

GENERAL PRINCIPLE OF THE TREATMENT OF POISON: A REVIEWDr. Kirti Sharma^{*1}, Rashmi Choudhary², Dr. S. R. Inchulkar³ and Dr. Prafulla⁴^{1,2}P.G. Scholar, Department of Agad Tantra Evam Vidhi Vaidyak, Govt Ayurvedic College, Raipur (C.G.)³Professor & HOD, Department of Agad Tantra Evam Vidhi Vaidyak, Govt Ayurvedic College Raipur (C.G.)⁴Reader, Department of Agad Tantra Evam Vidhi Vaidyak, Govt Ayurvedic College, Raipur (C.G.)***Corresponding Author: Dr. Kirti Sharma**

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ABSTRACT

According to WHO, 3 million acute poisoning cases with 220,000 deaths are found annually and 90% of fatal poisoning occur in developing countries due to particularly among agricultural workers. Acute poisoning is one of the commonest cause of emergency condition. The first step of the treatment should be to identify the poisons. In the case of poisoning if poisonous substance is known which have been administered, then the specific treatment must be started. If the poisoning case is unknown, then the general line of treatment which is being mentioned in this article, should be performed.

KEYWORDS: Poison, treatment, antidote, patient etc.**INTRODUCTION**

According to the National Poisons Information Centre, New Delhi, analysis of poisoning told that the maximum incidence of poisoning was due to household agents (44.1%) followed by drugs (18.8%), agricultural pesticides (12.8%), industrial chemicals (8.9%), animals bites and stings (4.7%), plants (1.7%), unknown (2.9%) and miscellaneous groups (5.6%). In developing countries most commonest cause of poisoning are pesticides such as organophosphates, carbamates, chlorinated hydrocarbons, pyrethroids and aluminium/zinc phosphide.^[1] The first step of the treatment is to identify the poisons and provide proper care and treatment to the patient, without wasting any time to save the life of the patient.^[2] General approaches to the treatment of poisoning are to identify the poison, route and amount of exposure ingested, the time of ingestion and exposure and the severity of poisoning.^[3] If the poisoning case is known by which poisonous substance have been used, the specific treatment must be started. If the poisoning case is unknown, should be given the general line of treatment which is mentioning in this article. Basic treatment of poison should be given to the patient to stay alive by giving attention to respiration, circulation, removal of absorbed poison, administration of antidote such as activated charcoal or any specific antidote as well as the elimination of absorbed poison from the body. After that patient should be managed by giving symptomatic treatment.

AIMS

1. To removal of the unabsorbed poison.
2. To treat and excrete the absorbed poison.

Procedures for Treatment of Poisoning^[4]

1. Support to vital system.
2. Removal of unabsorbed poison.
3. Use of antidotes.
4. Elimination of absorbed poison into the system.
5. Symptomatic treatment.

Support to Vital System- The initial management of poisoning case to given supportive care as per **ABC**, by means A for airways, B for breathing, C for circulation.^[5]

➤ **Airway-** Establish a patient airway by positioning (head tilt and chin lift), suctioning or insertion of an artificial nasal or oropharyngeal airway or endotracheal intubation.^[5]

➤ **Breathing-** If the arterial blood gas cannot be maintained in spite of establishing an effective airway, then graduated supplemental oxygen therapy either by a ventimask or through endotracheal tube should be administered.^[6]

➤ **Circulation-** Measure the pulse and blood pressure, and estimate tissue perfusion. Observe the patient on continuous ECG monitoring.(gautam,471) I.V. fluid administration may be life sustaining line.^[6]

Removal of Unabsorbed Poison- There are 4 routes for removal of unabsorbed poison, it depends upon the route of administration of poison.

➤ **Inhaled poison** - If the poison is inhaled as a gas like CO, CO₂, H₂S etc the patient must be removed into fresh air, artificial respiration and oxygen should be given. The air passage should be kept free from mucus by postural drainage and aspiration.^[7] Nikethamide 2 ml

i.v. should be given if necessary. Give aminophylline 250-500 mg if there is severe bronchospasm and diuretics if there is pulmonary edema.^[6]

➤ **Injected poison-** In case of injection of poisonous drugs or snake bite, immediately put a tight ligature above the wound should be loosened every 10- 15 minutes to prevent the formation of gangrene.^[4] The application of tourniquet, incision and suction has out dated & not recommended by WHO due to found lot of

complication like cellulitis, bleeding and infection etc.^[8]

