



A Study Profile Of Deaths Due To Carbamate Poisoning And Its Management In Hyderabad Region

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Abstract

Introduction: Poisoning with various substances is an important cause of death and disability worldwide. The types of poisons that are encountered in the emergency medicine departments encompass a wide range of substances.

Apparently, geographic location, socio-demographic factors, ease of availability of poisons and many other cryptic factors contribute to the wide spectrum of substances that cause poisoning. Pesticides, drugs and chemicals are reported to be the most commonly used poisons in India. Management of poisoning is quite challenging for the health care professionals globally. Factors such as the uncertainty in the identification of allegedly consumed poison, varied clinical features and the need for timely access to specific information for treatment, complicates poisoning management.

Aim: This study was therefore conducted to explore the clinical features, management and outcomes of poisoning cases reporting to a tertiary care centre in Hyderabad.

Methods & Results: The present study was undertaken to evaluate the pattern of poisoning deaths in Hyderabad region of Telangana. The Paper presents the study of 271 cases of poisoning during the span of three years from 01/04/2016 to 31/03/2018. Out of 1841 Post mortem examination done during the study period 271 cases were of poisoning. Among the poison cases carbamate insecticide accounted for 21 cases (7.74%). The cases were then analyzed on various parameters in the pro forma prepared for this purpose. We concluded that majority of victims were married, different religions males from rural area and low socioeconomic group. The incidence of poisoning was more common during 21-30 years of life. Suicidal cases were more common than accidental cases. Few cases of homicidal poisoning were detected in present study, chemical analysis of viscera was done in cases.

Conclusion: Carbamate poisoning was the most common type of poisoning. Several chemicals like Lannate, Baygon, Temik, Sevia and Isolan were used with suicidal intention. There were no casualties. Timely management of poisoning according to evidence based guidelines potentially minimises morbidity and mortality due to poisons and helps improve patient outcomes.

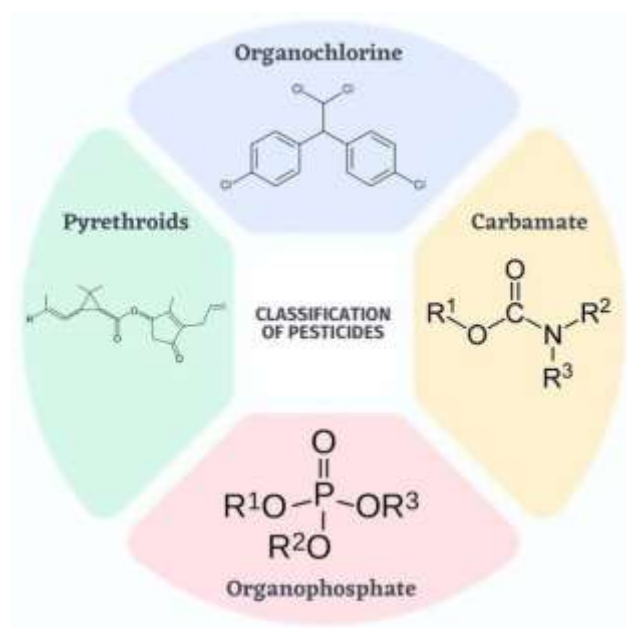
Keywords: Tachycardia, pulmonary oedema Lannate, Baygon, Temik, Sevianand Isolanwere.

Introduction

Due to rapid development in science and technology and vast growth in the Industrial and agricultural sector, the incidence of poisoning is spreading like a wild fire. A number of chemical substances, which are, developed to save the agriculture products from rodents and pests, so as to protect the human beings from starvation, are in fact, themselves proving to be man-eaters. Death as a result of poisoning/drug abuse is of enormous medical, legal and social significance. Due to easy availability of poisons and low cost, many people prefer it for the purpose of suicide, as poisons leading to peaceful death. Even though the advanced medical treatment and awareness, the poisoning cases are increasing day by day. The incidence of poisoning in India is among the highest in the world. It is estimated that more than 50,000 people die every year from toxic exposure. According to the National Poisons Information Centre, New Delhi, analysis of poisoning calls showed that the highest 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%). The commonest cause of poisoning in developing countries is pesticides which includes organophosphates, carbamates, chlorinated hydrocarbons, pyrethroids and aluminium or zinc phosphide. The reason behind this upsurge is the agriculture based economics, poverty, unsafe practices, illiteracy, ignorance and easy availability of highly toxic pesticides. Majority of victims of poisoning are from lower socio economic status.

