

Non-Cholinesterase Inhibitor Organophosphate Compound Poisoning – A Case Report

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Abstract

India being an agrarian country is plagued by mortality and morbidity due to agro-chemical poisons. Glyphosate, a non-cholinesterase inhibitor-organophosphate compound is one such herbicide which was restricted by Union Ministry of Agriculture and Farmers Welfare on October 21st, 2022. An 18 year old male was brought to Yenepoya Medical College Hospital with alleged history of consumption of Glyphosate. He was treated in local hospitals before he was referred to our institution. The patient was treated for 21 days and he succumbed to death, post-mortem examination was carried out by the Department of Forensic Medicine and Toxicology. Even though Glyphosate is restricted for usage by general public, it is rampantly available, and mortalities are being reported throughout India. The standard treatment protocol of Atropine and Oximes will not work in case of Glyphosate poisoning. As a treating physician, they must have a knowledge that all Organophosphorus compounds are not cholinesterase inhibitors.

Keywords: Death scene investigation; Cause of Death; Forensic Medicine Expert; Manner of Death; Medical Examiner's system.

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Introduction:

India historically has been an agricultural society, with most of the population residing in rural areas and depending on agriculture for sustenance. Pesticides and Herbicides are rampantly used in India nowadays to boost the productivity of farmlands. Due to their ready availability, around 6600 farmer deaths occur in India every year due to pesticide consumption¹. Most of these deaths are suicidal in nature. Out of all the pesticide related deaths, most cases are organophosphate compound related in the last decade².

The treatment and antidote vary based on the poison consumed.

Government of India and various state Governments have banned/restricted the use of some agro-chemical products due to their toxic nature and them producing health hazards in humans and animals.

Case report

The 18-year-old deceased resident of Davangere, Karnataka, India was a farmer by occupation, he allegedly consumed organophosphate compound (Roundup) due to unknown reasons. He was taken to a local tertiary care centre where stomach wash was done. He got discharged against advice after three days of hospitalization. On the fourth day he consulted a government hospital ENT surgeon with complaints of dysphagia and sore throat. Symptomatic treatment was given. He developed abdominal pain and intermittent breathlessness over the period of next 10 days and he was brought to

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Yenepoya Medical College Hospital with respiratory distress. He was treated symptomatically and was put on ventilator support. Despite treatment he succumbed to death after 6 days on hospitalisation in our hospital.

External examination

The deceased was moderately built and nourished. Bilateral periorbital oedema noted. Both upper limbs and lower limbs were oedematous. No visible external injuries.

Internal examination

Both chest cavities contained 500 ml of straw yellow coloured fluid. Peritoneum contained 200 ml of straw yellow coloured fluid. Oesophageal mucosa was congested. Stomach mucosa congested and showed petechial haemorrhages.

Liver parenchyma showed yellowish discolouration. Histopathology of liver showed mild centrilobular necrosis with congestion of sinusoids (Image 1). Both kidneys congested, cortico medullary junction poorly differentiated (Image 2). Histopathology showed early acute tubular injury in both kidneys (Image 3). Both lungs congested and oedematous, cut section showed multiple fibrotic areas (Image 4). Histopathology of both lungs showed diffuse alveolar damage and haemorrhage (Image 5).

Routine viscera were collected and sent to regional Forensic Science Laboratory for chemical examination. Police were instructed to collect the stomach wash content from the hospital where he was initially treated, and send it to regional Forensic Medicine Laboratory for chemical analysis.

Chemical analysis result of blood and viscera was negative for any poison, but stomach wash content responded positively for the presence of glyphosate.

Discussion

Glyphosate is a non-cholinesterase inhibitor organophosphorus compound herbicide. It acts primarily as a competitive inhibitor of shikimic acid pathway in plants which is not

present in human beings³. The commercial solution of glyphosate usually contains 15% added anionic surfactant polyoxyethyleneamine or POEA. This surfactant may be responsible for the toxic effect of glyphosate containing agro-chemical compounds in humans. Ingestion of more than 200 ml is fatal³.

Usual clinical features of systemic toxicity are, drowsiness, hypotension, oliguria/anuria, metabolic acidosis and leucocytosis. Dysphagia, sore throat, mucosal erosion and vomiting may also be noticed. Poor prognosis is likely in those who develop acute respiratory distress and metabolic acidosis³. This was the case in our patient.

Case sheet/discharge summary from first treated hospital was not available. Case sheet from the second treated hospital showed that he was given symptomatic treatment only.

The treatment given in our hospital was to protect the major organs from damage and failure.

Glyphosate being a non-cholinesterase inhibitor, the treatment protocol varies from regular OP compounds. The treatment is mainly symptomatic³. This must be kept in mind by the treating physician before commencing treatment.

Use of glyphosate in India is restricted following central government notice on 21st October 2022⁴. It is allowed only in tea plantations. Only authorized pest control operators can use it⁵.

The deceased was neither working in a tea plantation nor he was an authorized pest control operator. This indicates the restricted pesticide glyphosate is available to the public which shows the failure in the part of authorities in curbing its usage.

A study done by Robert DM et al, in Sri Lanka on 601 cases of Glyphosate poisoning showed 19 deaths⁶. This study shows that mortality rate in glyphosate poisoning is low.

A R Talbot et al, did a study on 93 cases of Glyphosate poisoning in Taiwan. Study

showed 66% of cases showed erosion of GI tract, 43% showed sore throat and 31% showed dysphagia⁷. The findings in our case is similar to the features mentioned in the study.

Nagesh K R et al, reported a similar case of Glyphosate poisoning where the patient was given supportive treatment, she developed respiratory deterioration and renal failure and died⁸. This case was like ours.

Conclusion

Studies done by other researchers show that chance of mortality in case of glyphosate is low but if respiratory distress sets in then chances of mortality increases. The standard treatment protocol of Atropine and Oximes will not work in a case of Glyphosate poisoning. As a treating physician, they must have a knowledge that all Organophosphorus compounds are not cholinesterase inhibitors.

Even though Glyphosate is restricted for usage by public, it is rampantly available, and mortalities are being reported throughout India. Proper regulatory control is a must to avoid this kind of mortalities and morbidities.

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