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CASE REPORT

Identifying the cause of intoxication case without a clear history using flowcharts

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ABSTRACT

Background: Suspicion of intoxication and its causative agents are required in the clinical practice of intensive care units. Patients with loss of consciousness and no history of leading causation present obstacles in emergency room management. An understanding of toxidromes and epidemiological evidence can help clinicians. However, classic toxidromes are not always presented. **Objectives:** This case was presented to determine the flow of approaches to identify the cause of intoxication and to design early strategies for supportive care in intoxication case management. **Case:** A woman with loss of consciousness accompanied by seizures, deep and rapid breathing, and hypotension. Since the search for collateral information did not produce any meaningful findings, the toxin diagnosis was given based on vital signs, pupil size, and mental status. Methanol intoxication was suspected based on hypothermia, decreased consciousness, normal pupil size, and Kussmaul breathing. Forensic analysis showed her serum was positive for ethanol and methanol. **Conclusion:** When facing a case without the classic presentation of the toxidrome, the toxin diagnosis can be directed based on vital signs, pupil size, mental status, and muscle tone. Introduction to epidemiology is also important in tracking intoxication causation.

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Highlights

1. Intoxication sign such as weakness and blurred vision and unclear causative agent are necessary in clinical practice in the emergency department (ED) for medical treatment and management of the patients.
2. The priority in patients with suspicion of intoxication of initially unknown cause remains the act of resuscitation.

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BACKGROUND

Almost 92% of poisoning events are minor, with 79.4% occurring accidentally, and a mortality rate of less than 0.1%. Exposure agents including analgesic agents (11.3%), cleaning agents (7.7%), cosmetics (7.7%), antidepressants (4.4%), and remaining agents are antipsychotic and sedative-hypnotic drugs (5.9%) (Mowry et al., 2015). Death is usually caused by carbon monoxide poisoning, analgesics, sedative-hypnotic agents, antipsychotics, antidepressants, alcohol, and illegal drugs.

Self-inflicted poisoning incidence (suicide attempts, overdoses, intoxications) in the emergency department totaled 3,533 cases during the 2005-2012 period with less than 2% of all cases in the ED. Alcohol was the majority cause (67.3%), with casualties in four cases due to intoxication (Sorge et al., 2015), followed by benzodiazepines (38.3%), analgesics (24.5%), antidepressants (27.2%), antipsychotics (15.7%), opioids (5.5%), and non-opioid banned substances (24.3%) (Ambrosius et al., 2012). However, data on poisoning incidence in Indonesia are still inadequate, especially on intoxicated individuals.

Intoxicated patients sometimes present in loss of consciousness with no causative leading history. Clinicians could become 'blind' to what they are faced with when dealing with intoxication cases or suspected overdoses, especially in cases of infrequent exposure to the substances. As a result, suspicion of intoxication and its causative agents is necessary in clinical practice in the emergency department (ED).

Identification of specific toxic syndromes (toxidromes) is a rational approach to poisoning cases. The introduction of toxidromes can help, but sometimes the symptoms are not specific or masked in other conditions (e.g., myocardial ischemia in cases of carbon monoxide poisoning). The course of the disease can also change during evaluation. For example, antidepressant poisoning initially undergoes several phases of multiorgan failure leading to cardiovascular collapse. An understanding of epidemiology, the flow of approaches to finding intoxication causes, and early strategies for supportive care are very important in managing intoxication cases.

OBJECTIVE

This case report aimed to understand the flow of approaches to identify intoxication causes and early strategies for supportive care in intoxication case management.

CASE

A 26-year-old woman was brought to hospital with complaints of weakness and blurred vision, reported approximately six hours earlier. The patient was still conscious in the ED, but she appeared agitated. When examined by an ophthalmologist, the patient suddenly fainted and was taken to the resuscitation room. Then, the patient had recurrent seizures.

Preliminary studies showed rapid breathing with over 30 breaths per minute, odorless breathing, 97% saturation with 15 liters of oxygen per minute via non-rebreathing mask (NRM), a blood pressure of 76/35mmHg, a pulse of 139 beats/min, and a temperature of 35^0C. The physical examination showed an E2V2M4 level of consciousness, 4/4 mm pupils, +/+ light reflexes, clean pulmonary sounds, a non-distended abdomen, and normal bowel sounds.

