

Clinical, laboratory and epidemiological study of acute suicidal ingestion of different types of herbicides in patients admitted in health care hospital

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Abstract

Background: Herbicide is any chemical that regulates growth of a plant which encompasses a number of xenobiotics of varying characteristics, they are used for destruction of plants in home, agriculture for weeds. Commonly available herbicides are paraquat, Glyphosate &Phenoxy acids.

Methods: The study focuses on acute ingestion of commonly available herbicides and their clinical, radiological and laboratory presentations and their impact on mortality. Study was hospital based, cross sectional comprising of 50 cases over a period of 3 years. Proper statistical method used.

Results: Study population were from 20 years to 60 years of which 20 to 40 years (58%) followed by 41 to 60 years (42%).

Paraquat was ingested by 30 members (60%), Glyphosate 12 members (24%), Phenoxy acids 8 members (16%). Common symptoms and signs were vomitings (60%) ,oral ulcers (28%),abdominal pain (50%) ,Respiratory discomfort (50%),Decreased urine output (50%),Diarrhea (12%) .

Laboratory's: 75% shows liver enzymes derangement, 50%acute kidney injury, 50 % shows alveolar damage .Total of 22 patients (44%) discharged after recovery & 28 patients (56%) died.

Mortality was high in paraquat (26members, 92%), 2 members died of Glyphosate poisoning (8%), and no mortality in Phenoxy acid poisoning.

Conclusion: Herbicides like Paraquat and Glyphosate are having high mortality and morbidity risk among them paraquat have high mortality. Their storage and usage should be limited to prevent suicidal usage. Study is done to create awareness of poisons intake effects on individual's health and mortality.

Keywords: Paraquat; Glyphosate; Phenoxy Acids; ARDS

1. Introduction

Despite the widespread availability, reports of herbicide poisoning with suicidal intention is scarce in the Indian literature. One reason for this underreporting could be the inability to differentiate them from other more commonly used compounds like anticholinergic pesticides. In the absence of specific clinical features and diagnostic tests, the diagnosis is completely based upon a reliable clinical history [1].

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Herbicides are chemical substances used to kill plants specifically [2]. Herbicides are commonly found as liquids or powders. The common poisonous ingredients found in herbicides which are available in India are paraquat, glyphosate, pretilachlor, pendimethalin, etc.. Herbicides may be of broad-spectrum or selective. Herbicide poisoning may be acute or chronic and poisoning occurs following skin or eye contact, inhalation of spray droplets or vapors, or swallowing of the product. Ingestion of herbicides could be accidental, or intentional to bring self-harm with suicidal intention.

So for the study, we included self-poisoning by herbicides to study clinical signs, symptoms, mortality and morbidity.

2. Material and methods

It is an observational study of total 50 cases of suicidal herbicidal poisoning in our health sector over a period of 2 years

2.1. Inclusion criteria

- Individuals aged > 18 yrs with suicidal intake

2.2. Exclusion criteria

Homicidal or accidental intake ruled out

- Children <18 yrs

3. Results

Table 1 Sex distribution of study group

Sex	Male	Female
	11(22%)	39(78%)

Table 2 Age distribution of study group

Age	20-40	41-60
No of patients	29(58%)	21(42%)
MEDIAN AGE	39YEARS	

Table 3 Occupation of study group

Occupation	Number
FARMER	22 (44%)
STUDENT	8 (16%)
BUISSNESS MAN	12(24%)
HOME MAKER	8(16%)

Table 4 Type of herbicide ingested

Type of herbicide	Number
PARAQUAT	30 (60%)
Glyphosate	12 (24%)
Phenoxy acids	8(16%)

Table 5 Symptoms /signs of study group

Symptoms/signs	Number of pts
Vomitings	30 (60%)
Abdominal pain	25(50%)
Throat discomfort	21(42%)
Decreased urination	26(52%)
Oral ulcers	24(48%)
Respiratory distress	26(52 %)
Asymptomatic	5(10%)
Diarrhoea	14(28%)

Table 6 Percentage of study group having renal failure

Renal function impairment		Number of pts
Present (Requiring dialysis)	Yes	20 (40%)
	No	18(36%)
Absent		12 (24%)

Table 7 Percentage of study group having liver function derangement

Liver function tests derangment	Number of pts
Present	26 (52%)
Absent	24 (48%)

Table 8 Percentage of study group having respiratory failure

Respiratory failure		Number of pts
Present (Requiring ventilation)	Oxygen	2(4%)
	NIV	4(8%)
	Invasive ventilation	23(46%)
Absent		21(42%)

Table 9 Outcomes of study population

Outcomes	Number of pts
Recovered	27(56%)
Death	23(46%)

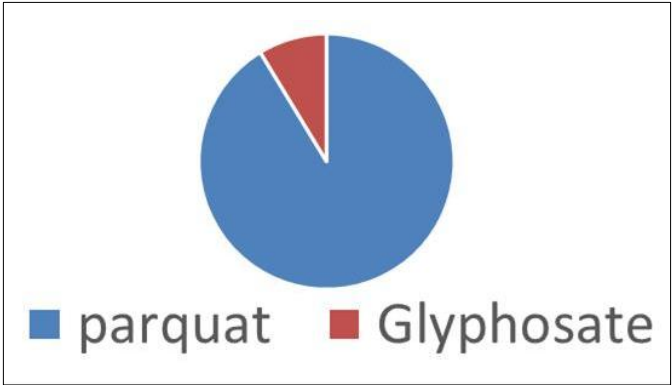


Figure 1 Mortality of Different Pesticides out of 23 patients, 21 (92%) died due to paraquat and 2 (8%) died due to glyphosate poisoning

