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media and superimposed, to a certain extent, by local pressure.

The epidemic ended abruptly when "vector" contact was eliminated by closure of the schools.

The correct management of a mass phenomenon requires, besides its prompt identification, a calm and authoritative approach to the affected population. Firm and immediate reassurance, based on a positive diagnosis should dispel fear and a point of the utmost importance is the use of the mass media to counter rumours about deliberate or incidental intoxication.

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Correspondence should be addressed to B. M., Chaim Sheba Medical Center, Tel Hashomer, Israel.

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THE ARJENYATTAH EPIDEMIC
Home Interview Data and Toxicological Aspects

PHILIP J. LANDRIGAN BESS MILLER

National Institute for Occupational Safety and Health and Center for Infectious Diseases, Centers for Disease Control, Georgia, Atlanta, USA

Summary In 1983, 949 cases of acute non-fatal illness consisting of headache, dizziness, blurred vision, abdominal pain, myalgia, and fainting occurred in the West Bank. Physical examination and biochemical tests were otherwise normal. There was no common exposure to food, drink, or agricultural chemicals among those affected. No toxins were consistently present in patients' blood or urine. Hydrogen sulphide gas was detected in low concentrations (40 parts per billion) at the site of the first outbreak. No other environmental toxins were found. The illness was thus of psychological origin and possibly triggered by the smell of hydrogen sulphide.

INTRODUCTION

THE major diagnostic challenge posed by epidemics of non-fatal illness as discussed on p 1472[1] is to determine whether such illness is of toxic or psychological origin.[2,3] Radio announcements and newspaper reports suggested that a neurotoxin was widely suspected of having been the cause of the epidemic which occurred in March and April, 1983, in the West Bank.[4,5] However, clinical, epidemiological, and toxicological studies suggested that the illness was psychological in origin.

METHODS

Clinical and Epidemiological

We assessed the clinical and epidemiological features of the illness by interviewing and examining patients with acute and recrudescent symptoms in two of the more severely affected villages—at Arrabah in northern West Bank, where the first cases had occurred, and at Yattah in the south, patients were interviewed and examined in hospital 2–12 days after onset of illness. This exercise preceded the home interview survey. The home interviews at Arrabah began 18 days after onset of illness, and at Yattah 8 days after onset. Patients as well as unaffected comparison subjects of the same age, ethnic background, and sex residing in the same village were invited to participate. Both cases and comparison subjects were interviewed individually by Arabic-speaking, female interpreters using a standard questionnaire about sociodemographic status; clinical features of illness; antecedent exposures to food, water, and agricultural chemicals; and general state of health. Questions were derived from survey instruments developed previously by the Centers for Disease Control.[6] During the interviews, venous blood samples were obtained from approximately 10 patients and 10 comparison subjects at each village for toxicological screening. Additional serum, urine, and whole blood samples for toxicological analysis were obtained from acutely ill patients admitted to Mukassad Hospital, Jerusalem, and from patients evaluated at Bir Zeit University.

Toxicological

Serum samples were examined toxicologically at the Centers for Disease Control (CDC), Atlanta, Georgia. Evaluations began with headspace analysis to detect volatile organic compounds. Samples were heated to 37°C in a closed container, and the headspace gases were analysed by gas chromatography/mass spectroscopy (GC/MS) as well as by gas chromatography/electron capture detection (GC/ECD). Samples were also subjected to high-pressure liquid chromatography (HPLC) to detect water-soluble compounds. Additionally, samples were extracted with hexane/ethyl ether, and the extracts were analysed by (1) GC coupled with flame photometric detection (FPD); (2) GC with flame ionisation detection (FID); (3) GC/ECD; and (4) GC/MS. Urine samples were acid hydrolysed and extracted; the resulting derivatives were analysed by capillary GC/ECD. Whole blood samples were screened for inorganic toxins by inductively-coupled argon plasma atomic emission spectroscopy; results were compared with data from composite whole blood samples which were prepared at the CDC from stored specimens collected in the Hispanic Health and Nutrition Evaluation Survey (HHANES), a survey of a representative sample of the US Hispanic population.

Environmental

To evaluate possible exposures to environmental toxins, air samples collected at outbreak sites were analysed, by methods described previously,[7] for carbon monoxide, hydrogen sulphide (H_2S), sulphur dioxide, total hydrocarbon content, oxides of nitrogen, and methane. Also, for each location, a broad spectrum of potentially toxic gases was sought by the use of continuous infrared spectroscopy, scanning over wavelengths from 2·5 to 14·5 μm.

