

Oral Manifestations of Poisons in View of Forensic Odontology-A Review

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Abstract

The aim of this article is to provide an overall view of the literature available about “Poisons” and changes in oral cavity due to poisons. “Oral Cavity” is the first source to identify or analyze the poisonous features and different manifestations observed in postmortem. “Forensic Odontologists” here plays a major role to provide the oral manifestations and diagnosis. The oral cavity can be considered as a region with tremendous potential especially in regard to coming to a final forensic diagnosis. This article revolves around this concept and reviews the different manifestations in the oral cavity observed in post mortem.

Keywords: *Poisons, Oral Cavity and Oral Manifestation, Forensic Odontologist.*

Introduction

In the field of Forensic the most challenging one is the poison cases. Oral cavity is the major insight for poison consumed cases because it is easy to analyze which type of poison by using the color changes. So, here we are trying to explain the poisons and oral manifestations (ie) clinical or autopsy changes in oral cavity. Law has not tried to define death. The death, in Black’s law dictionary means “cessation of life” or “ceasing to exist.” Medico-legally, death is defined as permanent and irreversible cessation of functions of the three interlinked vital.^[1] Oral cavity can be described as a window to changes occurring in the human body; almost all systemic variations show manifestations orally.^[2]

Various Sources of Poisons in India:

1. Domestic or household sources: Detergents, disinfectants, antiseptics, insecticides, rodenticides, etc.

2. Agricultural and horticultural sources: Different pesticides, fungicides, and weed killers.
3. Industrial sources: In factories, where poisons are manufactured or poisons are produced as by products.
4. Commercial sources: From distribution centers, and selling shops.
5. From uses as drugs and medicines: Due to wrong medication, overmedication, and abuse of drugs.
6. Food and drink: Contamination in a way of use of preservatives of food grains or other food material, additives such as coloring and odoring agents or other accidental contamination of food and drink.
7. Miscellaneous sources: Snakes bite poisoning, city smoke, sewer gas poisoning, etc.^[3]

Classification of Poisons: Poison may be classified in several method, following are 2 sorts during which poison may be classified:

I. Chemical

Inorganic

- (a) Corrosives
- (b) Metallic and non-metallic salts

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Organic

- (a) Volatile
- (b) Non-volatile, non-alkaloidal
- (c) Alkaloidal

II)Physiological/pharmacological**Corrosive**

- (a) Strong mineral/organic acids
- (b) Strong alkalis

Irritant

- (a) Metallic
- (b) Vegetable
- (c) Gas^[4]

Commonly Used Poisons in India: Suicidal (KCN, HCL, opium, barbiturates, Organophosphorus), homicidal (arsenic, aconite, thallium, oleander, madar, carbamates). Pesticides are commonly used for self-poisoning.^[5] Pesticides are highly toxic and poisoning may be a significant problem in India.^[6] In parts of Northern India, aluminum phosphide (AIP) causes most deaths.^[7]

Organophosphorus Compound and its Oral Manifestations: Organophosphorus compounds are the overall name for any compound containing phosphorus. OP compounds are widely used for a couple of decades in agriculture for crop protection, pest control & additionally, in veterinary, medical uses and “nerve gases” in chemical operations.

Classification of organophosphorus compounds:

According to their toxicity and clinical use OP compounds are classified as:

1. **Highly toxic OPs:** Agricultural insecticides.
2. **Intermediately toxic OPs:** Animal insecticides.
3. **Low toxicity:** Household application and also in field applications.^[8]

Most OPs are highly lipid-soluble agents and are well absorbed from the skin, oral mucous membranes, conjunctiva.^[9]

Clinical Manifestation: The onset and severity of

symptoms of organophosphate depend upon the precise compound, amount, route of exposure, and rate of metabolic degradation.⁽⁷⁾ A person's can are available contact with OP by various means like ingestion, eating or drinking, inhalation or dermal contact.⁽¹⁰⁾

Oral Manifestation of OP Poisoning: Most OPs are highly lipid soluble compounds and well absorbed from intact skin, oral mucous membranes, conjunctiva. Most characteristic garlic smell from the mouth.⁽⁷⁾

AIP (Phostoxin, Fumitoxin) And Its Oral Manifestation: AIP is an compound, which is usually used as a fumigant since 1940. it's utilized for control of pests in buildings (structural fumigation) and also used during processing of products to be imported or exported to stop transfer of exotic organisms.⁽¹¹⁾ AIP when ingested, liberates of Phosphine gas within the stomach, which features a very pungent smell.^[12]

