

Emergency medical assistance during a mass gathering

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The Thunderdome-party was a mass gathering of 14 000 young people. Many of them were under influence of drugs (amphetamine and ecstasy (MDMA)). The organization of on-site emergency medical assistance was essential in order to avoid overload at the local emergency department and to avoid a disequilibrium of the local emergency medical system, the 'call 100' system in Belgium. The benefit of a prehospital medical team at the event is illustrated by the description of the population treated on-site. Toxicological screening of blood and urine was not necessary to safely treat drug intoxication during the Thunderdome-party.

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Keywords: mass gathering; ecstasy; amphetamine; emergency medical assistance; toxicological screening

INTRODUCTION

The reported Thunderdome-party was the fourth time a rave party with participation of 14 000 young people had been held (Fig. 1). Rave is, according to the Internet, techno music recently developed in Great Britain. Techno or house music is loud electronic music with as its central element the rhythm (between 115 and 160 beats/minute), and little singing. Using massive sensory stimulation (auditory and visual), the disc jockey tries to achieve a state of heightened arousal. A rave party takes place in dark halls lit by laser beams. Ravers dance continuously with short and heavy movements until early in the morning. The number of participants at a rave party varies from 50 to 25 000. A typical raver is a lightly dressed adolescent. The popularity of rave and rave parties has increased during recent years across the world.¹⁻³ Rave is associated with the use of smart-drinks and drugs (amphetamine, LSD and ecstasy or MDMA (3,4-methylenedioxymethamphetamine)).²⁻⁴ A smart-drink is a mixture of fruit juices supplemented with amino-acids, vitamins and caffeine. Smart-drinks are supposed to increase the energy reserves and alertness.⁵

The Thunderdome-party took place over one night (from 19.00 h to 07.00 h) in the 'Sportpaleis' of Antwerp. It was a captive audience event;⁶ once the participants left the party, they had to

pay the full entrance price upon re-entrance (> 1000 BEF). The 'Sportpaleis' is a covered multi-purpose hall where several times a year various mass gatherings are organized. The 'Sportpaleis' has a capacity of 18 400 spectators, the complex is situated at the border of Antwerp, at approximately 1.5 km of the Stuivenberg Hospital.

There is little information available in the literature⁷ concerning medical assistance at rave parties. Information concerning medical assistance during large-scale gatherings exists,^{5,6,8-10} but no standard model is available.⁶ In Belgium the authorities have not issued concrete guidelines in relation to the organization of medical assistance at such gatherings. An event with a public of over 1000 people should be considered as a mass gathering.^{11,12}

ORGANIZATION OF MEDICAL ASSISTANCE

One month prior to the event, a safety meeting with the different services involved (police, state police, organizer, manager of the event complex, security, Red Cross, city government and the medical team) was organized. The fire brigade was also invited to this meeting. This was the third time that the medical team was involved in the organization of medical assistance for this kind of major event.

First aid was the responsibility of the Red Cross. A medical team was available to provide back-up

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Fig. 1. Photograph of the event, the Thunderdome-party.

medical care to the Red Cross. This medical team was composed of physicians (two emergency physicians, one anaesthetist, three trainee anaesthetists and one general practitioner with additional training in emergency medicine) and nurses of the Mobile Emergency Medical Team (MEMT) and the emergency department of the Stuijvenberg hospital. Their responsibility was limited to assistance at the Thunderdome-party; the function and the functioning of the Mobile Emergency Medicine Team, the regional emergency medical system '100', and the emergency service of the AZ Stuijvenberg were kept integrally. Additionally there was one permanent medical team (one physician and one nurse) at the entrance of the 'Sportpaleis' available for intervention in the complex. The latter were also at the disposal of the police who checked everyone for possession of drugs and weapons upon entry. In case of doubt, drugs were only confiscated after consultation with the medical team.

The medical assistance post was located at the rear end of the 'Sportpaleis'. The location was easily accessible from the complex where the event took place, as well as for ambulances. It was a heated and isolated room behind the stage. There was no noise disturbance despite the fact that there were over 110 decibels on the dance floor. The assistance post was only accessible to people seeking help and the people providing it.

Logistics, administration, radio communication and victim evacuation were performed by the Red Cross.

The medical assistance post was divided into three separate zones:

- Red zone: High emergency care, given by the medical team
- Yellow zone: Non-emergency care, given by nurses attached to the Red Cross
- Green zone: Minor care, given by Red Cross helpers

If necessary, assistance from the medical team of the red zone could be sought in the yellow or green zone (e.g. for hospital transfers).

Upon arrival at the assistance post all patients were screened by the general practitioner who was assisted by a nurse. In each case a record and a priority rating card were completed by the Red Cross workers. These priority rating cards were collected upon departure from the help post.

Further description in this publication will only cover activities from the medical team and the organization of the red zone.

