Management of Drug Poisoning

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DRUG POISONING

- This may be accidental as in children or deliberate self-poisoning using one or more drugs.
- The mortality rate of self-poisoning is low as safety measures, poisoning prevention education , proper medical attention and good supportive care have reduced incidence of death.
- Careful management of respiratory failure, hypotension, convulsions and thermoregulatory disturbances has resulted in improved survival of patients who reach the hospital alive

Causes of death in poisoning

1. **CNS depression:** resulting in coma with loss of airway protective reflexes. Airway obstruction, aspiration of gastric contents or respiratory arrest are the most common causes of death due to overdoses of narcotics and sedative-hypnotic drugs

2. **CVS toxicity** with hypotension, depression of cardiac contractility or arrhythmias such as ventricular tachycardia or fibrillation occurring with overdoses of many cardioactive drugs such as digitalis and cocaine.

3. **Cellular hypoxia** may occur with carbon monoxide and cyanide poisoning due to interference with transport or utilization of oxygen.

Causes of death in poisoning

4. **Convulsions** as by diphenhydramine, cocaine, and amphetamines.

5. **Organ system damage**: massive hepatic necrosis may occur with paracetamol poisoning resulting in hepatic encephalopathy & death, 2-3 days after ingestion

Principles of treatment of poisoning

- **Successful treatment depends on:**

A. type and amount of the poison

B. speed of providing therapeutic measures.

Lines of treatment:

1. Supportive measures

2. Prevention of further absorption of the poison

3. Enhancing elimination of the poison

1. Supportive measures

include the

A. ("ABCD") of poisoning treatment that include:

- **A: Airway** should be cleared and an endotracheal tube (ETT) is inserted if needed. Positioning of patients in the lateral position is useful to move the flaccid tongue out of the airway.
- **B: Breathing:** should be maintained and assessed by measuring arterial blood gases. Patients with respiratory insufficiency should be intubated and mechanically ventilated.
- **C: Circulation:** continuous monitoring of pulse rate, blood pressure and urinary output is essential. An intravenous infusion line should be inserted.
- **D: Dextrose IV** is given to correct hypoglycaemia if suspected in patients with altered mental status; hypertonic dextrose is given intravenously (50 ml of 50% dextrose solution for adults).

B. Diagnosis and assessment of drug poisoning

a. History & Physical Examination regarding amount and type of the drug ingested. Physical examination should be performed to assess the following:

Vital Signs:

- Tachycardia is detected with sympathomimetic and antimuscarinic poisoning

- Hypotension and bardycardia occur with overdose with calcium channel blockers, and sedative hypnotics.

- Rapid respirations are typical of salicylates and carbon monoxide poisoning.

- Hyperthermia may be associated with anticholinergics and salicylates poisoning.

Eyes:

- Miosis: with opioids and cholinesterase inhibitors (organophosphorous insecticides)
- Mydriasis: occurs with sympathomimetic and antimuscarinic drugs.

Mouth: alcohol odor may be noted.

Skin:

- Flushed, hot, and dry in poisoning with atropine and antimuscarinics.
- Excessive sweating occurs with organophosphorous insecticide poisoning.
- Jaundice may suggest hepatic necrosis due to paracetamol.

Abdomen: abdominal colic and diarrhea occur in organophosphorous insecticide poisoning

b. Laboratory Investigations

- Arterial Blood gases: (PO_2, PCO_2 and blood pH)
- Electrolytes: sodium, potassium, chloride, and bicarbonate
- Renal function: Blood urea and creatinine levels and urinalysis
- ECG: atrial and ventricular arrhythmias are common with digoxin poisoning

C. **Identification of the poison :**

- Comprehensive toxicology screening is time-consuming, expensive, and may be unreliable.
- Results of tests may not be available for days
- Rapid biochemical screen of plasma or urine are available and used in seriously ill or unconscious patients.

2.Prevention of further absorption of the poison

- The patient should be removed from the toxic environment and measures of decontamination or removing toxic substances from skin or GIT should be applied.
- **Skin:** contaminated clothing should be completely removed. Contaminated skin is washed with soap and water.
- **GIT:** for most poisoning, administration of activated charcoal to bind ingested poisons in the gut before they can be absorbed is recommended. In unusual circumstances, induced emesis or gastric lavage may also be used.

A. Emesis: can be used for fully conscious children and also for adults. It can be induced with ipecac *syrup*. Both emesis and gastric lavage are contraindicated for corrosive poisoning (risk of perforation) and for petroleum distillates (risk of aspiration pneumonia). Inducing emesis by fingertip stimulation of the pharynx or salt water are ineffective or dangerous and should not be used.

B. Gastric Lavage: if the patient is conscious or if the airway is protected by an ETT, gastric lavage may be performed using an orogastric or nasogastric tube. Lavage solutions (usually 0.9% saline) should be at body temperature to prevent hypothermia. It is done on hospitalized adults within one hour of ingestion of dangerous poisons.

