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To study clinical profile of Ratanjot (Jatropha Curcus) Poisoning in children admitted in Dr. BR Ambedkar Memorial Hospital Raipur Chhattisgarh

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Abstract
Introduction: Chhattisgarh government is encouraging Ratanjot (Jatropha curcas) plantation for biodiesel therefore incidence of poisoning is common in this region because of easily accessible and eagerly eating by children due to seeds resembles to ground nut. In spite of its ubiquity and propensity to cause many adverse effects on accidental consumption; not much literature is available therefore current study is carried out to study clinical spectrum and prognosis.
Materials & Methods: This Observational Study, retrospective descriptive Cross sectional study is carried out by Department of Pediatrics, Dr. BRAM Hospital, Raipur over a period from January 2005 to January 2015. All childrens were taken who has brought after ingestion of fruit and seed of Ratanjot plant and their clinical profile were studied.
Observation: Vomiting was the most common symptom present in all children followed by abdominal pain (85%), weakness (39%), and dehydration (18%). Diarrhea in 25% children, Hypovolemic shock was documented in 7 children 3.33 %(9/273) cases required IV fluid for resuscitation.
Conclusion: Children who ingest Jatropha curcas seeds develop mild gastrointestinal symptoms but life threatening complications like hypovolemic shock can occur. Health care providers must recognize, assess and initiate appropriate management.

Keywords: Ratanjot, jatropha curcas, jangli arandi, euphorbiaceae, ricin oleic acid

Introduction

Ratanjot poisoning is one of the leading causes of poisoning in children in our region due to large number of plantation by government for biodiesel. Incidence of poisoning is high due to seed of ratanjot which resembles to seeds of ground nut especially in ingestion by children belongs to low socioeconomic group. Children are attracted by the shape and the colour of the Jatropha fruits. [1] Every year several children are admit at Dr BRAM Hospital Raipur due to acute jatropha ingestion locally known as "Ratanjot". However in spite of its ubiquity and propensity to cause many adverse effects on accidental consumption; not much literature is available. Ratanjot (Jatropha curcas) is a common plant found all over the world. Jatropha is a genus of approximately 175 succulent plants, shrubs and trees (some are deciduous, like Jatropha Curcas L.) from the family Euphorbiaceae. The name is derived from Greek (iatros = physician and trophe = nutrition), hence the common name physic nut. The other common names are Jungle arandi, Ratanjot, Bagranda, purging nut tree and Barbados nut tree [2]Though all parts of the plant are poisonous, The seeds contain 21% saturated fatty acids, 79% unsaturated fatty acids and yield 25-40% oil by weigh [3]. seeds have the highest concentration of the toxin and are highly poisonous[4].The poisonous property of the plant is mainly due to presence of toxalbumin called curcin and cyanic acid, related to ricin oleic acid. Jatropha also contains Curcasin, arachidic, linoleic, myristic, oleic, palmitic, and stearic acids and curcin. Leaves contain isovitexin and vitexin. From the kernel saccharose, raffinose, stachyose, glucose, fructose, galactose, protein are also available [5]. There is usually a delay of half an hour or more after consumption of the toxin containing part(s) of the plant before the symptoms begin which are largely pertaining to gastrointestinal irritation. There is acute abdominal pain, burning sensation in the throat followed by nausea, vomiting and profuse diarrhoea. In severe poisoning, the faeces and vomitus may contain blood. There may be CNS and cardiovascular depression and children are more susceptible. Though the plant grows in wastelands, it is cultivated mainly for hedges. As these plants are grown as an ornament they will often be found in gardens and public areas and therefore will be easily accessible. Ratanjot (Jatropha) are fruit bearing and the seeds have a pleasant taste, the plants are particularly attractive to children. Furthermore, studies show that children are more susceptible to Ratanjot (Jatropha) poisoning when they ingest the seeds of the plant [6, 7, 8].

Due to ubiquity and propensity to cause many adverse effects on accidental consumption; not much literature is available therefore we carried out largest numbers of cases of ratanjot poisoning and its clinical profile.

