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DIAGNOSIS OF POISONING: ANCIENT AND MODERN REVIEW

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ABSTRACT

Agadatantra is one among the Astanga of Ayurvada, which deal with all case of poisoning. According to WHO, three million acute poisoning cases with 2,20,000 deaths occur annually. Prompt diagnosis of poisoning is necessary to determine treatment and help prevent complications. Ancient scriptures of Ayurveda like Sushrutasamhita, Charaksamhita, Ashtangasangraha etc. have been described many diagnostic methods of poisoning. In the current era a large number of analytical techniques available to determine the poisonous relevant case.

KEYWORDS: Ayurveda, Agadtantra, poisoning, diagnosis etc.

INTRODUCTION

A poison is any substance that causes harm to a living being. According to WHO, three million acute poisoning cases with 2, 20, 000 deaths occur annually.[1] It is estimated that more than 50,000 people die every year from toxic exposure in India.[2] The number of possible causes of poisoning are large and that unless proper diagnosis is made in systematic way the diagnosis may be missed and the patient can be lost. Ancient scriptures of Ayurveda like Sushrutasamhita, Charaksamhita, Ashtangasangraha etc. have been described many diagnostic methods of poisoning. In ancient time, it was duty of the physician to protect health of the king and so the kings always used to appoint an efficient physician to protect him from the danger of poisoning. In ancient time there were some different methods they used to apply to detect the poisoning.[3] In the current era a large number of analytical techniques available to determine the poisonous relevant case. Prompt diagnosis of poisoning is necessary to determine treatment and help prevent complications.

A. Diagnosis of Poison As Per Ancient View

a) *Panchabhutika pareeksha*[4,5]

Table 1: *Panchabhutika pareeksha* of visha.

Sabda pareeksha	When the poisonous food is placed on fire, it burns with crackling sound.
Rupa pareeksha	When the poison food is placed on fire, it originates flames in the colour of peacock neck.
Rasa pareeksha	The flies die after flying over the poisonous food.
Gandha pareeksha	When poisonous food is placed on fire, it emits irritating, pungent, sharp cadaveric fumes.
Sparsa pareeksha	If the poisonous food comes in contact with the skin, it cause burning sensation, rashes and severe itching.

b) Examination of poison according to source (*utpatti*)[6]

The animal poison(Jangama Visha) produces sleep, exhaustion, burning sensation, inflammation, horripilation oedema and diarrhoea.

The vegetable poison(Sthavara Visha) produces fever, hiccup, sensitiveness of teeth, spasm in throat, frothy saliva, vomiting, anorexia, dyspnoea and fainting.

The animal poison moves downwards in G.I.T. while the vegetable poison moves upwards in G.I.T.

c) Animal experimentation for detection of *visha*[7,8]

Table 2: Animal experimentation for detection of *visha*.

Bird / Animal	Effect
Chakora bird	Losses its redness of eyes
Jivajivaka (flies)	Dies
Kokil (cuckoo)	Deterioration of voice
Krauncha	Intoxicated
Peacock	Agitated
Suka (parrot) & sarika (maina)	Cry aloud with fear
Hansa (swan)	Grwol
Bhringaraja (bee)	Groan
Prsata (spotted deer)	Sheds tears
monkey	Eliminates excreta

d) Examination of *vishadata* (poisoner)

The person administering the poison should be identified as he is utterly suspicious, talking too much or less, devoid lusture. He perspires and tremors. He may be fearful, stammering and yawing freqently.[9,10]

e) *Vishakanya* (toxic dame)

Toxic substance were given to females from childhood & the dose were increased gradually as age advances at the time of puberty, they were logged with poisons. They were used to seduce the enemy king. Ways to identify such toxic dame has been given in the Sushruta Samihta. Her sweat, touch, contact etc. were harmful and sexual union was an invitation to death.[11]

f) Examination of poison entered by various passage

- ***Nasaya – dhuma visha* (poisoned snuff and smoke):** Produces Bleeding from the orifice, headache, running nose and disturbance of the vision, disorder of the sense organ.[12]
- ***Dantakastha visha* (poisoned tooth-brush):** It produces swelling of the tongue, teeth, gumes and lips.[13]
- ***Abhyanga visha* (Poisoned anointing):** It produces eruption, pain, ulcer of the skin, fever and tearing of muscles.[14]
- ***Anjana visha* (poisoned collyrium):** Causes accumilation of waste in the eye, burning sensation, pain, disorder of vision and even blindness.[15]
- ***Paduka visha* (poisoned footwear):** It produces swelling, exudation, loss of sensation, eruption in the foot.[16]
- ***Abharana visha* (poisoned ornaments):** Causes itching discomfort, rashes, horripilation, pricking sensation and swelling.[17]
- ***Karnatail visha* (poisoned oil for ear):** Causes disorder of hearing, swelling, pain and exudation of the ear.[18]
- ***Gandha visha* (poisoned smell):** produces headache, cardiac pain and fainting.[19]
- ***Avlekhan* (poisoned comb):** produces hair falling, headche, bleeding from hair root and cyste in the head.[20]