C. Activated Charcoal:

- reduces drug absorption better than induced emesis or gastric lavage
- is easier with less adverse effects.
- Owing to its large surface area, activated charcoal can bind to or adsorb many drugs and poisons and inactivates them.
- Charcoal **does not bind iron, lithium and corrosive mineral acids and alkali**.
- It is safe and should be given as soon as possible and ideally within one hour after poisoning while the poison is not yet absorbed.

- **Antidote administration:** is a substance which can counteract a form of poisoning

- may be given if there is a suspicion of certain drug poisoning.

Paracetamol	**Acetylcysteine**
Iron	**Desferoxamine**
Digitalis	**Digoxin antibodies**
Benzodiazepines	**Flumazenil**
Opioids	**Naloxone**
OPI (CE inhibitors)	**Pralidoxime**

3. Methods of Enhancing Elimination of Toxins

- After appropriate diagnostic and decontamination procedures and administration of antidotes, it is important to consider whether measures for enhancing elimination can improve clinical outcome

A. **Hemodialysis**

- helps in correction of fluid and electrolyte imbalance and may enhance removal of toxic substances.
- Hemodialysis is especially useful in overdose with drugs having small Vd in which drugs can be removed from blood as in aspirin poisoning

- Haemodialysis may be indicated in aspirin and lithium poisoning
- Haemodialysis is ineffective in digoxin and benzodiazepines poisoning

B.Urinary pH alteration

- Renal elimination of some drugs can be enhanced by alteration of urinary pH.
- For example, urinary alkalinization is useful in cases of aspirin overdose.
- Acidification may increase the urine concentration of amphetamines

Examples of Common Poisoning

PARACETAMOL

- most common drug in suicide attempt and accidental poisonings
- ingestion of more than 7 gm by adults is considered potentially toxic
- metabolized in the liver and a small proportion of paracetamol undergoes hydroxylation into a highly toxic metabolite called N-acetyl-p-benzoquinonimine (NABQI)
- NABQI normally conjugates with glutathione and becomes harmless
- **In overdose toxicity: NABQI** is formed in excess resulting in depletion of hepatic glutathione. The remaining unconjugated NABQI then binds to cell macromolecules leading to dysfunction of enzymatic systems and cell death, causing hepatic and renal tubular cell damage.

- Initially, the patient is asymptomatic or has mild GI upset.
- After 24–36 hours, evidences of liver injury appear, increased liver enzymes & hypoprothrombinemia.
- In severe cases, severe liver failure occurs, leading to hepatic encephalopathy and death.
- Renal tubular necrosis and hypoglycaemic coma may also occur.
- Hepato-renal damages occur 24-48 hours after ingestion.

- With serum paracetamol concentration greater than 150 mg/L for 4 hours after ingestion, the patient is at risk of liver injury.

- Early treatment is important (within 8 hours), giving N-acetylcysteine IV or oral methionine to increase hepatic glutathione reserve.

- Glutathione is not useful because of poor cell penetration.

- Acetylcysteine acts as a glutathione substitute & binds the toxic metabolite and is most effective when given early and so should be started within 8–10 hours if possible.

- A liver transplant may be required for patients with hepatic failure.

ANTI-MUSCARINIC AGENTS

Patients present with:

- Hot, dry, flushed skin
- Blurred vision
- Delirium
- Tachycardia
- mydriasis

➢ Treatment is supportive

Aspirin (Salicylate)

- Acute ingestion of more than 200 mg/kg is likely to produce intoxication.
- The first sign of aspirin toxicity is hyperventilation and respiratory alkalosis. Body temperature may be elevated.
- With very severe poisoning, severe metabolic acidosis, coma, and cardiovascular collapse may occur.

- **General supportive measures are essential**.
- After aspirin ingestions, **gastric lavage** and repeated doses of **activated charcoal** are recommended.
- **Intravenous fluids** are used to replace fluid loss
- **IV sodium bicarbonate** is given to alkalinize the urine making aspirin more water soluble and easily excreted.
- For severe poisoning with serum aspirin level > 100 mg/dl), **haemodialysis** is performed to remove aspirin more quickly and restore acid-base balance and fluid status.

ORGANOPHOSPHOROUS INSECTICIDE POISONING

- Excessive cholinergic stimulation:

1. muscarinic stimulation :colic, diarrhea, excessive salivation, sweating, urination.

2.nicotinic stimulation: bradycardia and respiratory paralysis.

- General supportive care should be provided.
- **Treatment:**

1.Atropine: High doses atropine block excessive muscarinic stimulation

2. Pralidoxime: (cholinesterase activator) given early is capable of restoring cholinesterase activity to metabolize excess Ach.

OTHER POISONINGS

- **Iron:**
  - Childhood poisoning
  - Desferoxamine

- **Opioids:**
  - Drugs of abuse
  - CNS & respiratory depression
  - Naloxone IV

- **Cyanide poisoning:**
  - Syncope, convulsions, coma
  - Treatment: Cyanide antidote kit consists of:
    - Nitrites: induce methemoglobinemia
    - Thiosulfate: converts cyanide to thiocyanate

THANKS