Materials and Methods

- **Design of study**- Observational Study
- **Study type**- retrospective descriptive
- **Data collection**- Cross sectional
- **Place of study**-Department of Pediatrics, Dr. BRAM Hospital, Raipur
- **Period of study**-From January 2005 to January 2015
- **Sample size**-All Patients who attended pediatric OPD and ward with complain of vomiting, abdominal pain, weakness and Diarrhoea after ingestion of fruit and seed of Ratanjot plant.

Inclusion Criteria
Age of 1year to old up to ≤14 years at the time of admission, admitted only due to acute Jatropha poisoning, and inclusive date of admission is from the January 2005 to January 2015

Exclusion Criteria
Adult age group.

Results
In the present study from the year 2005 to 2015, a total of 273 cases of acute Jatropha poisoning in children was reported. The year 2012 had the most admissions due to acute Jatropha poisoning i.e. 58 cases followed by 39 cases in the year 2012, 36 cases in the year 2010 and 28 cases in the year 2009.

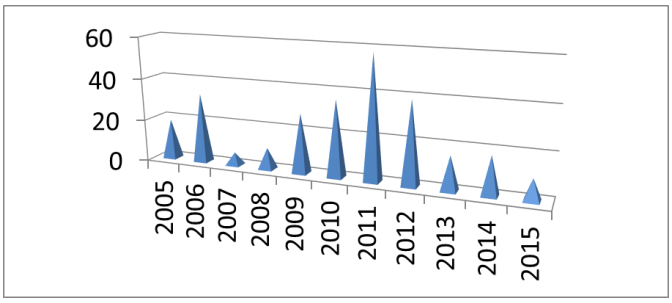

Fig 1: Distribution of Acute Jatropha poisoning cases according to year

An increase in number of cases was noted from year 2009 to 2012 after that there is decline in cases of jatropha poisoning.

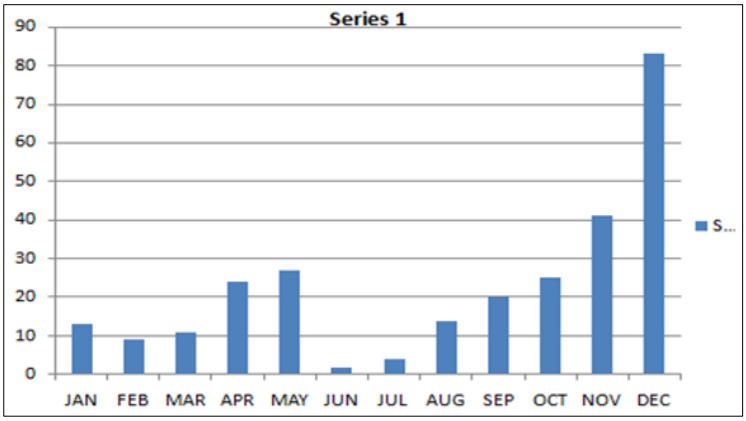

Fig 2: Distribution of acute Jatropha poisoning cases according to month

Most acute Jatropha poisoning in children happen during the months of December (84 cases), November (42 cases), May (28 cases) and April & October (24 cases). Occasional cases were also reported in other months.

Table 1 showed 75.82 % (207/273) of children with acute Jatropha poisoning were male with male female ratio of 3.1: 1. 49.08 % children were in age group of 8 – 11 years and 37 % children were between 4 to 7 years of age.

Table 1: Socio-demographic variables of cases

Demographic variable	No of cases	Percentage
A. Gender		
Male	207	75.82
Female	66	24.17
Total	273	100
A. Age group		
B. 1 – 3 years	19	06.95
> 4– 7years	102	37.38
>8 – 11 years	134	49.08
>12 years	18	06.59
Total	273	100

Table 2 showing Vomiting was the most common symptom present in all children with acute Jatropha poisoning followed by abdominal pain (85%), weakness (39%), and dehydration (18%). Diarrhea was present in 25% children. Hypovolemic shock was documented in 7 children with acute Jatropha poisoning. 57 %of the study populations were discharged within 24 hours. The rest were discharged after 24 hours. All cases were discharged with improved condition.

