Chapter
1

General Toxicology

Toxicology is derived from the combination of two words 'toxic' from Greek toxikon meaning arrow poison and 'logy' meaning study.[1,2] The history of poison is as old as human existence. Even in mythological story like Mahabharata, the Pandavas son Bhim was poisoned by Duryodhana.

Toxicology is defined as the branch of science which deals with the poisons in all its aspect. Thus, it is the study of poison deals with its source, properties, absorption, fate, action, fatal dose and fatal period, signs and symptoms, laboratory investigation, diagnosis, treatment, postmortem findings and medicolegal aspect of different poisoning cases. Mathieu Orfila is considered as the Father of Modern Toxicology, who has given the subject its first formal treatment in his Traité des poison in 1813.[3]

Forensic toxicology	*Clinical toxicology*
It deals with medicolegal aspects of poisoning, including causes and circumstances of death.	It deals with mechanism of action, clinical manifestations, laboratory investigation, diagnosis and treatment of a poison.
Poison	*Drugs*
• Poison is a substance which when ingested, injected, inhaled, applied or administered causes disease, ill health or death of a person. • It is used to curtail the life or to minimize the life or to get rid of life. • When the substance is given with the **intention of causing harm** or death, it is considered as **poison.**	• Whereas, drug is any substance used in the diagnosis, treatment, investigation, and prevention and modification of disease. • It is used to sustain or to prolong life or to get relief. • When a substance is given with the **intention of sustaining life,** it is considered as a **drug**, irrespective of the dose.

Legal difference

There is no legal definition of poison. Legally the poison and drug are differentiated on the **basis of the intention** with which that substance is given.

Medical difference

The difference between the poison and the drug is of **dose with which that substance is given**. Since a drug in therapeutic dose or lesser dose produces desirable or beneficial effect but the same drug when given in higher dose produces deleterious effect and acts as a poison, e.g. digitalis, barbiturates, diazepam, etc.

All drugs are poison when taken in **excess dose** and with **intention** to cause harm. But all poisons are not drugs even when taken in low dose.

CLASSIFICATION OF POISONS

Poisons can be classified according to the

1. Action of poison
2. Nature of poison
3. Source of poison

ACTION OF POISON

Poisons are classified into 2 groups: (a) Local and (b) Systemic (Table 1.1).

NATURE OF POISON

For the medicolegal purpose, poisons are classified as:

1. Homicidal Poisoning

There is no ideal homicidal poison. However, thallium and fluoride (present in rodenticides) are near to ideal homicidal poisons.[4] The commonly used poisons for homicidal purpose are arsenic, aconite, strychnine, snake venom, opium (Table 1.2).

Table 1.1: Classification of poison on the basis of action

A. Local	*B. Systemic*
1. Corrosives **a. Acids:** i. Inorganic: *Sulfuric acid, hydrochloric acid, nitric acid* ii. Organic: *Acetic acid, oxalic acid, carbolic acid* **b. Alkalies:** i. *Hydroxide of sodium, potassium and ammonium* ii. *Carbonates of sodium, potassium and ammonium* **c. Metallic:** *Mercuric chlorides*	**1. Cardiac poisons:** *Cyanide, aconite, digitalis, tobacco, Cerbera thevetia, Nerium odorum* **2. Respiratory poisons** (asphyxiant gases), e.g. *CO, CO_2, SO_2, H_2S, NH_3, phosphine (PH_3), war gases and sewer gases* **3. Hepatotoxic poisons:** *Phosphorus, chloroform, trichloroethane, carbon tetrachloride.* **4. Nephrotoxic poisons:** *Mercury, carbolic, oxalic, snake poison* **5. Miscellaneous:** *Food poison, drug abuse*
2. Irritants **a. Mechanical:** i. Glass pieces or powder ii. Hairs and fibers iii. Metallic chips, nails, pins iv. Diamond dust or powder **b. Chemical:** i. Inorganic **Non-metals:** *Phosphorus, iodine, fluorine, chlorine, bromine* **Metals:** *Arsenic, lead, mercury, copper, iron, zinc, thallium* ii. Organic: Agricultural poisoning like Insecticidal: *Organophosphorus, organochlorine, carbamate, pyrethroids* Rodenticidal Fungicidal Herbicidal **c. Vegetables:** *Abrus precatorius, Ricinus communis, Croton tiglium, Semicarpus anacardium, Calotropis, Plumbago rosea, Capsicum* **d. Animals:** *Snakes, scorpions, bees, wasps, spiders, cantharides, and poisonous fish*	**6. Neurotics** **a. Cerebral:** i. Somniferous: Opium and its alkaloids like *morphine, codeine, thebaine, papaverine, noscapine, and narcine* ii. Inebriants: Alcohols—*ethyl and methyl alcohol* Anaesthetic agents: *Ether, chloroform, nitrous oxide.* Coal tar derivatives, e.g. *naphthalene* iii. Deliriants: *Datura, cannabis, cocaine* iv. Depressant (sedatives and hypnotics): *Barbiturates, benzodiazepam, chloral hydrate, paraldehyde* v. Stimulants: *Amphetamines, camphor, caffeine, cocaine* vi. Hallucinogens: *LSD* (*lysergic acid diethylamide*), mescaline (peyote) **b. Spinal:** i. Excitants: *Strychnos nux-vomica* ii. Depressants: *Lathyrus sativus* (khesari daal), *gelsemium (jasmine).* **c. Peripheral:** *Conium, curare*

2. Suicidal Poisoning

There is no ideal suicidal poison. However, opium and barbiturates are near to ideal suicidal poisons.[4] The commonly used poisons for suicidal purpose are insecticides, rodenticides, cyanides, carbolic acid, barbiturates, diazepam, opium (Table 1.2).