Samples were obtained of environmental materials regarded by local residents as possible sources of illness. These included yellow powder from schoolyards, water, dust, dirt, schoolroom curtains, empty cola cans, powder from a glass jar found in a schoolyard, and

an aluminium canister suspected of containing toxic gas. These samples were analysed at both the Israel Ministry of Health (IMOH) and at the CDC. Analysis was by GC/MS, GC/FPD, and GC/ECD. Samples were also subjected to bioassay and were tested for the presence of organophosphorus compounds.

RESULTS

Clinical and Epidemiological

At Arrabah, 58 (95%) of 61 affected schoolgirls and 4 affected adults participated in our survey; at Yattah, 56 (64%) of 88 affected secondary schoolgirls and 6 affected adults participated. Also 57 age-matched and sex-matched unaffected comparison subjects from these two villages were included. Headaches, dizziness, abdominal pain, and weakness were the symptoms most commonly reported by survey participants (table). 42 (68%) of the patients interviewed in Arrabah and 46 (74%) of those surveyed in Yattah reported residual symptoms at the time of our surveys. Physical and neurological examinations done in hospital, 2–12 days after onset of illness showed tachycardia, mydriasis, and peripheral cyanosis but no other abnormalities. Although many patients complained of abdominal pain, none had tenderness or guarding. Also, although most patients described difficulty in walking, none had specific muscle weakness, sensory loss, loss of reflexes, or cerebellar dysfunction.

SYMPTOMS IN ARRABAH AND YATTAH

Symptoms	Arrabah (n=62)	Yattah (n=62)
Headache	60 (*97*)*	62 (*100*)
Dizziness	57 (*92*)	62 (*100*)
Abdominal pain	40 (*65*)	54 (*87*)
Blurred vision	38 (*61*)	42 (*68*)
Weakness of limbs	37 (*60*)	52 (*84*)
Myalgia	26 (*42*)	20 (*32*)
Loss of consciousness	18 (*29*)	23 (*37*)
Paralysis	9 (*15*)	7 (*11*)
Blindness	6 (*10*)	7 (*11*)

*Nos in parentheses = percentage.

Epidemiological

The interview surveys did not reveal common antecedent exposures to food, drink, or agricultural chemicals. At Arrabah, 8 cases (13%) reported that they had smelled an unusual odour before the onset of illness; 5 said that it resembled rotten eggs, 2 that it was like kitchen gas, and 1 could not describe it precisely. At Yattah, 50 (89%) of 56 patients reported an unusual odour.

We found no significant differences between cases and comparison subjects in their perceived antecedent health status, school performance, or reported frequency of school absenteeism.

Toxicological

Although low concentrations of chlorinated hydrocarbon compounds were detected in sera of several patients, no consistent differences were found at the CDC laboratories between samples from cases and comparison subjects. No organophosphorus compounds were detected in serum samples. Urine samples contained no detectable toxins. Analysis of the whole blood samples showed no inorganic toxins, and comparison with results from the HHANES samples showed no consistent differences.

Environmental

Initial air sampling at the Arrabah school on March 23 showed that the classroom with the highest concentration of H_2S contained 40 parts per billion (ppb) H_2S. No other toxic gas was detected at Arrabah or elsewhere. In follow-up air sampling at the school on April 10, H_2S was again detected, this time in concentrations ranging from 16 to 50 ppb in a latrine located 10 m from the main schoolbuilding; concentrations of H_2S in the subjacent percolating pit ranged from 200 to 350 ppb. Methane (150 parts per million) and airborne hydrocarbons (250 ppm) were also detected in the latrine.

No organophosphates or other environmental toxins were detected in soil, dust, and water samples obtained from outbreak sites. A yellow powder from the schoolyard at Arrabah was identified as pollen. Powder from a tin collected at the Yattah schoolyard was found to be calcium carbonate. Residue in a cola can from the school at Yattah contained sugar and flavouring.

DISCUSSION

The major differential diagnosis in this epidemic was between a toxic illness and an illness of psychological origin. Exposure to low concentrations of such airborne toxins as formaldehyde,[8] cigarette smoke,[9] carpet shampoo vapour,[10] gasoline vapours,[11] and polyvinyl chloride (PVC) fumes[12] have produced symptoms of headache, dizziness, blurred vision, and respiratory irritation similar to those experienced by patients here. Exposure to agricultural[13] or industrial chemicals[14] has also been responsible for widespread outbreaks of severe toxic illness. We found no evidence for a toxic aetiology of this outbreak.