➤ **Contact poison-** If corrosive substance contact through the skin, eyes, vagina, rectum, urinary bladder, wounds and natural orifices; wash the area with water or soap and water (triple wash), except eye. Immediate, copious flushing with water, saline or any other available clear liquid is the initial treatment for topical exposure (except alkali, metals, calcium oxide and phosphorus).^[9]

➤ **Ingested poison** or Gastric decontamination

Dillution ^[9]	Gastric lavage ^[8]	Induced emesis ^[8]
Drinking 5ml/kg of body wt of water, milk any other clear liquid, only after ingestion of corrosive (acids or alkali)	Emptying of stomach to remove out unabsorbed poison along with gastric content by suction	If there is difficulty in obtaining gastric lavage, vomiting induced by emetics

Gastric Lavage

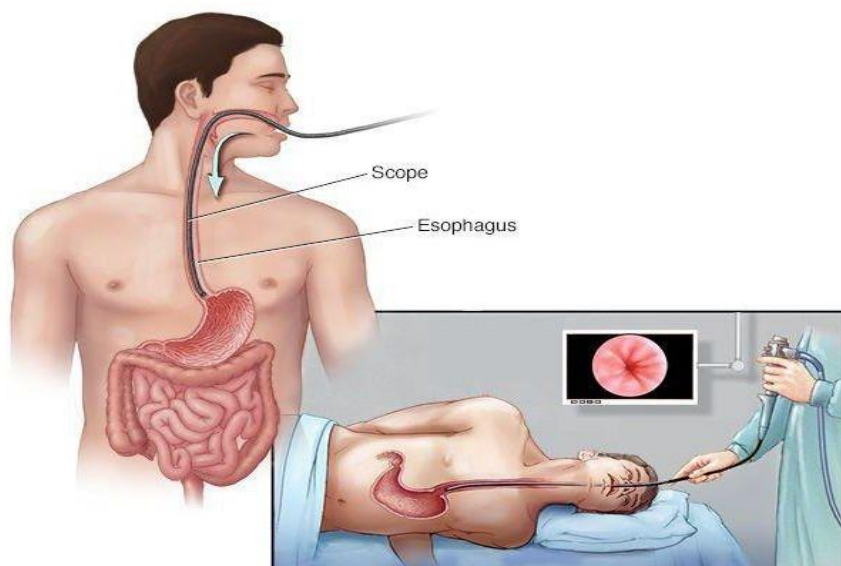
1. Indication- any ingested poison within 4-6 hour.^[7]
2. Contraindication-^[7,9] These are following conditions which are contraindicated in gastric lavage:
 - Corrosive poisoning (except carbolic acid) owing to danger of perforation of the stomach.
 - Convulsant poison, as it may lead to convulsion (e.g. strychnine)
 - Comatose patient because of risk of aspiration into air passage.
 - Volatile poison and hydrocarbons (petroleum distillate and kerosene oil) which may cause aspiration pneumonitis.
 - Risk of hemorrhage or perforation due to esophageal
4. Method of stomach wash by^[8] stomach wash tube or ryle’s tube.

or gastric pathology, as upper alimentary diseases (esophageal varices).

- Hypothermia or hemorrhagic diathesis.
- Ingestion of a foreign body (e.g. drug packet)

3. Complications.^[9,10]
 - a. Aspiration pneumonia-Common complication (10 % of patient)
 - b. Perforation of esophagus/ stomach- serious complication (1% of patient), occur due to tube misplacement in the trachea.
 - c. Laryngospasm
 - d. Electrolyte imbalance

Feature	Stomach Wash tube	Ryle’s tube
Position of pt	Trendelenburg with head low	Supine with neck extend
Route of insertion	Oro-gastric(mouth)	Naso-gastric(nasal)
Tube called as	Oro-gastric (OGT)	Naso-gastric (NGT)
Indication	Rarely used in case of thick/viscous poison	Commonly used for all poison
example	opium	All poison