Table 2: Clinical profile of cases

A.Signs and symptoms	No of cases	Percentage
Vomiting	273	100
Signs of dehydration	18	11.68
Abdominal pain	85	55.19
Weakness	39	25.32
Diarrhea	25	16.23
Shock	7	4.54
B.Duration of hospital confinement		
Less than 24 hours	155	56.77
More than 24 hours	118	43.23
Total	273	100

Table 3 showing in the present study all children with acute Jatropha poisoning required IV fluids, IV anti emetics and ORS. Gastric lavage was performed in only 60% (166/273) cases. 3.33 %(9/273) cases required IV fluid resuscitation.

Table 3: Management of cases

Treatment given	No of cases	Percentage
Gastric lavage	166	60
ORS	273	100
IV Fluids Maintenance	273	100
Oxygen	nil	nil
Anti emetic	273	100
IV fluid resuscitation	9	3.33

Discussion

Jatropha curcas is a small tree or shrub belonging to Euphorbiaceae family. It has many Synonym Curcas purgans Medic. Its vernacular common names in English are physic nut, purging nut; other common names: Barbados nut, Black vomit nut, Curcas bean, Kukui haole, Purgeerboontjie. The genus name Jatropha derived from the Greek jatrós (doctor), trophé (food), which implies medicinal uses. The plant is planted as a hedge (living fence) by farmers all over the world because it is not browsed by animals [9]. Jatropha curcas originated from Central America and Caribbean islands it was probably distributed by Portuguese seafarers via the Cape Verde Islands and formerly Portuguese Guinea (now Guinea Bissau) to other countries in Africa and Asia. Today it is cultivated in almost all tropical and subtropical countries as protection hedge around gardens and fields, since it not browsed by cattle [9].

It is a small tree or shrub with smooth grey bark, which exudes whitish colour watery latex when cut. Normally it grows between three to five meters in height, but can attain a height of up to eight or ten meters under favourable conditions. It has large green to pale-green leaves, alternate to sub-opposite, three to five lobed with a spiral phyllotaxis. The petiole length ranges between 6-23 mm. The inflorescence is formed in the leaf axil. In conditions where continuous growth occurs, an unbalance of pistillate or staminate flower production results in a higher number of female flowers. Fruits are produced in winter when the shrub is leafless. Each inflorescence yields a bunch of approximately 10 or more ovoid fruits. Three, bi-valved cocci is formed after the seeds mature and the fleshy exocarp dries. The seeds become mature when the capsule changes from green to yellow, after two to four months from fertilization. The blackish, thin shelled seeds are oblong and resemble small castor seeds [10].

J. *curcas* belongs to the Euphorbiaceae family and is known by such common names as physic nut tree, purging nut tree, American purging nut, Barbados purging The seeds contain an oil - known as hell oil, pinhoen oil, oleum infernale or oleum ricini majoris - which contains small amounts of an irritant curcano1eic acid, which is related to ricin oleic acid and croon oleic acid, the active principles of castor oil and croton oil respectively. The seeds also contain a lectin named curcin which causes agglutination of erythrocytes. The seeds of J. *curcas* have been used as a purgative, anthelmintic and abortifacient as well as for treating ascites, gout, paralysis and skin diseases. Poisoning by these seeds is well known in veterinary practice and autopsy findings include severe gastro-enteritis, nephritis, myocardial degeneration, haemagglutination and subepicardial and subendocardial haemorrhages. It therefore appears that J. *curcas* poisoning is one of which note should be taken in clinical practice as causing short-lived morbidity but from which patients usually recover rapidly [10].

According to Hartwell, the extracts are used in folk remedies for cancer. Reported to be abortifacient, anodyne, antiseptic, diuretic, emetic, haemostat, lactagogue, narcotic, purgative

rubefacient, stypt and vulnerary; physic nut is a folk remedy for alopecia, ascites, burns, convulsions, cough, dermatitis, diarrhoea, dropsy, dysentery, dyspepsia, eczema, fever, gonorrhoea, hernia, incontinence, inflammation, jaundice, neuralgia, paralysis, parturition, pneumonia, rash, rheumatism, scabies, sciatica, sores, stomach-ache, syphilis, tetanus, thrush, tumours, ulcers, uterosis, and yellow fever. Latex applied topically to bee and wasp stings. Mauritians massage ascetic limbs with the oil. Cameroon natives apply the leaf decoction in arthritis [11, 12].

