Frequency and Predictors of Mass Psychogenic Illness

Lisa A. Page,[a] *Catherine Keshishian,*[a,b] *Giovanni Leonardi,*[b] *Virginia Murray,*[b] *G. James Rubin,*[a] *and Simon Wessely*[a]

Background: Mass psychogenic illness refers to outbreaks of illness attributed to a toxic agent but for which no plausible organic cause is found. We determined the frequency and predictors of mass psychogenic illness within a sample of chemical incidents.

Methods: Information was collected on a random sample of 280 chemical incidents. We developed consensus operational criteria for mass psychogenic illness and estimated its frequency. We then assessed environmental, emergency, and health service indicators for their association with mass psychogenic illness.

Results: Nineteen "chemical incidents" were probable episodes of mass psychogenic illness. This represented 16% of incidents for which people reported symptoms and 7% of all incidents. Odor was a robust predictor of mass psychogenic illness. These illnesses were especially likely to occur in schools or healthcare facilities.

Conclusions: A substantial minority of chemical incidents may be mass psychogenic illness.

(*Epidemiology* 2010;21: 744–747)

Mass psychogenic illness describes outbreaks of illness apparently attributable to a toxic agent but for which no plausible organic cause is found. Alternative terms include "mass hysteria,"[1] "epidemic hysteria,"[2] and "mass sociogenic illness."[3] Despite a long and colorful history,[3,4] there is no commonly agreed-upon definition of mass psychogenic illness,[1,5] and previous literature is limited mainly to case reports.[1,6]

There is no information on the frequency of mass psychogenic illness, and such episodes are commonly diagnosed only by exclusion.[7] Women are more likely to be affected than men[6,8,9]; beyond that, affected individuals have few distinguishing features.[1,3] Incidents often begin with an index case.[1,6,9] When considering environmental factors, the presence of an odor may be an important precipitant,[6,9–12] and schools appear to be particularly vulnerable.[6,13] However all of these inferences have relied heavily on case studies. The aim of the present study was to measure the frequency of episodes of mass psychogenic illness within a routine sample of chemical incidents, and to assess predictors of its occurrence.

METHODS

The study was done in conjunction with the Centre for Radiation, Chemical and Environmental Hazards at the Health Protection Agency (UK), which coordinates a surveillance system that records environmental chemical incidents as they occur in England and Wales.[14] This system defines a chemical incident as "an acute event in which there is, or could be exposure of the public to chemical substances which cause, or have the potential to cause ill health."

A total of 965 incidents were recorded by this UK system during the study period (1 January 2007 through 24 April 2008). Incidents were excluded if they occurred in a single household (n = 85) or outside England (n = 50); if they had inadequate address details (n = 64); or for other reasons (n = 19). This left 747 incidents eligible for inclusion, of which 280 were randomly selected for inclusion in the study (see eAppendix 1 [http://links.lww.com/EDE/A414] for examples of incidents). Relevant characteristics were ascertained for each incident, including odor, setting, and indicators of emergency and health-service response.

Data Collection

An outline of each incident was available in free text, together with routine information on the location and the (suspected) chemical. We made further inquiries, as necessary, by email, phone, or letter to key informants (such as local health protection consultant, director of public health, or local chief duty emergency physician). Additional information was gathered from media reports using a systematic search strategy.[15]

Definition of "Mass Psychogenic Illness"

We developed 5 criteria for mass psychogenic illness: (1) presence of somatic (bodily) symptoms; (2) a pre-existing

Submitted 23 November 2009; accepted 9 March 2010.

From the [a]Division of Psychological Medicine, Institute of Psychiatry, King's College London, London, United Kingdom; and [b]Centre for Radiation, Chemical and Environmental Hazards, Health Protection Agency, London, United Kingdom.

Supported by the UK Home Office CBRN Science and Technology Programme (study reference: 43/05/81) (to C.K.); the National Institute of Environmental Health Sciences (NIEHS), National Institute of Health as a Ruth L Kirschstein National Research Fellow (F32 ES013690) (to L.A.P.); the South London and Maudsley NHS Foundation Trust/Institute of Psychiatry National Institute of Health Research (NIHR) Biomedical Research Centre (to S.W.). The Health Protection Agency was a cosponsor.

