassure both the affected individuals and the public.

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Correspondence: E. Steve Roach, MD, Department of Neurology, Wake Forest University School of Medicine, Medical Center Boulevard, Winston-Salem, NC 27157.

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REFERENCES