Colombians drink the leaf decoction for venereal disease. Bahamans drink the decoction for heartburn. Costa Ricans poultice leaves onto erysipelas and splenosis. Guatemalans place heated leaves on the breast as a lactagogue. Cubans apply the latex to toothache. Colombians and Costa Ricans apply the latex to burns, haemorrhoids, ringworm, and ulcers. Barbadians use the leaf tea for marasmus, Panamanians for jaundice. Venezuelans take the root decoction for dysentery. Seeds are used also for dropsy, gout, paralysis and skin ailments. Leaves are regarded as antiparasitic, applied to scabies; rubefacient for paralysis, rheumatism; also applied to hard tumours. Latex used to dress sores and ulcers and inflamed tongues. Seed is viewed as aperient; the seed oil is emetic, laxative, purgative and for skin ailments; root decoction as a mouthwash for bleeding gums [13].

Shah V at el [14] found a family of 5 members (mother, father and three sons) affected by the poisoning of its seeds, who presented within a few minutes with complaints of vomiting and diarrhoea. The nature of illness was self-limiting and no complications occurred during the entire hospital stay and follow up. There are few reported cases of its poisoning in paediatric age but we didn't come across any case report for its poisoning in adults.

According to *Levin Y at el* [4] two children were admitted to the Emergency Department (ED) after ingesting a large amount of fruit of a plant identified as Jatropha multifida. They were mildly obtund, had intractable vomiting, and seemed dehydrated. Intravenous fluid replacement and urine alkalinisation were initiated. After stabilization, their 5-day hospital stays were uneventful except for a subclinical rise of liver enzymes. Jatropha species contain the toxalbumin ricin, which causes severe vomiting and diarrhoea, dehydration, shock, and renal and hepatic impairment. Ricin also has cardio toxic and haemolytic effects and several deaths have been documented.

As per Koltin D *at el* [15] four siblings presented with vomiting, diarrhoea and miosis following ingestion of the plant. This is the first report of miosis as a presenting sign of Jatropha intoxication. The combination of vomiting, diarrhoea and miosis resembles the clinical presentation of organophosphate poisoning. This fact warrants the consideration of Jatropha ingestion in the differential diagnosis of organophosphate ingestion. Treatment of Jatropha intoxication is supportive with emphasis on rehydration. Measurement of plasma acetyl cholinesterase activity levels, which is normal after Jatropha ingestion and decreased following organophosphate poisoning, may help differentiate between the two.

Study conducted by *Chulathida Chomchai et al.* [16] conclude that atropha curcas is widely cultivated in Thailand, the seeds of which yield high quality oil used for biodiesel production. Toxicity due to ingestion of Jatropha curcas has become more common among children due to the close proximity between cultivation and residential areas. We report 10 calls made over a 40-month period to the Siriraj Poison Control Centre involving 75 children ages 2-14 years who experienced toxicity after ingesting various amounts of Jatropha beans. The amounts ingested, presenting symptoms, pertinent laboratory findings and their collective dispositions are reported. A brief review of recent published literature on toxicity due to ingestion of Jatropha curcas was also done.

As per *Ajay Kosam at el* [17] Total of 169 cases of Jatropha curcas poisoning were reported. Clinical profile and outcome were described. Total 169 cases were evaluated. Acute Jatropha poisoning was the commonest cause of poisoning in children constituting 31% of poisoning cases. Vomiting was the most common symptom present in all children followed by abdominal pain (58%), weakness (21%), dehydration (13%) and diarrhoea (11%). Hypovolemic shock was documented in 6 children with acute Jatropha poisoning. All children required IV fluids, IV anti emetics and ORS. 4 % cases required IV fluid resuscitation & oxygen supplementation due to hypovolemia shock.

Abdu-Aguye A at el [6] The seeds of *Jatropha curcas* L. ingested accidentally by two children aged 3 and 5 years led to a clinical syndrome of restlessness, severe vomiting and dehydration. A systematic study of the seeds indicated that they produced toxic effects in mice. Macroscopic anal haemorrhage and death occurred when the seeds were administered with the feed. Post-mortem examination revealed infarction of various parts of the gastrointestinal tract with congested vessels. Sodium chloride solution (150 mmol/l: saline) extract of the dried seed administered intraperitoneally into mice caused death in doses as low as 1 mg/kg. Post-mortem studies in this case showed widespread haemorrhages involving the colon, lungs as well as infarction of the liver. Larger intraperitoneal doses (> 30 mg/kg) were lethal rapidly but not associated with gross gastrointestinal haemorrhage.