Acute illnesses of psychological origin are characterised by headache, respiratory distress, nausea, vomiting, muscular pain, and protean neurological symptoms without demonstrable abnormalities on physical examination or in laboratory analyses.[15–18] The detection of an unusual odour has sometimes preceded symptoms.[15,17]

Support for a diagnosis of a psychogenic illness was provided here by the preponderance of female patients, particularly of adolescent girls.[2,15] The relative sparing of infants, adolescent boys, and older adults argues against the presence of a toxin. Moreover, we had no evidence that patients had deliberately fabricated their symptoms. Hence our conclusion that this epidemic was triggered either by psychological factors, or, more probably, by the odour of low concentrations of H_2S gas escaping from a latrine at the school in Arrabah. Subsequent spread was due to psychological factors operating against a background of stress, and it may have been facilitated by newspaper and radio reports.[4,5]

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Correspondence should be addressed to P. J. L., National Institute for Occupational Safety and Health, 4676 Columbia Parkway, Cincinnati, Ohio 45226, USA.

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Obstetrics

BIRTH UNDER WATER

MICHEL ODENT

Centre Hospitalier Général de Pithiviers, Pithiviers 45300, France

THE 100th birth under water in our hospital in June provided my team with an opportunity to summarise our experience of the use of water in an obstetric unit. Since a report on birth under water in 1805,[1] the subject has been rarely broached in the medical literature.

In Pithiviers, a hospital which is, in other respects, a conventional state hospital,[2] a small pool has been installed close to the homely birthing room. This pool is large enough (2 m in diameter) and deep enough (about 0·7 m) to make it easy for a woman in it to change her posture. Many parturients feel an irresistible attraction to water. We don't advise women to try the pool; we simply offer the pool as a possibility. The water is ordinary mains tap water, at a temperature of 37°C. The water is not sterilised, and contains no chemicals or additives of any sort. We tend to reserve the pool for women who are experiencing especially painful contractions (lumbar pains, in particular), and where the dilatation of the cervix is not progressing beyond about 5 cm. In these circumstances, there is commonly a strong demand for drugs. In most cases, the cervix becomes fully dilated within 1 or 2 hours of immersion in the pool, especially if the lights are dimmed. It is possible to check the fetal heartbeat regularly with a small ultrasound stethoscope or with a traditional obstetrical stethoscope. Most women choose to leave the water at the second stage.

We believe that the warm pool facilitates the first stage of labour because of the reduction of the secretion of noradrenaline and other catecholamines; the reduction of sensory stimulation when the ears are under water; the reduction of the effects of gravity; the alteration of nervous conduction; the direct muscular stretching action; and peripheral vascular action. Other factors, however, are difficult to rationalise. We have found, for example, that the mere sight of the water and the sound of it filling the pool are sometimes sufficient stimuli to release inhibitions so that a birth may occur before the pool is full. We have observed that water seems to help many parturients reach a certain state of consciousness where they become indifferent to what is going on around them. Although nearly all the women who enter the pool leave it before the birth, the process of delivery can sometimes be so extraordinarily fast under water, that some parturients do not leave the pool at the second stage. Birth under water is therefore not exceptional in our unit, although it may not be intentional. During the second stage, immersion in warm water seems to help women lose their inhibitions. Most women cry out freely during the last contractions.

When the birth happens under water, the newborn infant is brought gently to the surface and placed in the mother's arms. This is always done within seconds but without rushing (I am present at the pool for every underwater delivery). Our experience confirms that the newborn's first breathing is triggered by contact with the air and the sudden difference in temperature. There is no risk of inhalation of water. It is useful to remember that in the human species the carotid chemoreceptors are thought to be insensitive at birth, and very likely play no part at the time of the first cry.[3,4,5] Only 2 newborn infants out of 100 needed suction of the upper respiratory tract and a short period of manual ventilatory support. At the time of first contact, most mothers are in a vertical position, kneeling in the water. They hold the baby in their arms in such a way that skin-to-skin and eye-to-eye contact are as perfect as possible. An early demonstration of the rooting reflex is almost the rule, and a first sucking 20 min after the birth is common. Water seems to facilitate the development of the mother-infant relationship. We cut the umbilical cord and help the mother leave the pool just before expulsion of the placenta. We consider that there might be a risk of water embolism if the mother were to stay in the pool after this time. In 100 underwater deliveries there were 2 manual removals of placenta (our general rate is less than 1%).

All the presentations were cephalic. In breech presentations, our strategy is to use the first stage as a test before deciding on either a vaginal delivery or a caesarean section: in these cases we prefer not to interfere with drugs or with a bath. Among the 100 women who gave birth underwater,

P. J. LANDRIGAN AND BESS MILLER: REFERENCES—*continued*

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