Table 1.2: Characteristics of an ideal homicidal and suicidal poison

Ideal homicidal poison	*Ideal suicidal poison*
1. Cheap	Cheap
2. Easily available	Easily available
3. Highly toxic	Highly toxic
4. Odorless, colorless, tasteless	Tasteless, odorless, colorless/pleasant
5. Capable of being easily given with food or drinks	Capable of being easily taken with food or drinks
6. Produces features that resemble natural disease to avoid suspicion	Should lead to painless death
7. No antidote available	Not necessary
8. Completely metabolised so that it is not detected on TA/PM examination	Not necessary

3. Accidental Poisoning

Accidental poisoning can occur due to any poison but commonly occurs due to insecticides, snakebite, and gas leakage from industries. It occurs due to:

a. Mistaken with other materials
b. Carelessness in storing poisons
c. Quack remedies
d. While working or exposure in industry, in agricultural fields or in laboratory
e. Snakes, scorpions or insects bites
f. Leakage of gas from industries
g. Accidental consumption of poison by children
h. Food poisoning
i. Drug overdose or misuse or addiction

4. Other Types of Poisoning on the basis of its Nature (Table 1.3)

Table 1.3: Classification of poison on the basis of its nature

Nature of poison	*Description*	*Examples*
1. Homicidal:	These are the poisons used for killing other	Arsenic, aconite, lead, strychnine, etc.
2. Suicidal:	These are the poisons used to commit suicide	Insecticides, cyanides, carbolic, barbiturates, etc.
3. Accidental:	These are the poisons which cause poisoning due to accidental circumstances	Insecticides, snakebites, food poisoning, gas leakage, etc.
4. Abortifacients:	These are the poisons used for inducing criminal abortion	Arsenic, lead, ergot, quinine, Calotropis, Plumbago, Nerium, *Cerbera thevetia*, aconite, strychnine, etc.
5. Aphrodisiac agents:	These are the poisons which increase the sexual desire	Alcohol, Datura, cocaine, Cannabis preparations
6. Arrow poisons:	These are the poisons commonly applied on the arrow head/tip	Strychnine, Curare, aconite, Abrus, Calotropis, Plumbago and snake venom
7. Cattle poisons:	These are the poisons used for killing cattle	Strychnine, Curare, aconite, Abrus, Calotropis, Plumbago, Nerium, *Cerbera thevetia*
8. Stupefying poisons:	These are the poisons which alter the consciousness of the person and are commonly given for purpose of rape, robbery, dacoity and theft	Datura, cocaine, Cannabis preparations, alcohol
9. Malingering purpose:	These are the poisons used for malingering purpose to avoid duty or to make false charges against enemy	*Semicarpus anacardium*—branding; Abrus—conjunctivitis
10. Vitriolage:	Agents used to cause bodily injury	Corrosives

SOURCE OF POISON

Depending upon the source, poisons are classified as shown in Table 1.4.

Table 1.4: Source of poison with its examples

Source	*Examples*
1. Domestic/household	Detergents, disinfectants, phenols, kerosene, etc.
2. Agricultural	Organophosphorus, organochlorine, carbamates
3. Vegetables	All vegetable irritants, Datura, Cannabis, etc.
4. Animals	Snakes venoms, insect bite
5. Medicinal source	Wrong medication, over medication and abuse barbiturate, diazepam, opium, etc.
6. Industrial source	Factories where poisons are produced as by-products, e.g. carbide, methyl isocyanate, phosphine, carbon monoxide, cyanides, etc.
7. Commercial source	From storehouse, selling shops, etc. e.g. alcohols, opium, cocaine, etc.
8. Food and drink	Preservatives of foodgrains, additives like coloring and odoring agents, and food poisoning itself
9. Miscellaneous	Sewer gases

PROPERTIES

Color, odor, taste, solubility, form, etc. in relation to particular poison is described in particular chapter.

ABSORPTION

The absorption of poison/drug may be direct or indirect through mucous membrane or skin.

Direct: Through parenteral routes.

Mucous membranes (MM): Sublingual, inhalation, oral and other orifices.

Skin: Example phosphorus, phenol, insecticidal poison.

Routes of Administration

1. Oral
2. Parenteral/injection—SC, IM, IV, intradermal, intra-arterial, etc.
3. Inhalation
4. Sublingual
5. Other natural orifices (e.g. nasal, rectal, vaginal, urethral, etc.).
6. Contact poisoning, i.e. through skin or wounds, or ulcers
7. Through pellets (chemical or bacterial poison pellets fired with airgun).

FATE OF POISON

1. Eliminated as such by defecation or vomitus.
2. Neutralized or inactivated in GIT.
3. Metabolized or detoxified in the body.
4. Eliminated after absorption by urine, breath, bile, milk, sweat, saliva, tear, etc.
5. Gets deposited in some organs or tissue. Heavy metals and radioactive substances stored in epidermis, hair, nails and bones and organophosphorus compounds in fat.

ACTION OF POISON

The poison may be:

1. **Local action:** The poison exerts its effect at the site of contact, e.g. corrosive burns with strong acids, dilatation of pupil with atropine, tingling and numbness sensation with aconite.
2. **Systemic action:** The poison acts on a particular organ/part of the body after absorption of the poison to produce systemic action, e.g. strychnine acts on spinal cord, digitalis acts on heart, curare acts on peripheral nerves, opium/barbiturates acts on CNS.
3. **Combined action:** Some poisons have both local as well as systemic action after its absorption, e.g. carbolic acid, phosphorus, snake venom.

Poison	*Local action*	*Systemic action*
Oxalic/carbolic	Corrosive	Renal and CNS toxicity
Phosphorus	On GIT	Liver and CNS toxicity
Snake venom	At the site of bite	Also present

4. **General action:** The action of poison is not restricted to particular organ but involved multiple system, e.g. metallic poison, insecticidal poison.

FACTORS AFFECTING THE ACTION OF POISONS

1. **Dose:** The action of the poison is directly proportional to its dose. Higher the dose, more will be the fatality and lesser the dose, less will be the fatality with the following exceptions:[4]
   a. Idiosyncrasy: It is the abnormal response of a drug or hypersensitivity due to inborn peculiarities leading to reaction/death even in a small dose of a drug, e.g. quinine, aspirin, morphine, etc.
   b. Allergy: It is the hypersensitivity acquired as a result of previous exposure due to the formation of antibodies, e.g. penicillin, NSAID, anti-snake venom.
   c. Tolerance: It is the capacity of the body to sustain the action of certain drugs or agents without any immediate harm, e.g. alcohol, opium, tobacco, cannabis, etc. The repeated and chronic use of these agents results in addiction and drug dependence.
   d. Synergism: The final response due to combination of substances is more than the sum of their individual action, e.g. alcohol with cocaine or barbiturates or with antidepressants, anticonvulsants, tranquilizers and antihistaminic.
   e. Cumulative poisons: Some poisons are not readily excreted from the body and are retained or tend to accumulate in the body and may not cause any toxic effect when ingested/enter the body in a low dose, e.g. lead, arsenic, digitalis, carbon monoxide (CO), strychnine, and barbiturates.