- The carbamate is a group of insecticides derived from carbamic acids. They have a broad spectrum uses as agricultural and house hold garden insecticides. Sevin Baygon and Lannate are most commonly used insecticides. Carbamate is the predominant cholinesterase inhibitor, but the cholinesterase inhibitors are the reversible inhibitors. They cause this effect by reversible carbamylation of the enzymes acetyl cholinesterase, allowing accumulation of acetylcholine as with the other organophosphates. The carbamates are absorbed by including inhalation, ingestion, and dermal absorption.
- Morphine, reserpine, phenothiazines, organochlorine diazepam are not used in carbamate poisoning. In the critical patients with respiratory arrest and pulmonary oedema, sophisticated critical management with pulmonary consultation is necessary. General supportive care is indicated.
- The present study was undertaken to identify the death profile caused by carbamate insecticide poisoning and its management in Hyderabad region, Telangana, India.

○ Graphical representation of classification of Pesticides :



○ Materials and Methods

Place of the study and study period:

Cases of suspected poisoning with organophosphate and carbamate compounds were studied amongst the dead bodies that have come for post-mortem examination to the Department of Forensic Medicine, Gandhi Hospital, and Hyderabad in association with Ayaan institute of medical Sciences, Hyderabad during the period between January 2016 to December 2018.

- A thorough postmortem examination was done, on each case. The entire case histories of the patients from hospital records and from the patient's relatives were studied to learn the ante-mortem behaviour of the patients. After the post-mortem examination the tissue were submitted to Histopathological examination, all the viscera were sent to the Director, Forensic Science Laboratory, Govt. of Telangana for necessary toxicological analysis. The diagnosis of poisoning with organophosphate and carbamate in the cases under study was made on the basis of clinical history, post-mortem examination findings and report of chemical analysis. However in these cases, where the post-mortem appearance and clinical history were clearly and unequivocally indicating that the cause of death was due to pesticide poisoning, much reliance was not attached to negative chemical analysis report.

○ Routes of administration:

In all the cases whether suicidal, Homicidal or accidental the poison is administered orally. Only in some cases poisoning resulted from accidental contamination of the skin while spraying, Poisoning through respiratory tract also can occur due to inhalation of poison while spraying even while spraying with protected cloths.

○ Physical Examination:

On physical examination the presence of diaphoresis (Increased sweating), miosis, Lacrimation, excessive salivation, Respiratory distress with wheeze, disturbances in consciousness or orientation, Rhonchi and rales, Bradycardia or Irregular heartbeat, weakness or paralysis, extension plantar responses and muscle fasciculation may be noted.