An electrocardiography examination obtained a tachycardia sine wave pattern. No QRS complex dilation or elevated T waves were found. The ED physicians maintained the airway by tracheal intubation and the provision of mechanical ventilation assistance. Circulation was improved with an infusion of Ringer's lactate solution and gelatin, measuring 500 ml each, supplemented with dobutamine 10-15 mcg/kg/min. The patient was given midazolam 5 mg bolus iv followed by continued doses of 3-5 mg/hour to terminate the seizure.

After initial treatment, the patient's level of consciousness decreased to GCS E1VtM1 and vital signs showed a TD of 98/56 mmHg, a heart rate of 121 beats/min, a breath rate of 28 breaths/min, and spO2 99% on ventilator mode SIMV TV400mL RR22 PS12 PEEP5 FiO2 50% with a minute volume of 10-13L/min. Post-intubation blood gas analysis still showed severe metabolic acidosis. The minute volume was increased to >13 L/min and given the addition of intravenous sodium bicarbonate measuring 100 mEq within 30 minutes, followed by 100 mEq within 3-4 hours. Hemodialysis was carried out for 3-4 hours and treatment was continued in the high care unit.

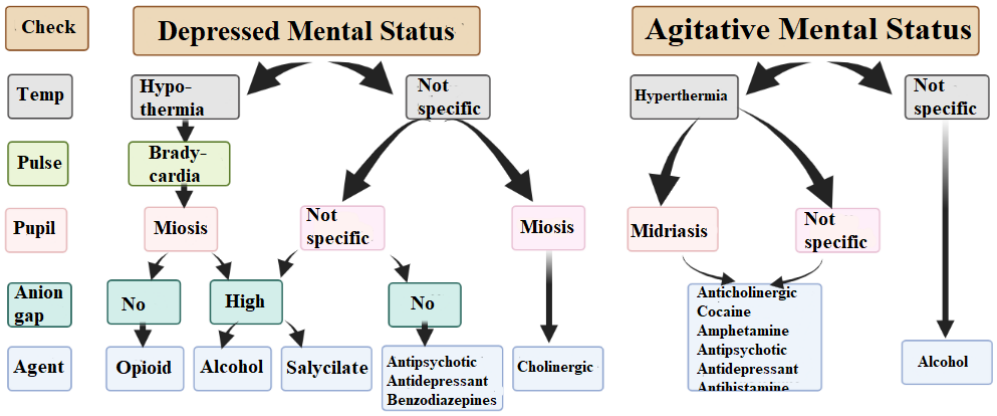

Figure 1. The flowchart to identify the cause of intoxication in cases without a clear history

DISCUSSION

Resuscitation remains the priority for patients with suspicion of intoxication with initially unknown causes. These patients come with a loss of consciousness and seizures, thus, intubation is performed. Mechanical ventilation assistance is provided while maintaining hyperventilation as compensation for acidosis. Gas analysis of arterial and/or venous blood is carried out as often as possible to evaluate the pH and ensure the presence of adequate ventilation and oxygenation. Hypotension is initially treated with the administration of a crystalloid bolus of 10-20 ml/kg. However, hypotension in intoxicated patients is rarely due to lack of fluid. Hence, dobutamine is administered according to the suspicion of the toxin type and its effect on hemodynamics (failure of the heart pump vs vasodilation) (Greene, 2019).

Furthermore, the initial assessment is typically in the form of a blood glucose level, vital sign, and mental status assessment. A cocktail consisting of oxygen supplementation, thiamine 100 mg, glucose 25 g, and naloxone 0.4-2.0 mg iv is often taught in literature for cases with loss of consciousness. However, this approach is not cost-effective in developing countries. Patients do not develop hypoglycemia based on rapid measurements of bed-side glucometers, whereas opioid poisoning is quite rare given the limitations of access. There is no hard evidence for thiamine administration before dextrose to prevent Wernicke's encephalopathy (Schabelman and Kuo, 2012). Due to this, cocktails were not administered in this case.

This patient did not show the classic toxidrome presentation; therefore, the authors used a diagnostic approach based on their vital signs, pupil size, mental status, and muscle tone (Pohjola-Sintonen et al., 2000). Mental status assessment can be divided into two sections: excitation/agitative and depressive (**Figure 1**). Excitation can be in the form of CNS stimulation and increased heart rate, blood pressure, breath rate, and temperature. It is usually caused by anticholinergic agents, sympathomimetics, and hallucinogenic agents. Meanwhile, depressive mental status presents in the form of CNS depression, decreasing blood pressure, heart rate, breath rate and depth, and temperature. It is usually caused by cholinergic agents, sympatholytic agents, opioids, sedative-hypnotic agents, or alcohol (Greene, 2019).