2. **Form of poison**
   a. Physical form: The poison in gaseous/vapor form is more poisonous than liquids, and liquids are more toxic than solids. The solid poison which is in fine powder form is more poisonous than coarse form.
   [Gases/vapors > liquid > solid (fine > coarse)]
   b. Chemical form: Pure arsenic and mercury are not poisonous while their compounds are highly poisonous.
   Similarly, some compound of an individual metal is not toxic and other compound of the same metal is deadly toxic, e.g. barium sulfate is non-toxic and used in barium meal in radiological investigation; whereas barium sulfide is highly toxic.
   c. Concentrated form: Normally more the concentration, more will be the absorption and more its toxicity. But the dilute solution of oxalic acid is more rapidly absorbed and is much more fatal.[5]

3. **Condition of stomach**[5]**:** It delays or facilitates the absorption of poison and it depends on:
   a. Empty stomach—absorbs poison rapidly.
   b. Food contents in stomach:
      - Presence of food in the stomach acts as diluents.
      - Fatty food delays the absorption process of poisoning except phosphorus.
   c. Abnormal conditions of the stomach also lead to delay in the absorption of poison.
      - Pyloric stenosis which delays the emptying of food.
      - Gastrojejunostomy causes repeated backward flow of gastric contents.
   d. Achlorhydric subjects—the salts of cyanides is ineffective due to lack of hydrochloric acid (HCl) in the stomach which is required for their conversion to hydrogen cyanide before absorption.

4. **Routes of administration of poison**
   a. Route: Rate of absorption depends upon the route of administration. Through some routes, poisons are absorbed very rapidly and exert their action promptly. The rate of absorption is fastest through

inhalation routes. This is followed by IV, IM and other parenteral routes as compared to oral and direct skin contact. Injured or ulcerated skin absorbs poison quicker than intact skin. The absorption is more rapid in oral route than rectal route.

b. Different route: The action of poisons is different when they are introduced through different routes, e.g.
   - Snake venom is effective only when injected and harmless when taken orally.
   - Cocaine: On ingestion acts as deliriants, on injection it acts as local anesthetic.
   - Curare: On ingestion is inert, on injection it is highly toxic.

5. General condition of the body

a. Age: Some poisons are better tolerated in some ages and badly in other ages. Opium is better tolerated by elderly and atropine is better tolerated by children.

b. Physique and health: Well-built person with good physique and health will tolerate poison better than weak and lean subject.

c. Presence of any disease: Usually, in disease conditions the effect of poison is more.
   - In liver pathology, Morphine is more poisonous.
   - In renal damage, Mercury is more poisonous.
   - In head injury or raised ICP, Morphine is more dangerous/lethal.
   - However, some poisons are well-tolerated during disease conditions like:
     - Sedatives and tranquilizers in Manic and deliriant patients
     - Digitalis in heart failure.
     - Strychnine in paralysis.
     - Cyanide in achlorhydria.

d. Sleep: Absorption is less during sleep due to slow metabolism and hence has slow action but depressant drugs may cause more harm during sleep.

e. Exercise: It decreases the action of drug as more blood is drawn to the muscle, e.g. alcohol.

DIAGNOSIS OF POISONING

The diagnosis of poisoning is not always possible due to various reasons.

1. Usually patient is not in a position to narrate the story or to give the history.
2. Sometimes in spite of knowing the nature of poisoning consumed by the patient, the relatives do not come forward due to fear of being involved in police investigation.
3. Also due to ignorance of the importance of giving proper history of poisoning to the doctor, the physician's task becomes more difficult as none is willing to give correct history to avoid police investigation.
4. Unlike in other clinical conditions arising out of natural disease, there are very few **toxic syndrome or toxidrome**[6] (refer to a group of clinical features that are consistently encountered in relation to a specific toxin) characterized by typical signs and symptoms.

In Living Subject

1. History of the case as stated by patient, relatives or friends:
   It includes time of onset, symptoms, progress, in relation to food/drink and condition of others who took the same, possible source of poison, any past history of poisoning, history of depression and about the properties of the poisonous material like smell, taste, color, consistency, etc.
2. Signs and symptoms of the patient
3. Detailed physical examination
4. Laboratory investigation of vomitus, blood, etc. or any material brought by the relatives. The toxicological analysis (TA) of gastric lavage fluid, blood, urine, stools and vomitus confirms the nature of the poison. The detection of the poison in suspected food, fluid or utensils help as corroborative evidence.

In Dead Subject

1. History as provided by police or relatives should be taken in the same line as in case of living victims. In addition, history should also contain:
   i. Period of survival after poisoning and their symptoms.
   ii. Details of treatment if given.
2. Postmortem examination of a body
   a. External examination (*see* page 13):
      i. Clothes examined for vomitus stain with its color and smell.
      ii. Body for any injection marks.
      iii. Mouth and nostrils for presence of froth—in insecticidal poisons, morphine, barbiturates, strychnine and cyanides.
      iv. PM lividity for peculiar color—in carbon monoxide (cherry red), hydrogen sulphide (bluish green), cyanides (pink) and opium (black lividity).
      v. Skin for different colors—in acute copper and phosphorous poisoning (yellow due to jaundice) and asphyxiants poisoning (bluish due to cyanosis).
      vi. Gums and teeth for color changes, particularly in metallic poisons like copper, mercury, lead (bluish color).
   b. Internal examination (*see* page 14):
      i. Organs/viscera should be examined for any congestion and edema.
      ii. Stomach should be examined for color and smell of its content along with submucosal hemorrhage, softening, congestion and perforations of its wall. In poisoning, these changes are more marked at greater curvature of stomach.[4]
      iii. Small intestine should also be examined for the above changes, particularly in the duodenum and jejunum.
3. Preservation of viscera and other materials for laboratory investigation like TA.
4. Moral and circumstantial evidence in suicidal and homicidal poisoning.
   i. In suicidal poisoning, it includes suicidal note, cause of suicide with evidence of ingestion/purchase of poison. The container of the poison may be found near the dead body or victim.
   ii. In homicidal poison, it includes history of quarrel or other cause/motive of homicide with evidence of ingestion/injection/purchase of poison. The relatives are very eager to dispose of the dead body.

TREATMENT OF POISONING

If the specific nature of the poison is not known, then it should be treated on the lines of general principles of treatment of poisoning which are as follows:

1. Removal of patient from the source of exposure
2. Removal of unabsorbed poison
3. Dilution of unabsorbed poison
4. Elimination of absorbed poison
5. Specific antidote
6. Symptomatic treatment

However, **Stabilization and Evaluation** of the patient should be done before starting the actual treatment like decontamination (removal of unabsorbed poison), poison elimination (by means of diuresis, dialysis) and specific antidote administration.[6] ***Stabilization*** refers to correction of life-threatening problems like airway, breathing, circulation and CNS depression. ***Evaluation*** includes complete assessment/examination and diagnosis/laboratory investigation of the patient of poisoning. *Moreover, most poisoned patients can be treated successfully without any contribution from the laboratory other than routine clinical biochemistry and hematology investigations.*

1. Removal of Patient from the Source of Exposure

- In gaseous/volatile poison—remove patient from the source or environment.
- In insecticidal poison—removal of clothes.
- In corrosives poison—removal of soiled clothes.