Stomach Wash Procedure

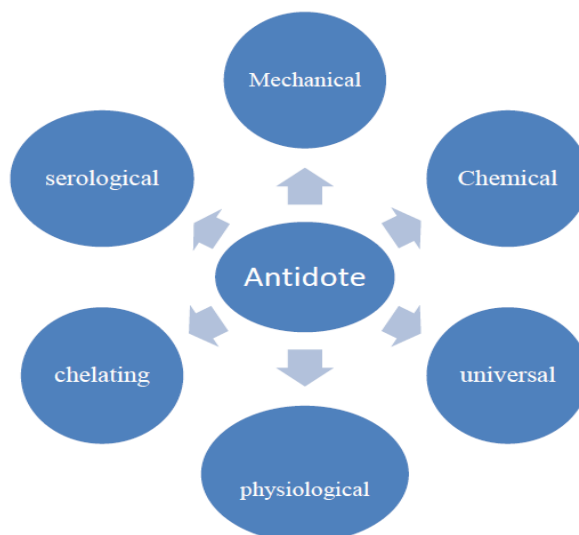
- The patient is placed in Trendelenburg position and it is done by stomach wash tube (soft, non-collapsible rubber tube, 1.5 m in length, 1.5 cm in diameter & a mark about 50 cm from one end, with a glass funnel attached at the other end).
- Take the proper position. Lubricate the end of tube by xylocaine jelly and passed into the stomach through the mouth, till the 50 cm marked is reached. Ensure that the tube is not in the trachea.
- For recheck, take stethoscope on epigastric region and push the air by syringe through the remaining upper end of OGT or NGT & hear pushing air sound.
- Approximate 250 ml of some appropriate solution should be passed through the funnel held up high above the patient's head then allow few minute for fluid to act in the stomach. The fluid is then taken out & preserved for chemical analysis.
- If suspected unknown poisoning take gastric lavage at first by plain water and then by KMnO_4 solution (1:5000) till colour comes unchanged purple.
- Lower the tube below the level of stomach & its contents emptied by syphon action on releasing pressure on the rubber tube. It is repeated till a clear and odourless fluid comes out.
- When the poison has been removed, a small quantity of the fluid is left behind in the stomach, so that it may neutralize whatever small quantity of the poison is left behind.^[6]

Emetics^[8] Vomiting should only be induced in a conscious patient.

Type	Procedure
Mechanical	Post pharyngeal wall to be stimulated by finger tip
Household emetics	- Large amount of warm water. - 1 tsp (15mg) mustard powder in 200 ml of warm water. - 2 tsp of common salt in a 200 ml of warm water
Chemical	- Symp Ipecac 30 ml (adult), 15 ml (child). - ZnSO_4 , 1-2 g in 200 ml of water, repeated in 15 min, but no longer used as an emetic. - $(\text{NH}_4)\text{CsO}_3$, 1-2 g in 200 ml of water.

Contra indication- same as for stomach wash and some other like severe heart and lung diseases, advanced pregnancy.

Use of Antidotes Antidotes are substances that act specifically to prevent, inhibit, inactivate, counteract, reverse or relieve the action or poisonous effects of a toxic agent, they are remedies used to counteract the action of poison.^[11]

Classification^[12]**Need of antidote.^[12]**

1. The poison may not have been completely removed by emesis or stomach wash, or these procedure are contra indicated.
2. The poison is already absorbed.
3. The poison has been administered by route other than ingestion.

A. Mechanical or physical antidote- The substances which prevent the action of poison by mechanically, without destroying the damaging action of the poison.

- I. Demulcents- It form protective coating on the gastric mucous membrane, e.g. egg-white, milk, starch, aluminium hydroxide etc. Fats and oils should not be used for oil-soluble poison such as kerosene, DDT, phenol, turpentine etc.^[11]
- II. Diluents- Water or milk or similar drinks dilute the poison, action by delayed absorption.^[12]
- III. Bulky food- Acts as mechanical antidote by imprisoning its particles within its meshes like banana, boiled rice, boiled vegetables etc.^[11]
- IV. Adsorbents- eg Activated charcoal: it acts by adsorbing and retaining within its pores, especially

alkaloid poison, allowing the charcoal-toxin complex to be evacuated with stool, dose- 40-80 gm (0.5-1 gm/kg body). It is used in case of poisoning with strychnine, morphine, atropine, nicotine, barbiturates, alcohol, salicylic acid, phenol etc. It is contraindicated in aliphatic hydrocarbons like kerosene, gasoline, ingestion of caustic acid or alkali, depressed level of unconsciousness etc. Nausea, vomiting, diarrhea and constipation these are some adverse effect during uses of charcoal.^[11]

- B. Chemical antidote**^[13,14] – These substances chemically react with poison by alter its chemical nature.^[13] Act either by direct chemical action or by oxidizing the poison to form a non-toxic or an insoluble compound called chemical antidote.