SDC Supplemental digital content is available through direct URL citations in the HTML and PDF versions of this article (www.epidem.com).

Correspondence: Lisa A. Page, Division of Psychological Medicine, Institute of Psychiatry, Weston Education Centre, Room 3.14, KCL, 10 Cutcombe Rd, London SE5 9RJ, United Kingdom. E-mail: lisa.2.page@kcl.ac.uk.

ISSN: 1044-3983/10/2105-0744
DOI: 10.1097/EDE.0b013e3181e9edc4

social connection between 2 or more of the affected people; (3) an epidemic spread of symptoms (where "epidemic" is defined as an occurrence of cases in greater numbers than expected for a given period of time); (4) attribution of symptoms by affected individuals (or by their parents or caregivers) to a threatening external agent of a physical (usually chemical, biologic or radiologic) or spiritual nature; (5) symptoms and signs that are not compatible with the environmental exposure specified by the affected individuals, nor with any other environmental exposure that could reasonably be expected to have been present at the time of (or shortly before) onset of symptoms.

In addition, we excluded episodes in which symptoms had been deliberately or ritualistically provoked in groups gathered for that purpose (eg, religious sects, shamanistic cults, etc); or symptoms had been used to obtain a state of satisfaction unavailable to a single person (eg, crazes, riots).

These criteria were developed by reviewing definitions of mass psychogenic illness from the literature and by consensus agreement among a panel of experts in toxicology, epidemiology, psychiatry, and social science.

Anonymized vignettes were produced, drawing on factual information available for each incident. A medically qualified member of the team reviewed all vignettes and rated them against the first 2 criteria. Eligible vignettes were passed to 3 independent medical toxicologists for rating against the next 3 criteria. The toxicologists assessed the incident vignettes separately, without conferring with each other. They read each vignette before rating the incidents on criteria 3, 4, and 5, which were presented as statements to which they responded: "yes," "probably," "probably not," "no" or "unable to rate." To aid decision-making, criterion 5 was split into 2 statements and the wording reversed. See eAppendix 2 (http://links.lww.com/EDE/A414) for information on validity and inter-rater agreement.

Toxicologists' responses were collapsed such that "yes" or "probably" endorsed criteria 3 or 4, whereas "probably not" or "no" endorsed the 2 statements making up criterion 5. If more than one toxicologist categorized a criterion as "unable to rate," these were presumed not to be mass psychogenic illness. Incidents were categorized as follows:

Highly probable mass psychogenic illness—incidents for which all 3 toxicologists endorsed criteria 3, 4, and 5 (and where criteria 1 and 2 had already been met), ie, there was complete agreement that all criteria had been met.

Probable mass psychogenic illness—incidents for which 2 of 3 toxicologists endorsed criteria 3, 4, or 5 (and where criteria 1 and 2 had already been met), ie, the majority of raters (but not all) had agreed that the episode met one or more criteria.

Not mass psychogenic illness—incidents where one or more criteria had not been met. In practice this meant that either criteria 1 or 2 were not met, or at least 2 of criteria 3, 4, or 5 were not endorsed by majority or consensus toxicologic opinion.

Associations With Mass Psychogenic Illness

Incidents classified as "highly probable" and "probable" mass psychogenic illness were combined to form the final outcome measure. The associations of odor, setting, and emergency and health-response variables with mass psychogenic illness were assessed crudely and conditioned on "fire" incidents (incidents classified as fires by the surveillance system), using the Mantel-Haenszel procedure where there were 2 strata and logistic regression where there were more than 2.

Multicenter research ethics approval for this study was granted by Oxfordshire Research Ethics Committee A, UK.

RESULTS

Nineteen of the 280 incidents were classified as mass psychogenic illness; 6 as "highly probable mass psychogenic illness," and a further 13 as "probable mass psychogenic illness." Details of these incidents are shown in eAppendix 3 (http://links.lww.com/EDE/A414). Mass psychogenic illness occurred with a frequency of 7% among all reported incidents and 16% among chemical incidents in which people reported symptoms.