2. Removal of Unabsorbed Poison

It depends upon the route of administration of poison.

a. In case of **contact poisoning** to skin/injuries:
- Removal of clothes.
- Wash the area with lukewarm water or soap.
- Application of local anesthetic agents.

b. In case of **intravaginal or other natural orifices:**
- Vaginal douching or irrigation with plain water.

c. **Inhaled poison:**
- Removal of patient from source.
- Ensure clear airway and respiration.

d. **Injected poison** (e.g. snakebite, arrow poison):

The spread of injected poison is restricted by:
- Application of ligature/tourniquette proximal to the site of bite.
- Application of ice packs.
- Antidote infiltration after washing of the site of bite.

e. **Ingested poison:**

The ingested poison is removed by:
- Emesis/induction of vomiting.
- Gastric lavage/stomach wash.
- Purgatives and colonic lavage by means of sodium/magnesium sulfate or dulcolax, etc.

Emesis

Emesis means induction of vomiting. It is better than stomach wash within 4–6 hours of ingestion of poisoning. It is absolutely contraindicated in all corrosive poisoning **except carbolic acid**. In rest of the condition, it is relatively contraindicated (Table 1.5).

Table 1.5: Contraindications of emesis[7] [5CVP-M]

Conditions	*Reasons for contraindication*
a. Corrosive poisoning[7]	Perforation of the stomach
b. CNS stimulant drugs poisoning[7]	Convulsions may be precipitated
c. Kerosene/volatile poisoning	Chances of aspiration/inhalation of fumes
d. Morphine poisoning[7]	May fail to act
e. Coma[7]	Aspiration
f. Children	Aspiration
g. Pregnancy	Abortion
h. Cardiorespiratory diseases	Heart failure may be precipitated

Methods of Emesis

Vomiting can be induced by different methods as shown in Table 1.6.

Table 1.6: Method of induction of vomiting

a. Mechanical irritation of throat	Finger—stimulating the posterior wall of pharynx
b. Plain lukewarm water	Good amount of water
c. Common salt	1 TSF in one glass of water
d. Mustard powder	1 TSF in one glass of water
e. Copper sulfate	Weak solution
f. Ipecacuhana syrup	15–30 ml orally[7]
g. Zinc sulfate	1–2 gm in one glass of water
h. Ammonium carbonate	1–2 gm in one glass of water
i. Apomorphine hydrochloride	6 mg IM/SC[7], is centrally acting potent emetic agent.

Household emetics: These are the emetics available in the house. Top four methods are the examples of household emetics.

Gastric Lavage

Gastric lavage/Stomach wash is the cleaning of the stomach with fluid. The volume of each wash depends on the age group of the person. It is done by means of following gastric lavage tubes:

In age group	*GL tube*	*Volume of each wash*
Adults	Stomach tube (Boa's/Ewald's)	200–300 ml
Children	Male urinary rubber catheter	100–200 ml
Infants	Ryle's tube	<100 ml

Indications of Stomach Wash

1. Stomach wash is indicated within 4–6 hours of ingestion of any poison. However, it should be done even if the patient is brought after 6 hours of ingestion of poison. It is absolutely contraindicated in corrosive poison except carbolic acid poisoning (Table 1.7).
2. It is also useful in unconscious and depressed condition of the patient after ingestion of poison as the gastric emptying time is delayed.[4]
3. In **injected morphine poisoning** due to its property of re-secretion in the stomach.

Table 1.7: Contraindications of gastric lavage

a. Corrosives	Except carbolic acid
b. Convulsions	Anesthetize or sedate the patient first
c. Coma/petroleum	Do cuffed intubation in such cases
d. Children	Use Ryle's tube or rubber catheter
e. Esophageal varices	Lead to massive hemorrhage

Stomach Tube (Boa's or Ewald's Tube)

Stomach tube is a rubber tube having 1.5 meter length and about 1.5 cm diameter. It is inserted at its lower rounded end through the mouth and has following parts:

a. Lower rounded perforated end: It is rounded to prevent damage to the GIT during insertion.

b. Mouth gag: It is made up of wooden and have central aperture for the insertion of stomach tube. One end of the gag is pointed to open the clenched teeth.

c. Rubber tube markings: It is marked at 40 cm, 50 cm and 60 cm.

d. Suction bulb: It is used to force open the perforated lower end when blocked and to take out the stomach fluid.

e. Funnel end: It is funnel shaped to pour fluid in the stomach for washing.

Procedure for Stomach Wash

The mouth gag is placed between upper and lower anterior teeth with the patient being on his/her left lateral side and head lower down. The lower perforated end of the tube is lubricated with glycerin or liquid paraffin and is inserted through the central hole of mouth gag, till the 50 cm marking on rubber tube (Fig. 1.1).

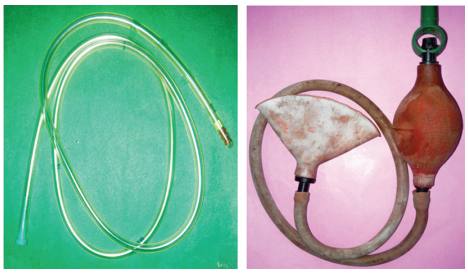

Fig. 1.1: Ryle's tube and stomach tube

The stomach tube may either enter the stomach or respiratory passage.

Stomach tube in respiratory passage	*Stomach tube in the stomach*
1. Cough starts	1. No cough reflex
2. Air bubbles come out when funnel end of the tube is dipped in water	2. No air bubbles. However, sound of air movement heard when stomach area is auscultated

When confirmed that the tube is in the stomach (as above), then 100–200 ml plain warm water or fresh lukewarm water or normal saline is poured through the funnel end of the tube. The fluid enters the stomach by means of gravity when the funnel end of the tube is held at a higher level than the body. After 1–2 minutes, the fluid from the stomach is removed out either by suction pump or by means of siphon action (when funnel end of the tube is taken lower than the level of body).