For acids	Weak non-carbonate alkali eg- milk of magnesia
For alkalis	Weak vegetable acids eg- vinegar
KMNO ₄ (1:1000)	Opium, strychnine, phosphorous, hydrocyanic acid, cyanides, barbituric acid & its derivatives
Tannic acid(4%)	Alkaloid, strychnine, nicotin, lead, silver, copper, Hg
Lugol's iodine/ tincture iodine	Alkaloid, quinine, strychnine, lead, Ag, Hg
Egg albumine	Mercuric chloride poisoning
Fresh prepared ferric oxide	Arsenic poisoning
Common salt	Silver nitrate poisoning
Copper sulphate	Phosphorus poisoning

C. Universal antidote^[15]

S. N.	Ingredients	Obtained from	Parts	Type of antidote	action
1	Powdered Charcoal	Burnt toast	2 parts	physical	Adsorb poison
2	Magnesium oxide	Milk of magnesia	1 parts	Chemical	Neutralizes acids
3	Tannic acid	Strong tea	1 parts	Chemical	Precipitate alkaloids

D. Physiological/Pharmacological/specific antidote – These agents produce specific effects opposite to that of poison.^[16]

Poison	Antidote
Organophosphorus, carbamates	Atropine, pralidoxime
Paracetamol	n-acetylcystine, methionine
Calcium channel blocker	Calcium chloride/ gluconate
Opiates	Naloxone
Anticholinergic	Physostigmine
Anticoagulants	Vitamin K
Betablockers	Glucagon, adrenaline

E. Chelating agents- They are widely used as specific antidote against some heavy metal poisoning, which act on the absorbed metallic poisons and produce nontoxic metallic complex. They form Chelate (a firm non-ionized cyclic complex)

- I. BAL (British anti-lewisite, dimercaprol)- Used in arsenic, lead, bismuth, Hg, gold, copper, and other heavy metal poisoning. BAL has two unsaturated sulfhydryl group (- SH) which combine with metal ion.^[17] Dose- BAL is a liquid and it is given as a 10% solution in arachis oil or peanut oil with benzyl benzoate in the dose of 3 mg/kg body wt, IM 4 hourly for 2 days, 6 hourly on 3rd days and 12 hourly till the 10th day. It cannot be given IV for danger of causing embolism due to arachis oil. It is given deep

IM otherwise it would cause irritation, necrosis, abscess formation.^[18] (singhal22) Contraindication in liver damage, G-6-PD deficient individuals and cadmium, iron poisoning.^[17]

- II. EDTA (Ethylene diaminetetra acetic acid, disodium edetate)- Used in lead, copper, cobalt, cadmium, iron, nickel poisoning.^[17] It is effective specifically in lead poisoning.^[18] EDTA is highly ionized, therefore distributed only extracellularly and rapidly excreted in urine by glomerular filtration carrying the toxic metal along.^[17] Dose- orally 1 gm BD for 5 days, IV 5 ml of 50 % solution BD for 5 days.^[18] Contraindication- renal damage.
- III. Penicillamine (cuprimine)- It is a hydrolysis product of penicillin, has got a stable -SH group. It is used in

copper, lead and mercury. Specifically used against copper poisoning. It is also used in Wilson's disease, i.e. Hepato lenticular degradation and cystinuria. Dose- orally 30 mg/kg in 4 divided doses for 5- 10 days. Complication- Almost non-toxic. Prolonged used may cause thrombocytopenia, agranulocytosis, skin rashes and nephrotic syndrome.^[18]

IV. **DMSA or Succimer (dimercaptosuccinic acid)**- it is similar to dimercaprol in chelating properties, water soluble and orally effective. It is used in lead, mercury, arsenic poisoning. It is superior to EDTA in the treatment of lead poisoning, due to it is less toxic to the kidneys and can be given in G-6-PD deficient patients.^[17] Dose- 10 mg/kg orally, every 8 hourly for 10 days.

F. Serological antidote^[19]

I Anti-snake venom serum- Each 1 ml contain has cobra venom- 0.6 mg, krait venom-0.45 mg, russel venom- 0.6 mg and saw scale venom- 0.45 mg. Indication- Cobra+ Krait+ Russel Viper+ Saw Scale Viper. Dose-10 vial (100 ml) with RL/IV drip till the signs and symptoms will be reverse.

II Anti-rabies serum- It is a preparation containing antiviral globulin that neutralizes the rabies virus. Indication- Rabid bite having wound with bleeding. Licks on tack skin or drinking raw milk from rabid animal. Dose- ERIG 40 IU/Kg body wt.