The infrastructure and organization of the red zone were set up as an advanced post of the emergency department of the hospital. Eight patients

could simultaneously be observed. All the necessary equipment to provide critical care was available. One nurse (materials manager) was solely responsible for the management of materials, medication, administration and medical files. A medical file was completed each time a physician was involved in treatment. In the red zone there were at least one physician and four nurses, who were relieved after 4 hours. The objective of the red zone was to treat as many patients on-site as possible, in order to avoid overload of the emergency services. It was decided in advance that for technical, practical and hygienic reasons any patient requiring surgical stitches or who needed further radiological investigation would be transferred to the hospital.

Ravers with complaints that could be due to the abuse of prohibited drugs were referred to the red zone where they could be observed neurologically and haemodynamically (with the aid of continuous blood pressure measurements and ECG monitoring). The treatment consisted initially of rest. Peripheral vascular access was obtained, based upon the physician's clinical decision. Intoxicated persons were initially re-hydrated by means of an infusion (glucose 5%), if necessary followed by crystalloid solutions. The decision for first administering a glucose solution rather than normal saline was based upon previous clinical experience—most patients recovered sooner—and that vascular access was more important than the type of solution used for rehydration. The (small) caloric input of the glucose solution was also taken into account, since most patients were exhausted. In the case of severe agitation a tranquillizer (midazolam) was administered intravenously. If necessary a neuroleptic (droperidol) was administered intravenously. The use of anti-arrhythmics (atenolol and labetalol) was limited. If the observation period in the red zone was likely to be longer than 2 hours, the patient was transferred to the hospital.

Upon insertion of the infusion, a blood sample was taken via the catheter prior to connection to the infusion solution. If possible, a urine sample was collected from these patients on a voluntary basis. Both samples served for later toxicological screening by means of gas chromatography. No further laboratory tests were performed, except determination of ethanol content in the blood samples.

PATIENT POPULATION

One hundred and eighty-nine patients were distributed as follows at the entrance of the help

post: 98 (52%) into the green zone, 49 (26%) into the yellow zone and 42 (22%) into the red zone.

The general profile of the raver presenting at the help post was a 17-year-old, male Dutchman, who between 24.00 h and 03.00 h had exhaustion symptoms due to dancing. He rested 25 minutes in the green zone and had no need for further treatment. After leaving the help post, he returned to the event.

In addition to the 42 patients initially referred to the red zone, 20 patients were seen by the medical team in the second line (Table 1).

The complaints for which the patients were directed into the red zone were 8/42 (19%) illness and 34/42 (81%) intoxication (Table 1). None of the referred patients had a surgical problem. The following complaints were defined as illness: hyperventilation, bronchitis with fever, general malaise, exhaustion and syncope. In the case of intoxication, the patient had at least one of the following complaints: agitation (motor and psychic), confusion, restlessness, reduced consciousness, muscular spasms, heart palpitations, disorientation, retrosternal pain, nausea and paranoid thoughts.

Eighteen people were transferred to the emergency service for further therapy. Eight (44.4%) with a surgical pathology; five for stitches and three patients for whom radiological examination was necessary. One (5.6%) was referred for bronchitis with fever (39.2°C) and general malaise, while nine (50%) patients were referred with intoxication (seven drug abuse, two alcohol abuse). Nobody was admitted to the hospital for more than 24 hours.

Of the 42 persons who initially arrived in the red zone, 16 (38%) were female, and 26 (62%) male. Thirty-four of the 42 (80.9%) came from the Netherlands, the other eight (19%) had Belgian nationality.

In 34 patients a peripheral infusion was placed. A blood sample was taken from 32 patients. Additionally 9/32 (28.1%) patients delivered a urine sample. Toxicological screening of the blood samples demonstrated in 26/32 (81.2%) the presence of prohibited drugs (Table 2): 13 (40.6%) blood samples demonstrated the use of MDMA, nine (59.4%) the use of amphetamine. One (3.1%) blood sample showed the presence of ephedrine. Seven (21.9%) samples were positive for amphetamine and MDMA. Ethyl was present in five (15.6%) blood samples, and three of these samples were also positive for drugs.

Table 1. Number of patients treated by the medical team

42 (67.8%) initially sorted into the red zone:	
8 (19%) illness:	• hyperventilation • bronchitis with fever • general malaise • exhaustion • syncope
0 (0%) surgical problem	
34 (81%) intoxication:	• agitation (motor and/or psychological) • confusion • restlessness • diminution of consciousness • muscular spasms • heart palpitations • disorientation • retrosternal pain • nausea • paranoid thoughts
20 (32.2%) initially sorted into the green or yellow zone	
Total: 62 out of 189 patients visiting the medical assistance post	

Table 2. Results of toxicological screening of blood samples ($n = 32$)

Positive on screening: 26 (81.2%)		
6	(18.7%)	MDMA
12	(37.5%)	amphetamine
1	(3.1%)	ephedrine
7	(21.9%)	MDMA and amphetamine
Positive on screening for ethanol: 5 (15.6%)		
Negative on screening: 6 (18.7%)		

Table 3. Results of toxicological screening of urine samples ($n = 9$)

Positive on screening: 9 (100%)	
4	MDMA, amphetamine, cannabis
1	MDMA, amphetamine, cocaine
1	MDMA and amphetamine
2	amphetamine
1	MDMA
Negative on screening: 0 (0%)	

Toxicological screening of the nine urine samples demonstrated 7 × MDMA, 8 × amphetamine, 4 × cannabis, 1 × cocaine (Table 3). In four patients there was a combination of MDMA, amphetamine and cannabis. One urine sample was positive for MDMA, amphetamine and cocaine. In two patients there was only amphetamine in the urine and in one patient only MDMA in the urine. One urine sample showed the use of MDMA and amphetamine. In total, six of the nine controlled urine samples contained traces of combined drug use.