This first washing sample by lukewarm water or normal saline is preserved for toxicological analysis. Later on, the washing is done with not >300 ml of either plain water or $KMnO_4$ solution (1 : 1000) or with specific antidote to particular poison. This process of entry and removal of fluid from the stomach is

repeated till the color of lavage fluid remains same. At the end, the tube is removed properly to avoid aspiration of fluid to respiratory tract by pinching or bending between the finger.[4]

However, in certain cases, the lavage fluid ($KMnO_4$ solution) is left in the stomach to neutralize the un-removed part of the poison, if any. The fluid ($KMnO_4$ solution, activated charcoal, demulcent) can also be left in certain poison that may be re-secreted in stomach (e.g. morphine) or that remains adherent to gastric mucosa.

3. Dilution of Unabsorbed Poison

It is done by giving:

a Water to drink that helps in two ways:
- It reduces the local damaging action
- It delays the rate of absorption

b. Bulky bland food, e.g. banana, boiled potato, mashed rice.

c. Demulcents/fats: It delays the process of absorption and also protects the stomach wall. This method is of **no use in oxalic acid poisoning** (where dilution is contraindicated), and **phosphorus poisoning** (where fats are contraindicated).

4. Elimination of Absorbed Poison

It is done by:

a. Diuresis (increased urination/forced diuresis) by using fluids and drugs like frusemide or mannitol infusion.

b. Diaphoresis (increased sweating/perspiration) by applying hot packs and neostigmine or pilocarpine injection.

c. Dialysis: In case kidney is not functioning (peritoneal or hemodialysis).

d. Chelating agents: See antidotes

e. Exchange transfusion: Capable of removing many of the toxins that are not removed by hemodialysis. It is best indicated in cerebral depressant, cardiac poison (digoxin, quinine), organophosphorus, phenol, paraquat, paracetamol, amanitin poisoning.[6]

5. Specific Antidote

Antidote is the substance which counteracts the deleterious effects of the poison without itself being harmful to the body. It is indicated when poison is absorbed from the GIT or shows clinical systemic manifestation of poison (*see* Appendix Table 1).

Types and Uses of Antidotes

I. **Physical (mechanical) antidotes:** These are the antidotes which **prevent the action of poison mechanically** without destroying or neutralizing the poison. Different physical antidotes with their examples and uses are given in Table 1.8.

II. **Chemical antidotes:** These are the substances which **chemically react with the poison** and thereby disintegrate or inactivate the poison (Table 1.9).

III. **Pharmacological or physiological antidotes:** These are the substances which have a pharmacologically opposite action as compared to the poison (Table 1.10).

IV. **Universal antidote:** It is so-called because it can be used in all cases of poisoning, especially when the nature of poison is not known. It is the combination of physical and chemical antidotes (Table 1.11). Dose is 15–30 g or 1 TSF in a glass of water.[5,13] It can be repeated 12–24 hourly. It is nowadays obsolete but can be used as first aid measure at home.[12–13]

V. **Chelating agents:** These are the substances which act on the absorbed metallic poison and form a non-ionized complex with the metal ion freely available in the blood circulation, so that the metal ion is not available for absorption and thereby cannot affect the enzyme system of the body. The commonly used chelating agents are BAL, EDTA, Penicillamine, and Desferrioxamine (Table 1.12).

VI. **Serological/biological antidotes:** These are the substance prepared by injecting the antigen (like snake venom) in the animal blood, so that the sensitized animal serum can be used as an antidote, e.g. antivenom serum.

Table 1.8: Different types of physical antidotes

Physical antidote	*Examples*	*Action/properties*	*Uses*
Demulcent	Oil, ghee, butter, milk, egg albumin (egg white), starch, barley, water, etc.	These substances have soothing action and form a protective layer on the mucosa of stomach so that the poison does not absorb	Corrosive/irritant, except phosphorus
Bulky foods	Banana, mashed potato, boiled rice, vegetables, etc.	These substances engulf the poison and make it unavailable for causing effects and for its absorption	Mechanical irritant
Adsorbent	Activated charcoal (dose: 1 gm/kg body weight[12] in water orally)[6]	It adsorbs the alkaloid poison in their pores so that poison is not available for absorption in stomach	Irritant poison
Diluents	Water, milk, drinks, etc.	It dilutes the poison, thereby delaying the absorption of poison	Corrosive/irritant, except oxalic acid

Table 1.9: Chemical antidotes and their uses

Chemical antidote	*Uses (action/forms)*
a. Weak non-carbonated alkali[5] (CaO, MgO)	Acid poison (neutralizing the acids)
b. Weak vegetables acid[5] (citric, acetic)	Alkali poison (neutralizing alkali)
c. Copper sulfate	Phosphorus (forms copper phosphide)
d. Egg albumin	Mercury chloride (forms mercuric albuminate)
e. Fresh ferric oxide	Arsenic (forms ferric arsenate)
f. Potassium ferrocyanide	Copper
g. Calcium carbonate	Oxalic acid (forms calcium oxalate)
h. $KMnO_4$	Opium/morphine
i. Sodium thiosulfate	Iodine/cyanide

Table 1.10: Pharmacological antidotes and their uses

Pharmacological antidote	*Dose*[8-11]	*Uses/for*
Physostigmine/Neostigmine[8]	0.5–2 mg IV	Datura, atropine
Atropine[8]	2 mg IV repeated every 10 min till dryness of mouth	Organophosphorus (OP)
Ethanol[9]	0.7 ml/kg through nasogastric tube followed by 0.15 ml/kg/hour	Methanol
Naloxone[10]	0.4–0.8 mg IV every 2–3 min (max 10 mg)	Opium/morphine
Lorazepam[11]	4 mg IV, repeated after 10 min if required	Strychnine

Table 1.11: Content of universal antidote

Contents	*Obtained from*[4]	*Parts*	*Action*
Charcoal	Burnt bread/toast	2	Adsorbs poison
MgO	Milk of magnesia	1	Neutralizes acid
Tannin	Strong tea	1	Precipitates metal, alkaloids, and glucosides