Table 10 Outcome according to amount of paraquat (24.00% w/w) ingested

Amount of paraquat(24.00% w/w) ingested(mL)	Recovered	Death
<15 ml	7	1 (3%)
16-30 ml	10	7 (23%)
>30ml	13	13(43%)

4. Discussion

Pesticides include insecticides like organophosphorus, herbicides (weed killers), fungicides, rodenticides, etc. Suicidal poisoning with pesticides is prevalent, especially with insecticides and rodenticides. Herbicide poisoning is also not rare, but awareness among physicians is relatively poor. Among acute pesticidal poisoning, majority of deaths are from self-poisoning due to paraquat, organophosphorus, and aluminum phosphide[2]. Herbicides are the chemical compounds used to control the growth of unwanted plants or to eliminate them.

There is very little literature about morbidity, mortality, and differentiating clinical features among different types of herbicidal poisoning. Only few studies are found related to glyphosate and paraquat poisoning and some case reports are available on paraquat, pendimethalin, chlorophenoxy, and glyphosate poisoning[3-7].

- 50 members who ingested different herbicides admitted in hospital was included in study.
- In this study group, out of 50 members, 11 (22%) are males 39 (78%) are females. In a study from Karnataka of South India by Cherukuri et al [8] ,regarding demography, mortality, and presenting features of different types of herbicidal poisoning, 60 cases attending a tertiary care hospital were evaluated. The study included 36 male and 24 female patients (male: female ratio 3:2)
- The mean age of patients in this study was 39 years (range 20 to 60 years), of which 29 members (58%) are from 20-40 yrs and 21 members (42%) are between 41-60 yrs, compared to Cherukuri et al [8]. Mean age of the study population was 25.38+/_9.136 years.
- In the present study, we found that most of the study population ingested paraquat (60%), followed by glyphosate (24%)and phenoxy acids (16 %)compared to study by Cherukuri et al[8], in which most of the cases

(95%) were self-poisoning (suicidal).and most patients ingested paraquat (78%) and 22% patients ingested glyphosate. .

- In the present study most of the study population were farmers 22(44%), followed bybusinessmen12(24%), and then followed by students 8(16%) and then homemaker 9(18%) compared to study by Sarkar TS et al [9], where study population were farmers (34%), followed by students (26%), and then followed by homemakers (24%) and small businessmen (16%).These herbicides in this present studyhad symptoms of vomiting (60%), abdominal pain (50%), throat discomfort(42%), oral ulcer (48%), decreased urination(52%), and respiratory distress (52%); diarrhoea (28%) and 10% patients were asymptomatic compared to study by Sarkar TS et al [9] where had symptoms of vomiting (60%), abdominal pain (40%), throat discomfort (26%), oral ulcer (24%), decreased urination(50%), and respiratory distress (30%); and 10% patients were asymptomatic.
- In a study at Ludhiana India, Sandhu et al evaluated 17 paraquat poisoning cases.9 The common symptoms were vomiting (100%) followed by oral ulceration or dysphagia (53%), dyspnea (41%), and loose stool (24%). Acute renal failure was seen in 76.5% cases[11]
- On laboratory investigation, it isfound that 52% patients had deranged liver enzymes in liver function test.
- 76% patients had laboratory values suggestive of acute kidney injury among which 40% requires dialysis.
- 58% patients had chest X-ray features suggestive of alveolar damage, in which 4% are maintained with oxygen,8% with noninvasive ventilation and 46% underwent invasive ventilation. This is comparable to a study by Ghosh et al [10] , where there was a significant renal and alveolar damage by paraquat poisoning.
- As per outcome data, 56% patients were discharged from hospital after recovery and 46 % patients died.
- Out of 23 patients ,21 (92%) died due to paraquat and 2 (8%) died due toglyphosate poisoning,i mplies high mortality with paraquat and no mortality in this study with phenoxy acids
- The mean amount of ingestion of herbicide was 32.5 +/- 28.7 mL (Mean +/- SD)
- Outcomes for paraquat has a linear association with amount of poison ingested, which there was highest mortality with >30ml intake.
- Similar outcomes seen with Cherukuri et al study where case fatality rate was 61.7% [8] .
- Case fatality rate of glyphosate is 8% in our study but the large Sri Lankan study revealed a case fatality rate of 3.2% [12].

5. Conclusion

In conclusion, as there is no specific antidote available for Paraquat and other herbicide poisoning. It is important to establish the diagnosis early and to pursue aggressive decontamination and prevention of further absorption. Increased awareness of the clinician and availability of the laboratory diagnostic methods will definitely help in successful management of Paraquat poisoning and to decrease the toxicity of easily available and most used herbicides is also helpful.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

We have no conflict of interest to declare in this study.

Statement of ethical approval:

This study doesn't harm any individual involved.

Statement of informed consent

All information and statements obtained from respondents (informants) are for research purposes and will be maintained.

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