Toxicological screening of the urine samples confirmed each time the results of the screening of the blood samples. The reverse was not always true (Tables 2 and 3).

There was no need for Basic and Advanced Life Support (defibrillation, intubation and artificial ventilation). There were no deaths.

DISCUSSION

Thanks to thorough preparation with a safety meeting involving all parties as a central part, the organization of on-site medical assistance was satisfactorily carried out. The number of transfers from the help post to the emergency service was reduced (18 out of a total of 189 patients seen at the location of the event). Only one raver with a cut wound went immediately without referral to the Stuivenberg hospital. This meant that the local emergency services could perform their normal activities during the Thunderdome-party and were not overloaded. This concept has previously been expressed.^{1,10,13}

The estimated number of patients presenting at a mass gathering can be done by means of certain criteria.⁶ Because of the likely number of patients, appropriate medical support can be organized. The most important factor is the number of people attending the event,⁶ certainly in the case of a rock concert.¹⁴ Other factors are duration and time of the event, location, environment and architecture, captive audience, collective mood, weather, age and number of active participants,

alcohol and drug abuse.^{6,13} On the basis of these criteria a mega rave party is a 'high risk' event.

According to other criteria,¹¹ at a sold-out event Basic Life Support should be able to start within 4 minutes, and Advanced Life Support within 8 minutes after the beginning of a problem. In order to fulfil these criteria, the assistance of a medical team at a mega rave party is essential.

Drug abuse was one of the most important reasons for medical intervention at the Thunderdome-party. Other reasons for medical intervention were comparable with those at rock concerts for instance. The red zone served mainly to look after persons with drug-related problems. It is noteworthy that no surgical patients were seen in the red zone. The pathology as a result of aggression and violence was remarkably low. Alcohol at a rave party is not a major problem;⁷ this was confirmed by us through the ethanol determinations in the blood of our patients. At a rave party the infrastructure and training of the helpers should be oriented towards diagnosis and treatment of drug intoxication. Statistics of big open air concerts indicate that one out of 75 participants presents at the first aid station.¹⁵ Our figures (14 000 participants/189 patients = 1/74) are in the same order of magnitude.

During a mega rave party medical assistance is confronted with the classical problems of a large-scale gathering, including those related to an existing pathology (for instance asthma and diabetes). The supplementary team at the entrance dealt with many of these requests for help. At an earlier comparable event, the routine confiscation of all medication (principally inhalers with beta-adrenergic agonists) by the police, led to urgent requests for help because of breathlessness.

As described¹⁻⁴ drug abuse also took place during this rave party. Toxicological screening demonstrated a high use of amphetamine and MDMA or ecstasy. To a lesser extent, other prohibited drugs such as cannabis and cocaine were found. There was often combined drug use. The literature demonstrates¹⁶ that young people consider MDMA as a safe drug, and disregard the risks. Deaths have been recorded even after a single use of MDMA.¹⁷⁻¹⁹ The treated population in the red zone (42 ravers) is probably not representative of the 14 000 participants. This is also valid for the blood and urine samples. In practice it was difficult to collect urine samples in comparison with blood samples, because urine samples were collected on a voluntary basis. Nevertheless, the result of the toxicological screening gives an impression of drug abuse at a rave party.

Our limited experience demonstrates that toxicological screening was not necessary to treat drug intoxication at the Thunderdome-party; history and clinical investigation were clear and conformed with each other so that local and immediate toxicological screening of blood and urine would not interfere with the management and the treatment. Only a minority was transferred to the hospital. Diagnosis did not pose a problem but there were situations where further monitoring (clinical and haemodynamic) after the initial observation period of 2 hours was required.

In the red zone 80.1% of the patients were Dutch; a mega rave party is not a local event, but is associated with (drug) tourism.

CONCLUSION

While organizing a large-scale gathering, a safety meeting should take place prior to the event, in order to evaluate the risks. In accordance with the level of risk it is important to have a medical team, trained in emergency and preclinical care (MEMT) to provide first assistance. Essentially this team should be able to deal with the medical problems at the location of the event in order to avoid overload at the surrounding emergency services, and the Emergency Medical System ('call 100').²⁰ Especially in the case of a mega rave party, because of the high incidence of drug intoxication (especially amphetamine and MDMA), the presence of a medical team is essential. Routine drug screening in blood or urine is not necessary to treat safely drug intoxication at the rave party.

ACKNOWLEDGEMENTS

With thanks to Dr H. Neels, P. Demedts and A. Wauters of the toxicology laboratory of the AZ Stuivenberg and the AZ Middelheim, Antwerp for the realization of the toxicological screenings.

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