Predictors of Mass Psychogenic Illness

A nonsmoke odor predicted that a chemical incident was mass psychogenic illness as compared with incidents with no odor (odd ratio [OR] = 4.2 [95% confidence interval (CI) = 1.5–12]) (Table); this association remained after controlling for fire incidents (adjusted OR = 4.7 [1.7–13]). Incidents that took place in schools (adjusted OR = 5.0 [1.4–18]) and healthcare facilities (7.1 [2.0–25]) were also predictive of mass psychogenic illness. None of the emergency-response variables was strongly associated with mass psychogenic illness, but all of the health-response variables were associated; this pattern remained after controlling for fire incidents. See eAppendix 4 (http://links.lww.com/EDE/A414) for further analysis restricted to incidents for which symptoms were reported.

DISCUSSION

Episodes of mass psychogenic illness are regularly found among chemical incidents reported to a national surveillance system. We confirm that schools are common settings for mass psychogenic illness.[13] Our finding that healthcare facilities are also common settings has not previously been reported. The role of odor in the genesis of mass psychogenic illness has been suspected,[6,8,9,11,12,16–18] and we found that "other" odor (ie, odor not related to smoke from fires) is a risk factor for the development of these episodes.

TABLE. Associations With Mass Psychogenic Illness

	Mass Psychogenic Illness			
	No (n = 261) No. (%)	Yes (n = 19) No. (%)	Summary OR (95% CI)	Adjusted OR[a] (95% CI)
Location of incident				
School/college	14 (5)	4 (21)	6.7 (1.9–24)	5.0 (1.4–18)
Healthcare facility	11 (4)	5 (26)	11 (3.1–37)	7.1 (2.0–25)
Other[b]	236 (90)	10 (53)	1.0	1.0
Odor				
No odor[b]	114 (44)	6 (32)	1.0	1.0
Other odor (not smoke)	55 (21)	12 (63)	4.2 (1.5–12)	4.7 (1.7–13)
Smoke odor	92 (35)	1 (5)	0.2 (0.0–1.8)	1.3 (0.1–30)
Attendance of emergency personnel				
Police				
No[b]	124 (48)	11 (58)	1.0	1.0
Yes	137 (52)	8 (42)	0.66 (0.3–2)	0.76 (0.3–2)
Fire service				
No[b]	59 (23)	8 (42)	1.0	1.0
Yes	202 (77)	11 (58)	0.40 (0.2–1)	0.70 (0.3–2)
Ambulance				
No[b]	132 (51)	8 (42)	1.0	1.0
Yes	129 (49)	11 (58)	1.4 (0.6–4)	1.3 (0.5–4)
Evacuation occurred				
No[b]	134 (51)	10 (53)	1.0	1.0
Yes	127 (49)	9 (47)	0.95 (0.4–2)	1.1 (0.4–3)
Hospital response				
Public decontamination				
No[b]	246 (94)	18 (95)	1.0	1.0
Yes	15 (6)	1 (5)	0.91 (0.1–7)	0.63 (0.08–5)
Staff decontamination				
No[b]	254 (97)	18 (95)	1.0	1.0
Yes	7 (3)	1 (5)	2.0 (0.2–17)	3.8 (0.4–41)
Emergency department physician aware				
No[b]	206 (79)	8 (42)	1.0	1.0
Yes	55 (21)	11 (58)	5.2 (1.9–14)	4.8 (1.8–13)
No. casualties presenting to hospital emergency department[c]				
0[b]	172 (70)	5 (26)	1.0	1.0
1–10	65 (27)	11 (58)	5.8 (1.9–17)	4.1 (1.3–12)
>10	8 (3)	3 (16)	13 (2.6–64)	16 (2.9–90)
Hospital major incident plan activated				
No[b]	259 (99)	16 (84)	1.0	1.0
Yes	2 (<1)	3 (16)	24 (3.5–170)	16 (2.3–115)

[a]Adjusted for whether the incident was a fire.
[b]Reference category.

We did not attempt to further classify the "other" odor group, as odor reports are notoriously unreliable.[16]

We used an expanded definition of mass psychogenic illness (to include the "probable" plus "highly probable" groups) because such incidents lie at one end of a spectrum and would be expected to share common risk factors. We fully expect there to be incidents for which there is both a toxic and a psychogenic etiology for symptoms, and we view it as necessary for this possibility to be considered when responding to chemical incidents. Our operational criteria have face validity and demonstrated good construct validity.