Table 1.12: Examples of chelating agents with their dose and uses

Chelating agents	*Properties*	*Dose*	*Adverse effects*	*Uses*[14]
a. BAL (Dimercaprol)	It is an oily, pungent, viscous liquid developed during World War II as an antidote to the arsenical war gas lewisite. It has 2 SH groups which bind with metal ion present in the blood.[14]	5 mg/kg body weight stat **deep IM** followed by **2–3 mg**/kg 4–8 hourly for first 2 days, followed by 12 hourly (1BD) for next 10 days.[14] If given IV, it causes embolism due to presence of arachis oil in *benzyl benzoate*.	Hypertension, tachycardia, sweating, cramps, headache, anxiety. It is CI in iron and cadmium poisoning; *and in G6PD deficiency*[12]	• Arsenic, mercury poisoning • Bismuth, nickel, gold, antimony. • Adjuvant to copper poisoning and Wilson disease. • Adjuvant to calcium disodium edetate in lead poisoning.
Dimercaptosuccinic acid: It is less toxic and effective orally for lead poisoning.				• As, Hg, Pb poisoning
b. Calcium disodium edetate ($CaNa_2$ EDTA)	It has higher affinity for metals like Pb, Zn, Cd, Mn, Cu and some radioactive metals by exchanging with calcium present in it.[14]	**1 gm** in 200–300 ml saline/glucose by **slow IV** drip, BD for 3–5 days. Repeated after 5–7 days[14]	Renal damage with proximal tubular necrosis, acute febrile reaction, anaphylaxis	• Lead poisoning • Cu, Fe, Zn, Mn but not in mercury poisoning.
The disodium salt of ethylene diamine tetraacetic acid (Na_2 EDTA) is a potent chelator of calcium, it causes tetany. Dose: 50 mg/kg IV infusion for 2–4 hrs.[14]				• Emergency control of Hypercalcemia
c. Penicillamine	It is a degradation product of penicillin. It has stable SH-radicle. It selectively chelates Cu, Hg, Pb and Zn. It is adequately absorbed after oral administration.	**30 mg**/kg body weight, **orally** in 4 divided doses for 7 days.[5] **OR** 0.5–1 g/day orally in divided dose for few days 1 hr before meals [14] **OR** Potassium sulfide 20–40 mg to reduce absorption of dietary copper [14]	Usually non-toxic but may cause thrombocytopenia, skin rash, renal problems.	• Copper poisoning • Wilson disease • Alternative to dimercaprol for Hg poisoning • Adjuvant to $CaNa_2$ EDTA in lead poisoning. • Cystinuria and cystine stones
d. Desferrioxamine	Chemical removal of iron from Ferrioxamine yields desferrioxamine which has very high affinity for iron.[14]	0.5–1 g/day IM, repeated 4–12 hourly till serum iron falls below 300 microgram/dl.[14] **OR** 10 g/day orally for unabsorbed iron.[5]	It releases histamine and causes skin lesion. Also causes cramps, abd pain, loose motion, fever.	• Iron poisoning. • Transfusion siderosis in thalassemia patients. (BAL is not given in iron poisoning)
Deferiprone: It is an orally active iron chelator particularly in transfusion siderosis and alternative to iron poisoning. Dose: 50–100 mg/kg daily in 2–4 divided doses.[14]				

Household Antidotes

These are the substances which are available usually in the house and can be used as antidotes in case of poisoning (Table 1.13)

Table 1.13: Household antidotes and their uses

Household antidotes	*Uses/used as*
1. Common salt, mustard powder, plain warm water	Emetic agent
2. Charcoal from burnt toast	Adsorbent
3. Flour suspension	Engulf or even adsorb
4. Banana, potato, boiled rice	Physical antidote
5. Oil, ghee, butter, milk, egg albumin	Demulcent
6. Starch solution	Iodine poisoning
7. Milk of magnesia, tooth paste, wall scrapping	Acid poisoning
8. Vinegar, lemon/orange juice	Alkali poisoning
9. Milk	All ingested poison
10. Strong tea (Tannic acid)	Metallic poison, cocaine, nicotine, strychnine[13]

6. Symptomatic Treatment

A. Safeguarding respiration
   1. Clearing the airways
   2. Endotracheal intubation
   3. Tracheostomy
   4. Oxygen inhalation—6 liters/min
   5. Artificial respiration

B. Maintenance of circulation
   1. Vasoconstriction
   2. Stimulants
   3. Blood transfusion
   4. Noradrenaline drip for peripheral circulatory failure

C. Electrolyte imbalance correction
   1. IV fluids for dehydration/shock
   2. Sodium/potassium for electrolyte imbalance
   3. Other fluids

D. Other supportive treatments like
   1. Atropine for abdominal pain
   2. Diazepam for convulsions/restlessness
   3. Adrenaline, antihistaminic and steroids in anaphylactic reactions
   4. Morphine, pethidine for pain
   5. Glucose for hypoglycemia

E. Maintenance of general condition of the patient
   1. Warm and comfortable condition
   2. Good nursing care
   3. Prophylactic antibiotics
   4. Physiotherapy for rehabilitation
   5. Psychotherapy in an attempted suicide

POSTMORTEM FINDINGS IN SUSPECTED POISONING

The postmortem (PM) findings are different in individual poisoning which are described in respective chapters. However, the characteristic findings in different poisoning are as follows:

External Postmortem Findings

1.	Postmortem lividity:	
	Deep blue color	Asphyxiant/aniline
	Cherry-red	CO poisoning
	Pink	Cyanide
	Brown	Phosphorus
	Black	Opium
	Green	Hydrogen sulfide
2.	Froth from mouth and nose	Opium, barbiturate, Cyanide, strychnine, OP (blood tinged)
3.	Detectable smell	Insecticidal poison, volatile poison, opium, cyanide, kerosene, phenol
4.	Deep cyanosis	Opium, CO_2, sewer gas,
5.	Early rigor mortis	Strychnine, HCN
6.	Resist decomposition	Arsenic, datura, formalin
7.	Stain near mouth and on hands	Nitric acid, copper sulfate, paints
8.	Ulceration on lips and mouth	Corrosives
9.	Hemorrhage spots under skin/mucosa	Phosphorus
10.	Staining, erosion, ulceration near external genital[5]	Abortifacient agents, corrosives
11.	Alopecia, hyperpigmentation, hyperkeratosis[5]	Arsenic
12.	Injection marks	Opium/cocaine abuser
13.	Punctures marks	Bite marks of snakes, scorpion and insect
14.	Constriction of pupil	Morphine, phenol, organophosphorus,
15.	Dilatation of pupil	Datura, alcohol

Internal Postmortem Findings

1.	Corrosion, ulceration and desquamation of lips, mouth, tongue[5]	Corrosive
2.	Soft, swollen, bleached (whitish or yellowish) tongue/mouth[5]	Alkali
3.	Chalky white teeth	Sulfuric acid
4.	Blue lining on gums/teeth	Lead, mercury (chronic poisoning)
5.	Corrosion, ulceration and desquamation of GIT mucosa	Corrosives, irritant
6.	MM of upper GIT	
	Hard/white	Phenol
	Yellow	Nitric acid
	Bluish green	Copper sulfate
	Green	Ferrous sulfate
	Black	Sulfuric acid
	Grey/slate color	Mercury chloride
	Red velvety	Arsenic
	Discolor/staining	Colored salts of arsenic, lead, copper
7.	Stomach wall	
	Thickened and soft	Corrosive, irritant
	Hard wall	Formaldehyde
	Hard and leather-like	Carbolic acid
	Hemorrhage/ulcerated	Irritant
	Ulceration and sloughing	Corrosive
8.	Stomach contents	
	Blood	Corrosive, irritant
	Bluish	Copper sulfate
	Luminous in dark	Phosphorus
	Powder/tablets	Drug tab, arsenic, oxalic
	Detectable smell	Kerosene, alcohol, insecticides, cyanide, formaldehyde, etc.