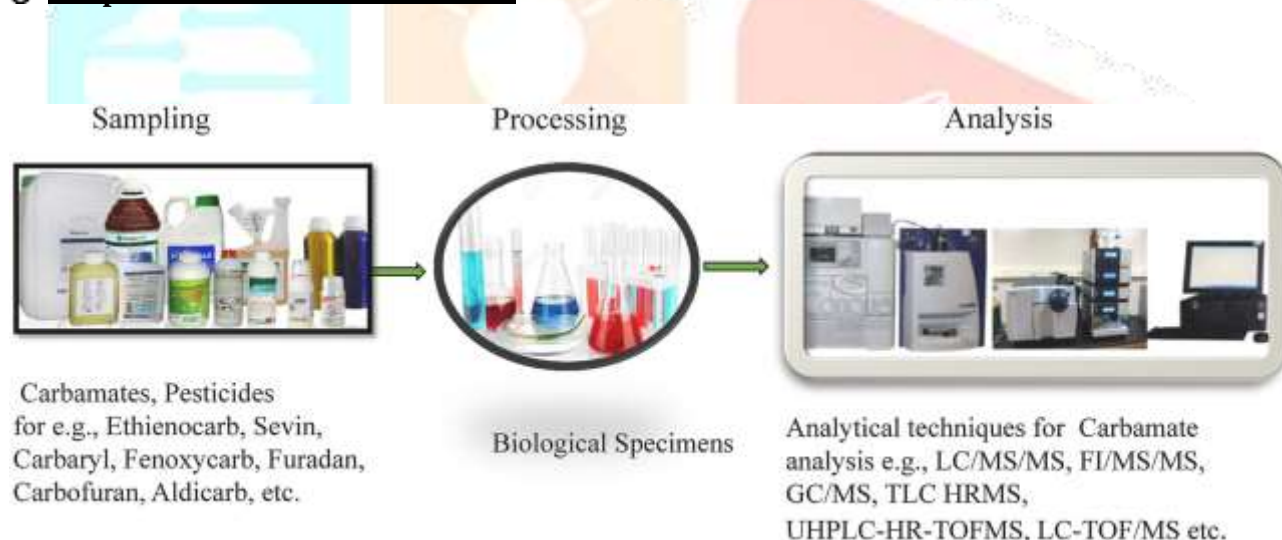
○ **Postmortem appearances:**

No specific anatomic changes are found in acute poisoning. The changes are suggestive of asphyxia, the appearances are external or internal. Externally the face is cyanosed there is froth at the nose and mouth, and the froth may be blood stained. Kerosene like smell may be perceived. Internally the stomach contains greenish oily substances used as diluents and their kerosene like smell easily perceived. The contents of the stomach are blood stained, mucosa is congested and sub mucosal petechial haemorrhages and hypercalcemia are seen. The other post mortem findings are pulmonary oedema, capillary dilation, petechial haemorrhages and hyperaemia of lungs, brain and other organs. In delayed paralysis of extremities induced by parathion, malathion other compounds the findings are demyelination of ascending and descending spinal tracts with degeneration of motor horn cell. Carbamate compounds resist the decomposition and they have been detected in highly decomposed bodies that have been between 3-7 days prior to post-mortem examination. Since alcohol makes the smell and these compounds have been used with alcohol for homicidal purposes the viscera for chemical analysis should be preserved in saturated solution of sodium chloride in suspected cases of carbamate poisoning.

○ **Chemical analysis:**

The viscera of the study group cases (50%) were subjected to chemical analysis which revealed the presence of organophosphate compound in 36 cases, carbamate insecticide in 12 cases, no poisonous substance could be analysed in one case and in one case final opinion is pending report of **Director State Forensic Sciences Laboratory**. In all the positive cases the poison was found in stomach, small intestine, liver, kidney and blood.

○ **Graphical abstract of carbamates:**



• **Method of analysis:**

The viscera which are sent to forensic science laboratory are analysed mainly in two steps:

1. Extraction of the poison from the viscera
2. Identification of the poison

These two steps are briefly described here, taking example of monocrotophos (also called as Azodrin), which falls under **Aliphatic organophosphate poison**.

1. **Extraction of organophosphate compound:**

- Take approximately 200 mg of viscera in a big bowl and cut into small pieces.
- Make it acidic with 1:4 HCL acid.
- Add 100 ml of solvent (Hexane).
- Stir it and wait for 10 min.
- Now take the solvent into separating funnel and add few drops of distilled water. Shake well for

2-3 times.

- Remove the lower aqueous layer and add 2% NaOH and shake it. Filter of the lower layer.
- Then take upper layer and wash with distilled water two times and reject the washings.
- Next take the upper layer and evaporate in fuming chamber. The residue is the neutralpoison, which is **monocrotophos** in this case.

2. Identification techniques:

- Chromatography is the technique widely used for identification.
- This is process in which a mixture carried in a mobile phase (either liquid or gas) isseparated as a result of differential distribution of the solutes between the mobile phase and a stationary liquid or solid phase around or over which the mobile is passing.
- There are different types of chromatography for identification.

3. Types of Chromatography:

- Thin layer chromatography
- Gas chromatography
- Gas chromatography coupled with mass spectrometer (G.C.M.S)
- High pressure thin layer chromatography (H.P.T.L.C) .
- Among these **Thin layer chromatography** is the most commonly used and most sensitive technique which can detect as little as 10 mg of poison.
- **HPTLC** is the quicker method which takes only few minutes.

4. Thin layer chromatography:

TLC is one of the techniques of chromatography where the stationary phase is silica gel coated on a glass plate and the mobile phase is the liquid.

I. Preparation of Glass plates (Coated with silica gel)

- Weight about 45gms of Silica Gel and take it into mortar and thistle.
- Add 90 ml of distilled water makes slurry.
- Spread on the five glass plates.
- Allow to dry in air.
- Heat in oven at 80oC for 1 hr.
- Cool the plates and use them.

II. Preparation of solvent system (Neutral)

- Using Hexane and acetone in the ratio of (8:2)

III. Visualising agents for organophosphates

1. Mercurous Nitrate (5%)
2. Di- phenyl Carbazone (1% prepared in 100ml of ethyl alcohol)

Procedure:

- Take the evaporated neutral dish make the mass in the dish into solution with in 10drops of acetone.
- Apply about 15 micro lit of the solution at the bottom of the glass plate.
- Also apply control sample at 2.5 cm away at same height.
- Put this plate in glass tank and run up to 15 cm from point of application.
- Then take it out of the tank, dry and spray with reagent (1).
- After one hour again with reagent (2).
- Compare the Rf values.
- If they are at the same height and of the same colour then it is sure that sample andcontrol are of the same chemical nature.