The availability of agents/substances and the incidence rate in an area can narrow the search for toxin types. For instance, salicylates are very rarely used in Indonesia. Organophosphates and alcohols are the most reported agents. Psychiatric drugs are sometimes also abused. **Figure 2** shows the possibility

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of certain drugs being detected in poisoning cases. However, Pohjola-Sintonen et al. (2000) reported a discrepancy between the history of directing the agent type (collateral information, empty containers, or known prescriptions) in drug poisoning cases and 73% of toxicologically detected drugs, of which 18% were clinically meaningful (Pohjola-Sintonen et al., 2000). Neither the victim's discoverers nor those close to these patients were able to provide collateral information for the identification of the toxin's substance, dosage, route of exposure, and time of exposure. That important information could be covered up because of the fear of being linked to criminal acts. Empty containers/bottles were not reported at the victim's premises. Medications prescribed to patients or medications accessible from family or friends were also disclaimed. A history of psychiatric disorders as well as previous suicide attempts were also refuted. Although it was denied, the use of illicit substances could not be ruled out due to the increase in abuse cases in entertainment venues.

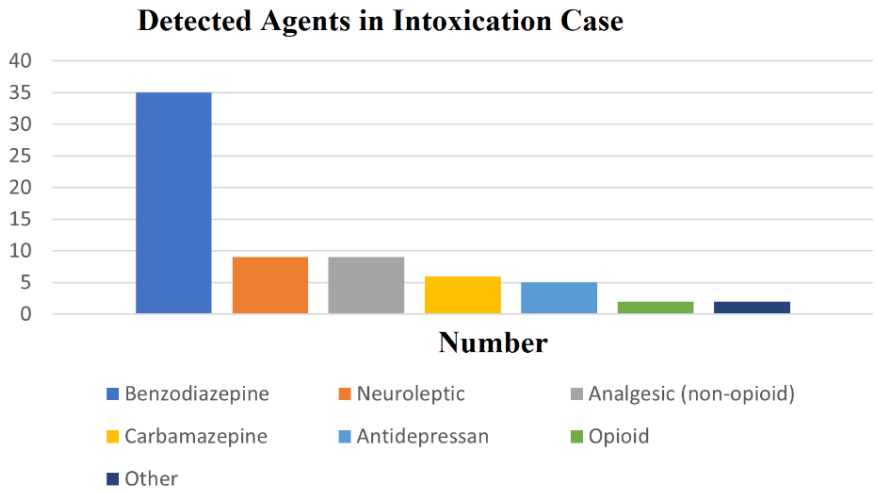

Figure 2. Detected drugs in poisoning cases (Schabelman and Kuo, 2012).

This patient was suspected of drinking alcohol six hours before going to the hospital. It is important to emphasize that the onset of methanol toxicity is delayed when ethanol is also consumed alongside it (Kerns et al., 2002). Ethanol competitively inhibits alcohol dehydrogenase, thereby reducing the formation of toxic metabolites. The possibility of concomitant ethanol and methanol consumption should always be considered, especially in alcoholics who may ingest alcohol in any form.

Based on the findings of hypothermia, non-constricted pupils, and early symptoms of depressive mental status coupled with epidemiological basis, the patient was suspected of alcohol intoxication as well as sedative-hypnotic drugs. The urine drug screening test did not detect amphetamines, benzodiazepines, or cannabis. The blood gas analysis suggested metabolic acidosis with high anion gaps, leading to methanol/ethylene glycol intoxication. Blood samples sent to forensic laboratories suggested the presence of methanol and ethanol.

Strengths and Limitations

Further studies are needed to explore other possibility.

CONCLUSION

When facing a case without the classic presentation of the toxidrome, the toxin diagnosis can be directed based on vital signs, pupil size, mental status, and muscle tone. Introduction to epidemiology is also important in tracking intoxication causation.

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Conflict of Interest

All authors have no conflict of interest.

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Author Contribution

The author contributed to all processes in this study, including preparation, data gathering and analysis, drafting, and approval for the manuscript's publication.

Patient Consent for Publication

This case report has been approved by the patient and his/her guardian.

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