9. **Small intestine:** May show irritation, corrosion, ulceration as similar to stomach with presence of poisonous remains.
10. **Large intestine:** May show corrosion, ulcerations in strong acid ingestion. It particularly involves the ascending and transverse colons.
11. **Brain and spinal cord:** Brain may be congested, oedematous in cerebral poison with occasional hemorrhagic points at places in asphyxiant poisons. In spinal poison, spinal cord is congestion and edematous.
12. **Larynx and trachea:** Froth may be present in opium and OP poisoning. It is inflamed and hyperemic in inhalation of irritating gases/acid fumes or aspiration of acids.
13. **Chest cavity:** Smell of volatile poisons, cyanide, opium, etc. can be detected.
14. **Lungs:** It may be voluminous, congested and may show Tardieu's spots in asphyxiant poisons. Cut section gives bloodstained frothy fluid in opium and asphyxiant poison.
15. **Heart:** Subendocardial hemorrhagic spots in poisoning with arsenic, phosphorus, mercuric chloride, etc.
16. **Liver:** Different degenerative changes may be present in poisoning with phosphorus, carbon tetrachloride, chloroform, tetrachloroethylene, etc.
17. **Kidneys:** Swollen, reddish, soft, sometimes greasy in touch with hemorrhage in the calyces and other degenerative changes in poisoning with mercury, oxalic acid, carbolic acid, phosphorus, viper snakebite, etc. In case of oxalic acid poisoning, white oxalate crystals are present in the tubules and the calyces.
18. **Uterus and vagina:** Staining, congestion, hemorrhage, ulceration in attempted abortion by use of local abortifacient agents.

DUTIES OF DOCTOR IN POISONING CASES

1. **Treatment:** The primary duty of a doctor is to treat the patient in any case. If the

nature of poison is unknown, then the patient should be treated on general principle of treatment of poisoning.

2. **History in details of the case:** The information about poison with respect to its type, nature, color, smell, etc. should be recorded along with amount/time of consumption of the poison and motive/reason of poisoning. Details about time of onset and nature of manifestation should also be recorded along with its history of vomiting if any with its nature, smell and color.
3. **Informed to authorities:**
   - The doctor must inform to police in all cases of poisoning irrespective of whether it is suicidal or homicidal or accidental poisoning.
   - If the patient is about to die, then arrange for dying deposition or dying declaration.
   - If the patient dies, police must be informed and the body should be sent for postmortem examination.
   - In case of accidental poisoning due to food/water, public health authorities should also be informed so that precautions can be taken for public health safety.
4. **Maintenance of BHT records:** The record is very important for future reference if required to produce in the court/police. Detailed information of the complaint, condition and treatment of the patient should be included in the record. Details about name, age, sex, address, brought by, consent and identification marks of the patient should also be included in the record. The bed head ticket (BHT) record (case paper of the patient) should be prepared meticulously and updated on daily basis. It should be numbered serially before submitting to record section of the hospital.
5. **Preservation of material for toxicological analysis:** A doctor must preserve all possible evidence of suspected poisoning. He should preserve stomach wash, vomitus, urine, blood and also other suspicious articles and utensils used in poisoning.

POISONING AND LAW

1. If the patient of poisoning is brought dead, then doctor should inform the police and send the body for postmortem examination.
2. The doctor is bound to inform to police in poisoning cases irrespective of whether it is suicidal or homicidal or accidental poisoning. As per Sec 39 of CrPC, it is mandatory for a doctor to inform the police for the commission of homicidal poisoning.
3. The doctor has to preserve all possible material/evidence of suspected poisoning. The doctor is bound to provide all information/documents to the police/court in poisoning cases when asked or summoned. If the doctor causes any evidence to disappear or gives false information with the intention of screening the offender is punishable u/s 201 IPC; and if he intentionally omits to give any information relating to poisoning is punishable u/s 202 IPC. Whoever gives any false evidence in any stage of judicial proceeding is punishable u/s 193 IPC.
4. Indian penal code also describes the punishment specifically related to the poisoning and adulteration to deal offences related to drugs and poison (Table 1.14).

ACTS RELATED TO THE USE OF DRUGS AND POISON

In India, dealing of poisons and drugs are governed by Acts which are as follows:

1. **The Opium Act, 1857:** This Act empowers the Central Government to cultivate poppy plants and manufacture opium in the farms authorized by the Government. This Act was amended in 1878.
2. **The Opium Act, 1878:** This Act prohibits transport, possession and sale of opium. This Act was further amended in 1957.

Table 1.14: Punishment for offence related to drugs and poison

Sec of IPC	*Offence*	*Punishment*
272	Adulteration of food or drink intended to sell, so as to make it noxious	Imprisonment of either description for a term which may extend to 6 months and/or fine of up to ₹1000
273	Sale of noxious food or drink	Imprisonment of either description for a term which may extend to 6 months and/or fine of up to ₹1000
274	Adulteration of drugs with any changes in its effect intended to sold or use	Imprisonment of either description for a term which may extend to 6 months and/or fine of up to ₹1000
275	Sale of adulterated drugs	Imprisonment of either description for a term which may extend to 6 months and/or fine of up to ₹1000
276	Sale of drug as a different drug or preparation	Imprisonment of either description for a term which may extend to 6 months and/or fine of up to ₹1000
277	Fouling water of public spring or reservoir	Imprisonment of either description for a term which may extend to 3 months and/or fine of up to ₹500
278	Voluntarily making atmosphere noxious	Fine which may extend to ₹500
284	Negligent conduct with respect to poisonous substance so as to endanger human life or likely to cause hurt or injury	Imprisonment of either description for a term which may extend to 6 months and/or fine of up to ₹1000
326A	Voluntarily causing grievous hurt by use of acid	Imprisonment of either description for a term which may not be less than 10 years but may extend to imprisonment of life and fine
326B	Voluntarily throwing or attempting to throw acid on any part of the body with an intention of causing damage or disfigurement	Imprisonment of either description for a term which may not be less than 5 years but may extend to 7 years and fine
328	Causing hurt by means of poison or any intoxicating agent or drug with intent to commit an offence	Imprisonment of either description for a term which may extend to 10 years and fine