***g)* Examination according to the site of poison[21]**

- ***Asya visha* (poison in mouth):** Causes glositis, stomatitis, incapable to recognise taste, pricking pain and burning sensation in the mouth.
- ***Amasaya visha* (poison in the stomach):** Produces fainting, vomiting, diarrhoea, burning sensation, flatulence, shivering and disorder of sense organ.
- ***Pakvasaya visha* (poison in the intestine):** Producces burning sensation, diarrhoea, disorder of sense organ, gurgling noise in the abdomen and emaciation.

h) Gara Visha & Dushi Visha

- ***Gara Visha*:** 'Gara' is toxic combination of substance, non-poisonous or poisonous, which exerts toxic effect after intervel of some time.[22] It may produce swelling , anaemia, enlargement of the abdomen, insanity, piles etc.[23]
- ***Dushi Visha***: Dushi Visha (latent poison) produces pustules, Kithibh and urticarial rashes due to disorder of blood. Thus poison takes away life soon by affecting each dosha.[24]

i) Examination in dead body

According to Vagbhata, in the cadaver, dead by consuming poison the poison will be found accumilated in the heart, if dead by being bitten by poisonous insect etc. or dead by wounds of weapons smeared with poison then the poison will be found at the site of bite or wound.[25]

B. Diagnosis of Poison As Per Modern Science

The diagnosis of posioning has to be made in the living, as well as in the dead.

In the living

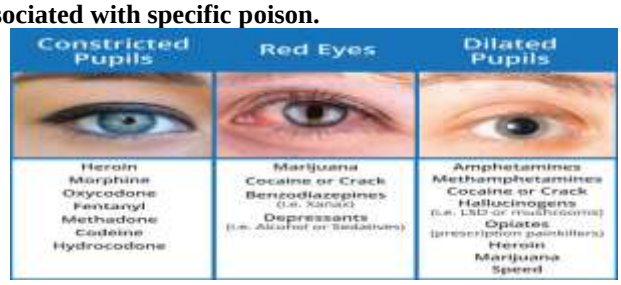
***Clinical history*:** A detail clinical history is of great importance. The doctor gathers toxicological, medical, psychiatric and social history for the diagnosis of poisoning. This history can be acquired from friends and relatives also. There is no single symptom and no definite group of symptoms, which are absolutely characteristic of poisoning.[26]

***Suspicion of poisoning*:** There is sudden appearance of symptoms. Usually symptoms occure immediately after

ingestion of food drink or a common meal, Number of people who consumed same food show similar symptoms simultaneously, consumed food, medicine and the vomitus, urine faeces etc. can be preserved for test and analysis.

***Symptoms of acute poisoning*:** The sudden onset of abdominal pain, nausea, vomiting, diarrhoea, collapse, convulsion, coma with constriction of people, delirium with dilated pupils, jaundice, paralysis, oliguria with proteinuria and heamaturia.[27]

Table 3: Clinical features associated with specific poison.



Clinical feature	Poison
Dilated pupils	Atropin, dhatura, cocaine, anticholinergic drug
Constricted pupil	Oragano phasphorus, opiod, insecticide
Pupil-macawan sign	Ethyl alcohol
Pupil-Hippus	Aconite
convulsion	Strychnine, organophosphate insecticides, lead, arsenic, cyanide
coma	Alcohol, chloroform, opiod, barbiturates, sadetives
Tremor	Chronic poisoning of alcohol, mercury, lead
Delerium	Dhatura, cannabis
Hallucinations	Cocaine, cannabis, hyosine
Excessive salivation	Mianral acid, croton oil, mercury, alcohol, tobacco, aconite
Blister	Barbiturate, arsenic, calatropis, bhalatak juice, oleander, croton oil
Dryness of mouth	**Dhatura, lead, organophasphorus**
Vomiting	Arsenic, lead, copper, mercury, croton
Forth at nose & mouth	Strychninine, opium, copper sulphate, DDT
Rice water purgation with blood stain	Arsenic
Watery diarrhoea	Jamalgota
Watery diarrhoea with blood & mucus	Erand (ricin)
Oligourea or anurea	Corbolic acid
Dark smoky & green coloured urine	Carbolic acid
Heamaturia urine	Oxalic acid

***Sympotms of Chronic poisoning*:** Symptoms develop insidiously and gradually. Symptoms are exaggerated after the administration of suspected food, fluid, medicine. The main symptoms in chronic poisoning are usually Malaise, cachexia, depression and gradual deterioration of health. Repeated attacks of diarrhoea, vomiting. Removal of patient from his usual surrondings

causes the symptoms to disappear. Trace of poison found in the urine, blood, faeces and vomitus.[28,29]

In the dead

The poisoning in the dead can be tested by following 4 methods.