○ Histopathological Examination:

The histological examination was rather insignificant, congestion is found in all the organs. Lungs showed pulmonary oedema and congestion. Liver showed congestion, fatty degenerating haemorrhage into the inter sinusoidal spaces, and distortion of liver lobules. Kidneys showed congestion, cloudy swelling and pigmented casts. Brain gets soften with some times leads to haemorrhage into the prone with large amount of blood in the ventricles. Haemorrhage can also be due to hypertension produced by these compounds. The following are the results for the examination:

Table 1: Showing the incidence of poisoning cases among the total number of post-mortems done in the department during the year 2018

Cases	Number of cases	Percentage
Total number of post-mortems done	18 41	—
Number of poisoning cases	2 7 1	1 4 · 7 2 8 %

Table 2 : Showing the number of cases with carbonates insecticide compound among the total number of poisoning cases

Cases	Number of cases	Percentage
Total number of poisoning cases	2 7 1	—
Number of carbonate poisoning cases	2 1	7 · 7 4 %

○ Products and solvents used:

Tik-20 (Diazinon) and parathion (Folidol) are the products commonly used. They are mixed with aromax which gives the smell of kerosene. Tik-20 is mostly used because it is commonly used in the

house to kill bugs and as readily available. Among the carbamate baygon spray (Propokur) is commonly used as household and garden insecticide.

○ Routes of Administration:

In all the cases oral route was used to administer the poison. Skin contamination is not found because spraying problems are not present in the city.

○ Sign and Symptoms:

Out of 50 cases under study 8 cases brought dead, hence no sign and symptoms could be noted. For the remaining 42 cases where the hospital records were available, the clinical data were recorded.

Table 3: Showing the symptoms among the cases studied

Symptoms	N u m b e r o f c a s e s	Percentage
Unconsciousness	38	90.47 %
Vomiting	4	9.42 %
Semi consciousness	4	9.42 %
Convulsions	28	66.06 %
Froth at mouth & nostrils	26	61.09 %

• Fatal doses

Time in which a person dies or max number of people die when administered the fatal dose. Fatal dose varied from half a spoon to one ounce. It could not be given in mg. In most cases as the poison is not found at the scene of offence and the individual may not be in a position to give the correct figure.

- Fatal period

Table 4: Showing the fatal period in study group cases

Fatal period in hours	N u m b e r o f c a s e s	Percentage
Within half an hour	2	4 %
1/2 - hrs	16	32 %
1-2 hrs	8	16 %
2-4 hrs	6	12 %
4-8hrs	2	4 %
12-24hrs	3	6 %
1-2 days	3	6 %
3 days and above	2	4 %
Could not be ascertained (brought dead)	8	16 %

○ Discussion

Poisoning has been regarded as a leading cause of death in rural and agricultural areas across the world. According to WHO 99% of fatal poisonings out of annual 251,881 occur in developing countries and particularly among agricultural workers. Like in present study, in most of the other studies done in rural parts of Asia, carbamate insecticidal poisons were most commonly responsible agents for toxicity in poisoning cases. In some of the studies conducted at urban places, aluminium phosphide was reported as commonest poison followed by organophosphorus compounds.

- In India, opium and arsenic were very commonly used poisons in the past. But in recent studies pesticides became very common poisons, the reason being agriculturebased economy , poverty and easily available with high toxic pesticides.
- The incidence of cases of poisoning with carbamate is on increase. Poisoning hereby carbamate compound is most commonly used is baygon spray. These insecticides are easily available, cheap most effective and kill the person in a short time. Therefore the study of poisoning by carbamate compound is thought necessary and an attempt is made here.

A. Products commonly used:

Baygon commonly used among organophosphate group, which are mixed with **aromax** which gives **kerosene** smell.

B. Routes of administration:

In this entire case oral route was used. Oral route defines that are absorbed by inhalation, ingestion and through skin.

C. Signs and symptoms:

Unconsciousness (90%), vomiting (9.4%), and convulsions are the common symptoms. Whereas constricted pupils (85%), pulmonary oedema (88%), Tachycardia (76%) and hypotension are the common signs.

D. Fatal dose:

Varied from half spoon to one ounce.

E. Fatal period:

Most patients died between ½ -2 hr. 64% of cases died within 4 hours.