P. H. JOUBERT et al. [7] during the first 3 months of 1983, 8 cases of acute poisoning with seeds from the tree J. *curcas* were seen. These poisonings occurred in Black children between the ages of 2 and 9 years (4 male, 4 female) who thought the seeds were edible. All presented with moderate to marked gastrointestinal symptoms, including nausea, vomiting and abdominal cramps. Of these patients 5 were clinically dehydrated and were given intravenous fluid replacement. All patients made a rapid and uneventful recovery and could be discharged the next day.

Study conducted by *Singhal at el* [18] found that there are very few case reports in literature of J. curcas poisoning. Previously grown as an ornamental plant; it is presently being cultivated on a large scale for its seed oil, which is used as biodiesel. This has brought this plant in close vicinity to the human population, exposing them to the chance ingestion. We are presenting clinical and biochemical profile of eight children with J. curcas poisoning. The plant is commonly known to be a purgative and gastrointestinal irritant but the most conspicuous feature in our patients was absence of diarrhoea. Lethargy, severe abdominal pain, inability to ingest anything, and intense thirst were the most prominent.

Joubert at el [19] found in different parts of the world during the first 3 months of 1983 8 children were admitted to Ga-Rankuwa Hospital with marked nausea, vomiting and diarrhoea after ingesting the seeds of Jatropha curcas. Five

patients needed intravenous rehydration but all made a rapid and uneventful recovery.

Langrand J at el [20] report a series of 24 cases of poisoning with J. curcas seeds or fruits reported to poison centres in Paris and Marseille between December 2000 and June 2014. Fifteen adults and 9 children ingested J. curcas seeds or fruits. All patients experienced gastrointestinal disorders, within the first hours following ingestion: nausea, vomiting, diarrhoea and abdominal pain. Laboratory investigations performed in 10 patients revealed minor abnormalities: CK elevation (8 cases), dehydration (5 cases) with moderate elevation of serum creatinine levels (3 cases), and mildly increased serum bilirubin (8 cases). Complete remission of all clinical signs was observed within 48 hours in the 20 cases for which the outcome was known.

Ghodkirekar at el [21] In India, accidental poisoning due to ingestion of plant seeds is common among children, especially under 12 years of age. It varies from relatively mild poisoning to fatal poisoning. Since unripe fruits of Yellow Oleander (Cerbera thevetia; Thevetia peruviana) resemble the fruits of Jatropha curcas, and symptoms such as vomiting, diarrhoea, and abdominal pain are common to both when ingested, differentiating the two is occasionally difficult. Mass poisoning with Jatropha curcas that was initially mistaken to be due to Cerbera thevetia.

B. Kaur at el [22] despite lot of parental care & disciplined care at schools, accidental poisoning is not an uncommon presentation in paediatric emergency. 36 children belonged to local primary school age ranging from 6-12 years admitted with acute jatropha poisoning at community health centre (CHC) in District Fatehgarh sahib, Punjab. Most prominent symptom of poisoning is nausea, vomiting, abdominal pain and most serious sequel hypovolemic shock. Jatropha plant seed poisoning manifests as gastrointestinal symptoms. Cornerstone of treatment is decontamination and hydration

Dror Koltin at el [23] four siblings presented with vomiting, diarrhoea and miosis following ingestion of the plant. This is the first report of miosis as a presenting sign of *Jatropha* intoxication. The combination of vomiting, diarrhoea and miosis resembles the clinical presentation of organophosphate poisoning. This fact warrants the consideration of *Jatropha* ingestion in the differential diagnosis of organophosphate ingestion. Treatment of *Jatropha* intoxication is supportive with emphasis on rehydration. Measurement of plasma acetyl cholinesterase activity levels, which is normal after *Jatropha* ingestion and decreased following organophosphate poisoning, may help differentiate between the two.

Conclusion

Most children who eat Jatropha curcas seeds develop mild gastrointestinal symptoms but life threatening complications like hypovolemic shock can occur. We need to recognize, assess and initiate appropriate management promptly to minimize the serious consequences that could put in danger the lives of childrens.

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