Symptoms of more severe toxicity includes:^[13,14] Individuals after death consuming ALP on external examination during autopsy, face when observed appears to be livid or distinct bluish discoloration. Garlicky pungent odor are often noted in many cases. Froth are often noted round the mouth and/or nose.^[15,16]

Lead Poisoning: Lead (Pb) may be a soft, ductile, bluishgray metal that's extracted chiefly from galena. Additionally on mouth, it causes astringency & metallic taste. Chronic plumbism results when small amounts of lead are taken in over a extended period.^[7]

Oral Manifestation of Lead Poisoning: A “lead hue” of skin with pallor is another feature. A blue line along the gum, with bluish black edging to the teeth is another indication of chronic plumbism. Fig: 1 & 2^(17, 18)



Fig: 1 Shows gingival enlargement



Fig: 2 Shows Blue Colour Discolouration (Lead Line)

Arsenic Poisoning and Its Oral Manifestation:

Arsenic may be a element that happens in many minerals, mainly combined with sulfur and metals, also it's commonly used as a semiconductor.^[19]

Oral Manifestation of Arsenic Poisoning:

Groundwater contamination by arsenic is a major public health concern worldwide. Chronic exposure to arsenic cause various types of skin lesions including raindrop pigmentation, hyper-pigmentation, hyperkeratosis,

squamous cell carcinoma, basal cell carcinoma, and Bowen's disease.

Signs and symptoms are also found on other tissues of the body including the tongue, gingival, and buccal mucosa.^[15] Toxic metals have profound effects on oral health. Melanocytes present in the basal cell layer of the oral mucosa are similar to those found in the skin.^[20] The changes are shown (fig 3).



Fig 3: Shows the Rain drop pigmentation, hyper pigmentation, etc.,

Boric Acid Poisoning and its Oral Manifestation:

Boric acid (BA) is an odorless compound (H_3BO_3 ; 5.5% Boron) which can be used as pesticide, water

softener and personal care products such as toothpastes & disinfectant. It is also used in high concentrations as pesticide (99% boric acid).^[21&22]

External Oral And General Manifestation of Boric Acid Poisoning:

1. At first glance, intense cyanosis of lips and nail beds were evident
2. Inflammatory changes in oral cavity and brownish stains along with right angle of mouth and right nostril.^[23]

Sulphuric Acid Poisoning and its Oral Manifestations: Sulfuric acid is one of the most widely used industrial chemicals. Sulfuric acid is widely used in electrical industry, chemical laboratories, jewelry, and agriculture. The commonest means of intoxication usually takes place through ingestion, acidic vapors are strong irritants to the respiratory mucosa and may cause pulmonary edema in the more severe cases.^[24]

Oral Manifestation of sulphuric poisoning:

Insensitive yellowish spongy tongue, gums, buccal mucosa, and palate.^[24]

CASE REPORT OF POISONING AND ORAL MANIFESTATIONS:

Case 1- Organophosphorous Poisoning:

The first subject was a moderately built, male with approximate age ranging from 30-32 years. Presence of white froth observed in corners of mouth & nose. The eyes characteristic hazy presentation also referred to as glassy appearance. Examination of oral cavity revealed thickening of the oral mucous membranes with mild whitish discoloration, and moderate taintense white discoloration with the attached gingival. The tongue also displayed white patches. (fig 4).⁽²⁾



Fig 4: Oral manifestations in the case of organophosphorus poisoning

After the Chemical analysis it revealed the cause of death is to be ingestion of organophosphorus compound.^[25]

This has three types of effects: (1) muscarinic, (2) nicotinic, and (3) central effects.^[26]

Case 2: Sulphuric Acid Poisoning:

A 36-year-old jeweler was admitted to our emergency department 30 minutes after he accidentally ingested highly concentrated solution of sulfuric acid. He suffered immediate cutaneous burns of varying extent and depth on his face, neck, thorax, and abdomen. He had a severe trismus with insensitive yellowish spongy tongue, gums, buccal mucosa, and palate (Fig. 5).^[24]



Fig 5: The necrosis of the lips, tongue, and gums is evident.

Case 3: Sulphuric Acid Poisoning:

The second subject was a moderately built female, approximately 17-20 years of age. Various patches exhibiting yellowish discoloration were also present all over the body. Darkening of the skin was observed from the facial region extending till the neck. Swelling of lips was presented along with signs of cyanosis.