F. Treatment:

Atropine sulphate is the best treatment, in carbamate insecticide compounds. Large doses are tolerated. Several prophylactic and supportive measures studied.

G. Post-mortem appearances:

No specific anatomic changes are found in acute poisoning. The changes are suggestive of asphyxia.

H. Chemical analysis:

Chemical analysis revealed that there is presence of organophosphate compounds. The poisons are found in stomach, intestine, liver, kidney and blood. Sometimes alcohol is also found along with organophosphate compound.

I. Histopathological examination:

The findings are not significant. Histopathological examination of tissue revealed that usually congestion of brain, oedema and congestion of lungs and fatty degeneration in kidneys and in some cases cloudy swelling and tubular necrosis in kidneys.

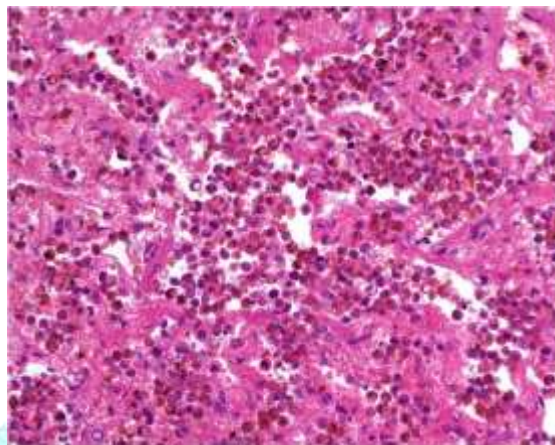


Fig 2: Histological section of lung(severe congestion)

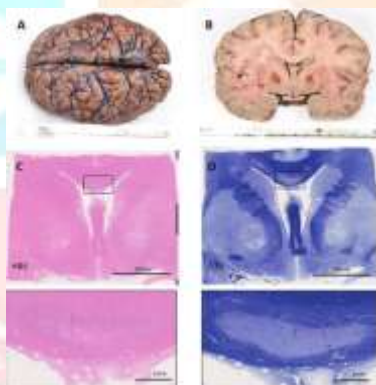


Fig 3: Congestion of brain after post- mortem examination

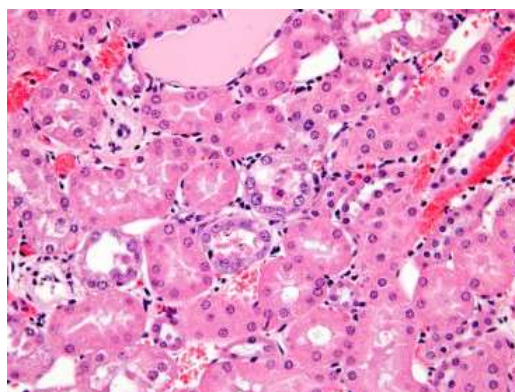


Fig 4 : Tubular necrosis in kidneys

○ Management

Clinical presentation and treatment:

Treatment of carbamate poisoning includes establish of airway, stabilisation of vital signs, removal of poisons gastric lavage with the usual precautions and removal of contaminated clothes and through and cleaning of skin. Activated charcoal and cathartic are indicated in the event of ingestion.

• Complications:

A few reports of delayed neurotoxicity from carbamate poisoning are noted in literature although recovery is generally completed in the majority of exposures.

• Atropine Sulphate Uses:

It is the drug of choice in the management of carbamate of poisoning. The doses for the **adults is 0.4 to 2.0 mg i.v. repeated every 15 to 30 minutes** until signs of atropinization (upper dry mouth) . Unlike with organophosphate poisoning large doses of atropine are not usually needed and atropinization may be necessary for only 6-12hrs for the majority of patients. The exception is the critical patients. The patientspreferably should be well oxygenated with the use of atropine. **Children's dosage of atropine 0.05 mg/kg** initially repeated as necessary at intervals similar to those for adults. The rational for the use of atropine is the same as that with organophosphate insecticides.

○ Conclusion:

Out of 271 cases of poisoning in this study, 21 cases (7.44%) were of carbamate compound poisoning. Most of the cases belong to rural area and due to low education and awareness, majority of victims from poisoning by unknown type of poisoning.

- In both sexes, married persons were more involved and suicidal are commonestmanner of death.
- Financial reason in case of married males and Domestic problem in case of marriedfemales is commonest.
- Education amongst the farmers of carbamate compounds regarding its proper manner of use and stringent laws in relation to its use as insecticides and pesticidesin the burning need of the time to save the most commonly affected group by thesetoxic compounds.

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