Elimination of Absorbed Poison from Body

This may be achieved by accelerating excretion of absorbed poison.

- 1. Renal excretion-** It may be improved by giving large amount of fluid or tea orally. Forced diuresis may cause pulmonary or cerebral edema.^[20]
- 2. Purgings-** 30 gm sodium sulphate with large amount of water, hastens the elimination of poison in the stool. Magnesium sulphate should be avoided, since sufficient may be absorbed to produce central nervous system depression in case of renal failure. To remove unabsorbed material from the intestinal tract, poorly absorbable material, such as liquid petroleum which is a solvent for fat-soluble agents is effective. Sorbitol 50 ml of 70 % solution is a better purgative, but in young children it may cause fluid and electrolyte imbalance.^[20]
- 3. Whole-bowel irrigation-** It is performed by administering a bowel-cleansing solution containing electrolytes and polyethylene glycol orally or by gastric tube at a rate of 21/h (0.51/h in children), until rectal effluent is clear.^[21] It is useful in patients who have ingested large quantities of substances that are difficult to remove, e.g. iron and lithium overdose, sustained release preparations, cocaine, heroin, etc.^[20]
- 4. Diaphoretics-** Application of heat (blankets or hot water bottles) and administration of warm beverages- alcohol, ipecac, pilocarpine, opium and salicylates will cause increased perspiration and

speeds up the excretion of toxic agents, but its usefulness is doubtful.^[21]

- 5. Forced alkaline diuresis-** Achieving a urinary pH of 7.5 to 9 promotes, excretion of drugs that are weak acids, such as salicylates, phenobarbital, chlorpropamide, methotrexate etc. A solution of sodium bicarbonate 50 to 100 meq. added to one litre of 0.45% saline may be administered at the rate of 250 – 500 ml/hr for the first 1- 2 hours. Alkaline solution and diuretics should be administered to maintain a urinary output of 2- 3 ml/kg/hr.^[20]
- 6. Extracorporeal removal-** Peritoneal dialysis, hemodialysis, charcoal or resin hemoperfusion, hemofiltration, plasmapheresis and exchange transfusion are capable of removing any toxin from the bloodstream.^[21]

Peritoneal dialysis- Alcohol, long acting barbiturates, chloral hydrate, lithium, salicylates, bromides, inorganic mercury, theophylline, sodium chlorate are removed by peritoneal dialysis effectively. For adults, the exchange is usually 2 litres; for children under 5 year, 200 ml. it is only 10-25 % as effective as hemodialysis. Exchange transfusion especially in children is useful in barbiturates, carbon monoxide and salicylate poisoning.^[20]

Hemodialysis-It is very useful in poisoning of acetone, barbiturates, bromide, chloral hydrate, ethanol, methanol, cocaine, cannabis, ethylene glycol, isopropyl alcohol, salicylates, fluoride, methaqualone, boric acid.^[20] dialysis is not useful in poisoning with kerosene oil, copper sulfate, organophosphorus, digitalis, benzodiazepines, digoxin, amphetamine.^[21]

Hemoperfusion- It should be considered in case of severe poisoning due to caffeine, hypnotic sedatives (barbiturates, meprobamate or methaqualone), CCl₄, mushroom (amatoxin containing) and paraquat.^[21]

Symptomatic Treatment

It should be refer as indication arises. Morphine is given for pain, artificial respiration for respiratory failure, barbiturates or diazepam for convulsions, sodium bicarbonate to treat acidosis, glucose infusion for hypoglycemia, ringer lactate for electrolyte imbalance etc.^[21]

DISCUSSION AND CONCLUSION

The commonest cause of poisoning in India and other developing countries is pesticides; the reasons being agriculture based economic, poverty and easy availability of highly toxic pesticides. Occupational poisoning due to pesticides are also common in developing countries, due to unsafe practices, illiteracy, ignorance, lack of protective clothing.^[2] A poison shows rapid deleterious action in body while it is inhaled in gaseous/ vaporous form or ingested into the stomach so it should be eliminated as soon as possible. General line of treatment is given if the specific poison is not known. The patient

should be removed from the source of exposure. All the conditions of the patient is assessed by detailed clinical examination. Poison may be taken accidentally, unintentionally by any person or may be self-administered for committing suicide. So in the poisoning cases doctor should identify the substance which is causing toxicity and then start the line of treatment for that specific toxic material. If poison is unknown doctor should initiate proper and general line of treatment to save the patient. Hence this article deals with the general principle of treatment of poison.

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