Examination of the oral cavity revealed a faint generalized yellowish tinge with the oral mucosa; the teeth exhibited an unusually white shade and were

brittle in consistency (fig 6). There was moderate to intense yellowish discoloration of the tongue seen. The chemical analysis in this case showed the cause of death to be sulphuric acid poisoning.^[2]

The injuries in mouth, throat, esophagus, reversible or irreversible. The damaged mucous membrane, the sub-mucosa regenerate only with great difficulty because of the surrounding inflammation and secondary complications.^[27] Naik SM et al (2012) reported a case of acute accidental formic acid poisoning and examination of oral cavity revealed intense corrosion of tongue and the oral mucosa.^[28] Vijanath V et al (2010) presented a suicide case, consumption of sulphuric acid and the autopsy revealed extensive demarcated cutaneous burns on the inner aspect of the lips.^[29]

In a study performed by Malcol D (1961) on the effect of sulphuric acid on the teeth of battery workers observed the initial lesion to be etching of the labial surface of the enamel, giving a dull ground glass appearance barely visible to the naked eye. The exposed surface of teeth were highly polished or etched & also said that both material alba and calculus dissolved completely from the exposed surfaces in vivo, which shows false presentation of good oral hygiene.^[30]



Fig 6: Oral manifestations in the case of sulphuric acid poisoning

Case 4: Rodenticide, Aluminium phosphide, Battery acid:

An automobile mechanic with an alleged history of consumption of rat killer poison mixed with battery acid presented with coffee-colored in oral cavities. Clinical examination at our hospital revealed congestion

and ulceration of the oral. At autopsy erosions and minute haemorrhages were seen on both lips and dorsal aspect of the tongue.^[31]

SNAKES POISONS AND ITS ORAL MANIFESTATIONS:

Deaths due to bite/sting of a venomous animal accounted for 10.7% of all deaths due to unintentional injuries, with an adjusted mortality rate of 6.2 (95% CI 6.0±6.3) per 100,000 population. By seeing the oral manifestations we can judge and conclude the snake bite.

Oral Manifestations:

Spontaneous systemic haemorrhage is most often detected in the gingival sulci. Later the face, palate, jaws, tongue, vocal cords, neck muscles become paralysed, Locally Froth formation and Bluish or Blackish discoloration of oral cavity and face.^[34]

CASE REPORT OF SNAKE BITE:

Case report 5: 14 years/girl, Respondent: Brother

Brother of the deceased told that his sister had slept at night after dinner. After sometime, someone went to check on her but she was found dead. Her whole body had turned pale and froth was coming from her mouth. Because of the froth, they came to know that a snake had bitten her.

SUMMARY:

A general review of this literature showed us many cases with documented post-mortem oral manifestations. The oral cavity can be considered as a region with tremendous untapped potential especially in regard to coming to a final forensic diagnosis, but this aspect of forensic medicine is relatively undiscovered and overlooked. The above cases shed light on the prospects offered by observation of the manifestations of the oral cavity post mortem and their significance in the field of forensic science.^[2]

Organophosphorus insecticides appear to be the most commonly ingested pesticides in rural Asia, accounting for around two thirds of cases.^[32] Organophosphorus poisoning; after hanging (49%) is known to be the second most common method of suicide in India (40.3%).^[33]

Findings from arsenic poisoning suggest that a higher level of urinary arsenic concentration is associated with higher risk of arsenical lesions of gums & tongue.

In the present review, we provide further direct evidence that arsenic has stronger association with arsenicosis symptoms of gums & tongue. These findings imply that contamination of drinking water with arsenic might also be a risk factor for arsenicosis of the gums and tongue.^[20]

A dead body with erythematous rash, redness of skin, bluish green color of vomitus and fecal matter, corrosive changes in oral & nasal cavity & multiple organ damages can be highly suggestive of Boric Acid poisoning.^[23] Sulfuric acid is widely used in electrical industry, chemical laboratories, & agriculture.^[24]

Conclusion

The main aim of forensic toxicology is that the technology and therefore the techniques that are utilized in obtaining and interpreting the results. The explanation for death could also be achieved after considering all the forensic investigations. The aim of this paper was to report the likelihood of poisoning and the way to interpret the oral manifestation (ie) (Oral Cavity Changes) in perfumes and other household products which will contain this substance.

Ethical Clearance: It is just a review article. It does not come under any ethical review.

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