Our findings suggest that mass psychogenic illness is an important differential diagnosis in a substantial minority of chemical incidents, and yet this diagnosis is usually reached only by exclusion. The importance of early diagnosis rests in the considerable difference in management compared with other chemical incidents. Mass psychogenic illness is best managed by reassurance, separating symptomatic from non-

symptomatic persons, minimizing unnecessary medical procedures,[19,20] and providing a credible explanation for symptoms.[21] In contrast, casualties from mass toxic incidents may require decontamination, antidotes, and invasive medical care.[22]

ACKNOWLEDGMENTS

We are grateful to the experts who gave their time to the development of criteria and the rating of incidents. Particular thanks are due to Simon Clarke, Paul Dargan, David Baker, Matthew Hotopf, and Robert Bartholomew. Thanks are also due to Pat Saunders, Lorraine Stewart and colleagues for allowing us to use the CRCE chemical incident surveillance database, and to Louise Dowling who helped with data collection.

REFERENCES

1. Wessely S. Mass hysteria: two syndromes? *Psychol Med*. 1987;17:109–120.
2. Friedman T. Methodological considerations and research needs in the study of epidemic hysteria. *Am J Public Health*. 1967;57:2009–2011.
3. Bartholomew RE, Wessely S. Protean nature of mass sociogenic illness: from possessed nuns to chemical and biological terrorism fears. *Br J Psychiatry*. 2002;180:300–306.
4. Waller J. A forgotten plague: making sense of dancing mania. *Lancet*. 2009;373:624–625.
5. Bartholomew R. Letter. *Am J Epidemiol*. 2000;151:206–207.
6. Boss L. Epidemic hysteria: a review of the published literature. *Epidemiol Rev*. 1997;19:233–243.
7. Balaratnasingam S, Janca A. Mass hysteria revisited. *Curr Opin Psychiatry*. 2006;19:171–174.
8. Gallay A, Loock FV, Demarest S, Heyden JV, Jans B, Oyen HV. Belgian Coca-Cola-related outbreak: intoxication, mass sociogenic illness or both? *Am J Epidemiol*. 2002;155:140–147.
9. Jones T, Craig A, Hoy D, et al. Mass psychogenic illness attributed to toxic exposure at a high school. *N Engl J Med*. 2000;342:96–100.
10. Hay A, Foran J. Poisoning or epidemic hysteria in Kosova? *Lancet*. 1991;338:1196.
11. Selden BS. Adolescent epidemic hysteria presenting as a mass casualty, toxic exposure incident. *Ann Emerg Med*. 1989;18:892–895.
12. Modan B, Tirosh M, Weissenberg E, et al. The Arjenyattah epidemic: a mass phenomenon: spread and triggering factors. *Lancet*. 1983;2:1472–1475.
13. Bartholomew R. Epidemic hysteria in schools. In: Bartholomew R, ed. *Little Green Men, Meowing Nuns and Head-Hunting Panics*. Jefferson, NC: McFarland & Co; 2001.
14. HealthProtectionAgency.Availableat:http://www.hpa.org.uk/HPA/ProductsServices/ChemicalsPoisons/ChemicalRiskAssessment/1158313435037/. Vol. 2010, 2009.
15. Keshishian C, Page L, Amlot R. Quantifying the print media's coverage of chemical incidents. *Chem Hazards Poisons Rep*. 2007;10:32–33.
16. Donnell HD, Bagby JR, Harmon RG, et al. Report of an illness outbreak at the Harry S Truman state office building. *Am J Epidemiol*. 1989;129:550–558.
17. Small G, Feinberg D, Steinberg D, Collins M. A sudden outbreak of illness suggestive of mass hysteria in schoolchildren. *Arch Fam Med*. 1994;3:711–716.
18. Goh K. Epidemiological enquiries into a school outbreak of an unusual illness. *Int J Epidemiol*. 1987;16:265–270.
19. Jones T. Mass psychogenic illness: role of the individual physician. *Am Fam Physician*. 2000;62:2649–2653.
20. Keshishian C. Mass psychogenic illness and how to respond to incidents. *Health Prot Matters*. 2009;13:20–23.
21. Wessely S. Responding to mass psychogenic illness. *N Engl J Med*. 2000;342:129–130.
22. Kales S, Christiani D. Acute chemical emergencies. *N Engl J Med*. 2004;350:800–808.