3. **The Poisons Act, 1919:** This Act deals with the regulation of import of poisons and grant of license for the possession and sale of poisons.
4. **The Dangerous Drugs Act, 1930:** This Act regulates the import, export, cultivation, manufacture, possession, sale and use of dangerous drugs of abuse like opium, cannabis and cocaine.
5. **The Drugs Act, 1940:** This Act regulates the import, manufacture, distribution and sale of drugs in India. This Act was amended in 1962 to include cosmetics under its purview. It is now known as "Drugs and Cosmetics Act of 1940".
6. **The Drugs and Cosmetics Act, 1940:** This Act empowered the Central Government to form a Drugs Technical Advisory Board, and to establish a Central Drugs Laboratory, to help and advice the Governments for enforcing uniformity in the implementation of the different provisions of the Act, all over the Country. The Central Drug Laboratory analyses the purity and potency of imported and manufactured drugs. This Act was further amended to include Ayurvedic

and Unani drugs under its purview in 1964.

7. **The Drugs and Cosmetics Rules, 1945:** The rules were framed under the provisions of the Drugs and Cosmetics Act of 1940 (former Drugs Act of 1940), which came into effect in 1945, known as Drugs and Cosmetics Rules of 1945, to regulate the import, manufacture, distribution and sale of drugs and cosmetics.

   Under these rules, drugs are classified in certain schedules as follows:

   Schedule C: Biological and special products;

   Schedule E: List of poisons,

   Schedule F: Vaccines and sera,

   Schedule G: Hormone preparation,

   Schedule H: Poisonous drugs which cannot be sold without a prescription,

   Schedule J: List of drugs used to cure disease which should not be advertised, and

   Schedule L: Antibiotics, antihistaminics and other chemotherapeutic agents.

   [Schedule H and L drugs cannot be sold without the prescription.]

   This rule also dictates the procedure of sale of medicine by the retailer. The retailer should maintain a register, which should contain the name and address of patient and prescribing doctor, name and ingredients of drug, the serial number and date of the sale should be recorded along with the name of manufacturer, batch number of the product and the expiry date of the drug enlisted in Schedule C, H and L.[5]

8. **The Pharmacy Act, 1948:** It regulates the Pharmacy Councils and allows only the registered pharmacist to compound, prepare, mix or dispense any medicine on the prescription of doctor.

9. **The Drugs Control Act, 1950:** It regulates the sale, supply, distribution and regulates the maximum price of a drug.

10. **The Drugs and Magic Remedies Act, 1954:** It bans the advertisement of magic remedies in relation to: (i) abortion, (ii) prevention of conception, (iii) increase sexual potency/pleasure, (iv) treatment for menstrual disorders, (v) treatment and cure of venereal diseases, (vi) false or misleading information about a drug as to its nature and function.

11. **Medicinal and Toilet Preparation Act, 1955:** This Act provides for payment of levy and excise duty for medicinal and toilet preparations containing alcohol, cannabis, opium and other similar drugs.[5]

12. **Narcotic Drugs and Psychotropic Substances Act, 1985:** It repeals three Acts, namely The Opium Act, 1857 and 1878; and the Dangerous Drugs Act, 1930. This Act
    i. Consolidates and amends the existing laws relating to narcotic.
    ii. Strengthens existing control over drug of abuse.
    iii. Makes stringent provision for the purpose of preventing, combating trafficking, and abuse of narcotic drugs and psychotropic substances.

To enforce the Act, Government of India had framed ND and PS Rules, 1985. Likewise, State Governments have also formed their own rules to enforce this Act within their jurisdiction.

A narcotic drug is one that produces narcosis or sleep. A **narcotic drug** includes cannabis, cocaine, opium, and their derivatives.

Psychotropic drugs are one that alters mental function by its action. "**Psychotropic substances**" means any substance or preparation of such substance that are included in the list of 77 psychotropic substances, e.g. hallucinogens—LSD, stimulants—amphetamines, hypnotic—barbiturate, tranquilizer—diazepam, meprobamate.

The Act prohibits the cultivation of poppy, cannabis and coca plants; however restricted cultivation is allowed for medicinal purpose. This Act also provides punishment of imprisonment for those dealing in these

drugs and substance, for 10 years which may extend to 20 years with fine of ₹ 1 lakh extend to 2 lakhs.

Under Section 27, person who is found to be in possession of a small quantity of any drugs or substance for his personal use or who consume any material under this Act is punishable for a period of one year with fine or both.

IMPORTANT QUESTIONS

1. **Classify poisons on the basis of their action. Describe general principles of treatment of poisoning.**
2. **Classify poison according to mode of poison. Enumerate the poisons which discolor/impart color to the skin and mucous membrane.**
3. **Write different actions of poison. Describe factors affecting absorption of poison.**
4. **Define antidote. Describe different types of antidote with their examples.**
5. **Write in brief about chelating agents with examples as an antidote.**
6. **Write indication and contraindication of emesis and stomach wash. Describe the procedure for stomach wash.**
7. **Describe the duties of doctor in case of poisoning.**
8. **Describe general guidelines or steps for diagnosis of poisoning in general.**
9. **How will you diagnose a case of poisoning during postmortem examination? What are the reasons for negative report from chemical analyser in a suspected case of poisoning?**
10. **A patient is brought in the hospital / casualty in an unconscious condition with history of poisoning. Discuss differential diagnosis and briefly outline the management in anyone of them.**

SHORT NOTES/SAQs

1. **Stomach tube**
2. **Laws related to poisons**
3. **Household emetics**
4. **Chelating agents**
5. **Universal antidote**
6. **Characteristic features of ideal suicidal and homicidal poisons**
7. **Physical antidotes with its examples, action and uses**

SPECIFIC LEARNING OBJECTIVES

After reading this chapter, the reader should be able to:

- **Define toxicology and related terms like poison and drugs**
- **Classify poisons with examples**
- **Enumerate the characteristics of ideal suicidal and homicidal poisons and their examples**
- **Understand different factors affecting the action of poisons**
- **Diagnose poisoning in living and in dead subject**
- **Understand the general principles of treatment of poisoning**
- **Recognize different antidotes and their examples**
- **Enumerate various indication and contraindication of emesis/ gastric lavage and to describe its procedure**
- **Enlist the examples of household emetics/ antidotes**
- **Enlist different chelating agents with their examples, dose and uses**
- **Enumerate different postmortem findings in suspected case of poisoning**
- **Understand the duties of doctor in poisoning cases**

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