- Post mortem examination
- Chemical examination of viscera
- Experiment on animals
- Moral and circumstantial evidence

A) Post Mortem Examination

1. External examination: Emission of a peculiar smell from the cloth and body, forth at nose and mouth, Colour of skin and postmortem lividity, marks of injection, and condition of natural orifice may help to diagnose poisoning.[30]

Table 4: Characteristic smells associated with particular poisons.[31]

Smell(odour)	Poison /substance
Acetone(apple like)	Chloroform, ethanol, lacquer
Acrid(pear like)	Chloral hydrate, paraldehyde
Bitter Almonds	Cyanide
Fruity /sweet	Ethyl Alcohol
Brunt rope	Marjuna(cannabis)
Coal Gas	Carbon monoxide
Hospital odour	Phenol, Disinfectants
Garlic	Arsenic, Organophasphoras, selenium
Moth balls	Camphor, naphthalene
Fishy	Aluminium-phosphide, Zink phosphide
Rotten eggs	Hydrogen disulphide, carbon disulfide
Shoe polish	Nitrobenzene
Vinegar	Acetic acid
Witergreen	Methyl salicylate

Table 5: Colour of PM staining in some poisons.[32]

cherry red skin color produced by CO poisoning

Poison	Colour of PM staining
Carbon monoxide (CO)	Cherry red
Carbon dioxide (CO2)	Deep blue (reduced heamoglobin)
cyanide	Bright red /pink
Phosphorus or copper	Dark brown / yellow
Hydrogen sulphide	Bluish green
Opiates	Black
Nitrites, aniline, nitrobenzene, chlorates (methemoglobin formation)	Chocolate or coffee brown

2. Internal examination: All organs must be examined and all contents peserved.

- ***Smell*:** The smell shoud be noted while opning the body. This is useful in cynide, alcohol, phenol, cersol, cloroform and camphor poisoning.[33]
- ***Mouth and throat*:** Examin the tongue, mouth and throat for any evidence of inflammation, erosion or staining. Areas of necrosis of the pharynx may be seen in death associated with agranulosytosis caused by amidopyrine, thiouracil, dinitrophenol, sulfonamide and barbiturates.[34]
- ***Oesophagus*:** Softening and desquamation of mucosa produced by corrosive alkalis.[35]
- ***Respiratory tract*:** Corrosives may cause edema of glottis, congestion and desquamation of mucous membrane of trachea and bronchi.[36]
- ***Heart*:** Subendocardial hemorrhages in left ventricle is seen in poisoning with Arsenic, antimony, phosphorus and viper bite.[37]

- ***Stomach*:** When dealing with the examination of stomach and its contents, any unusual appearance, such as the hyperemia, softening, ulceration, perforation and presence of any foreign material should be noted. These signs are usually seen in corrosive and irritant chemical poisoning.

Table 6: Colour changes of mucous membrane of stomach.

Poison	Colour
Copper sulfate, amytal capsule	Blue
Ferrous sulfate	Green
Sulphuric /hydrochloric or acetic acid	Black
Nitric acid	yellow
arsenic	White particles
mercury	salte
Carbolic acid	Buff/white
cersols	brown

- ***Liver*:** Substances, such as phosphorus, chloroform, CCL_4, may produce liver necrosis. Arsenic, CCL_4, $FeSo_4$ produce a fatty liver. Jaundice may be produce by phosphorus and potassium chlorate.[38]
- ***Kidney*:** Parenchymatous degenrative changes are seen in metal and cantharidin poisoning. Necrosis of proximal convolated tubules is found in mercuric chloride, phenol, lysol and CC_{L2} poisoning.[39]

***B) Chemical Analysis*[40]**

1. Detection of the poison in excretion: In vomit, faeces, urine and blood if alive, and in the contents of GIT and tissue of the body, after death.
2. Modern methods of chemical analysis useful in poisoning cases:

- Colour test
- X-rays
- Infrared analysis
- Ultraviolet analyzers
- Chromatography - *Thin layer chromatography* (TLC) and *Gas liquid chromatography* (GLC)
- Mass spectrometry
- Radio Immunoassay
- Neutron activation analysis

C) Experiment on Animals

The suspected food, medicine or fluid or poison extracted from viscera can be fed to domestic animal, such as dog or cat. The poison affected these animals in the same way as human beings.[41]

D) Moral and Circumstantial Evidence

Clues regarding recent purchase of poison by the victim or accused, his behavior the conduct of those living with the victim, sucide note and history of quarrel or financial problems may provide voluable information.[42]

CONCLUSION

Treatment of patient with unknown poisoning is challenging. Today lots of doctors are providing their services in remote areas and government still not able to provide all equipments and instruments which is necessary to detect the poison. So this study is essential for those doctors who are serving in the remote area and deprived current modern equipments which are used to detect the poisoning.

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