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POISONING CASES REPORTED BY PLANT POISONS IN SRI LANKA

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ABSTRACT Poisonous plants comprehend several biologically active phytochemicals that may be harmful to living organism if originate in contact. Due to the presence of wide number of phytochemicals constituents (including digitoxin, colchicines and atropine etc.) these poisonous plants have also been found to be useful in treating various diseases. This review is an endeavour to present an updated account of forensically important Sri Lankan toxic plants and its reported cases. According to this research result shows 10 poisonous plants reported in poisonous case in Sri Lanka according to published research articles indexed journals by searching the PubMed results. Results and discussion of this research revealed as; All taxonomical classification of plants used as poisoning purpose commonly suicidal purpose. Parts used were listed as; seeds were mostly used and other parts which are leaves, tubers, and flowers. This research finally concluded as Plants which are used as poisoning by purposeful in suicidal and accidently by children used seeds were mostly used and other parts which are leaves, tubers, and flowers of plants such as; *Jatropha curcas, Thevetia peruviana, Abrus precatorius, Ricinus communis, Jatropha multifida, Caladium bicolor, Datura stramonium, Gloriosa superba, Alocasia cucullate and Nicotiana tabacum.*

KEYWORDS : Poisonous Plants, Sri Lanka, PubMed articles

INTRODUCTION

A poison is a material which, when administered, inhaled or ingested, is capable of acting deleteriously on the human body. Thus, there are really no limits, between a medicine and a poison, for a medicine in a toxic dose is a poison and a poison in a small dose may be a medicine means, it depends on dose/quantity only. In law, the real difference between a medicine and a poison is the intent with which it is given. If the substance is given with the intention to save life, it is a medicine but if it is given with the intention to cause bodily harm, it is a poison [1]. It is fact that virtually any substances can be harmful at high concentration- as Paracelsus (1493-1541), the father of toxicology said in the sixteenth century, "Everything is poison, there is poison in everything, only the dose makes a thing not a poison" [2]. In the context of biology, poisons are substances that can cause disturbances to organisms. Throughout human history, intentional application of poison has been used as a method of assassination, murder, suicide, and execution. Poison includes both naturally produced compounds and chemicals manufactured by humans. Natural poisons are produced by species of bacteria, fungi, protists, plants and animals. Poisonous plants are those which cause serious problems or even death occur, if a small quantity of its stem, leaves, seeds, fruits and roots are ingested [3].

Some other plants are normally harmless but they may become toxic if preparative from them are taken in excess in strong doses or for along period of time as suggested by Qureshi *et al.* [4]. Poisoned weapons were used in ancient India, and war tactics in ancient India have references to poison.

The incidence of poisoning in India is among the highest in the world, and it is estimated that more than 50,000 people die every year from toxic exposure [7]. The causes of poisoning are many - civilian and industrial, accidental and deliberate. The commonest agents in India appear to be pesticides (organophosphates, carbamates, chlorinated hydrocarbons, and pyrethroids), sedative drugs, chemicals (corrosive acids and copper sulfate), alcohols, plant toxins (datura, oleander, strychnos, and gastro-intestinal irritants such as castor, croton, calotropis, etc.), and household poisons (mostly cleaning agents).[8] Poisonous plants of India and Sri Lanka have been described by few workers [9-10]. A lot of work has been reported on toxicology of plants but no work has been done specially on poisonous plants study in terms of forensic context. In the present study, a review has been performed on almost poisonous plants of India about their fatal dose and fatal period. In this article, we reported basic details such as the botanical and family names, toxic parts of plant, chemical constituents and information about fatal dose and fatal period of the important plants.

There are number of toxicologically significant phytochemicals (including proteins, oxalates, glycosides, terpenes, phenolics, alkaloids, anthocyanins, proteins, glycosides and resins etc.). These plant derivatives are used as silent naturally occurring biological bioweapons which may destroy life mysteriously without any violence. Poisonous plants which cause serious problems or even death are considered as biological weapons. These are the first choice of professional poisoners in toxicological crime because of their easy availability and having no cost. These plant derived naturally occurring biological weapons were also used by criminals in burglary, rape and murder cases. In India, there are so many cases where criminals use these products by mixing in food material or/and contact to victim's body in the buses/trains. The toxic constituents of many of such plants need to be properly recorded to develop a prefect database to be utilized in forensic analysis and identification of specific causal agents.

MATERIALS AND METHODS

Research Type: Data collected from PubMed online search on 30th April, 2020 at 19:00. There were only 10 articles were full paper was selected in this research. Data under process to grouping and classified according to the research objectives.

RESULTS

Table 1: collection of published articles on poisonous plants

No.	Plant	Title	Type	Citation
1	*Jatropha curcas, Thevetia peruviana, Abrus precatorius, Ricinus communis, Jatropha multifida, Caladium bicolor, Datura stramonium, Gloriosa superba*	Plant poisoning: a hospital-based study in Sri Lanka.	Prospective study	Lucas G. N., Indian J Pediatr. 1997 Jul-Aug;64(4):495-502. doi: 10.1007/bf02737755.
2	*Alocasia cucullata*	Is Nai Habarala (Alocasia cucullata) a poisonous plant?	Case study	Goonasekera CD et al, Toxicon. 1993 Jun;31(6):813-6. doi: 10.1016/0041-0101(93)90388-y.
3	*Gloriosa superba*, *Ricinus communis* and mushroom	Poisoning with plants and mushrooms in Sri Lanka: a retrospective hospital based	Prospective study	Fernando R, Fernando DN., Vet Hum Toxicol. 1990 Dec;32(6):579-81.

4	*Thevetia peruviana*	Epidemic of self-poisoning with seeds of the yellow oleander tree (Thevetia peruviana) in northern Sri Lanka.	Prospective study	Eddleston M et al., Trop Med Int Health. 1999 Apr;4(4):266-73. doi: 10.1046/j.1365-3156.1999.00397.x.
5	*Thevetia peruviana*	Anti-digoxin Fab fragments in cardiotoxicity induced by ingestion of yellow oleander: a randomised controlled trial.	Randomised controlled trial	Eddleston M et al, Lancet. 2000 Mar 18;355(9208):967-72. doi: 10.1016/s0140-6736(00)90014-x.
6	*Nicotiana tabaccum*	Setting priorities for cancer control programs.	Retrospective study	Eddy DM. et al, J Natl Cancer Inst. 1986 Feb;76(2):187-99.
7	*Nicotiana tabaccum*	Some oral carcinomas from Sri Lankan betel/tobacco chewers overexpress p53 oncoprotein but lack mutations in exons 5-9.	Retrospective study	Ranasinghe A et al, Anticancer Res.1993 Nov-ec;13(6A):2065-8.

Summarization of collection of referred articles:

1. This is a prospective hospital based study of 148 cases of plant poisoning seen by the author during a 12 year period. All cases were accidental. There were 2 deaths. Some measures to reduce the incidence of plant poisoning in Sri Lanka are listed.[1]

2. Nai Habarala (Alocasia cucullata) is not documented as a poisonous plant. However, we report two cases of fatal poisoning following ingestion of its fruit. The clinical manifestations have a similarity to cyanogenic glycoside poisoning.[2]

3. A retrospective hospital-based study in Sri Lanka showed that out of 4556 cases of poisoning, 2.5% were caused by plants and mushrooms. *Gloriosa superba* (44%), and *Ricinus communis* (24%) were the commonest plants responsible for poisoning; 39% of the victims were less than 15 y old. Gastric lavage and iv fluids were the most common therapeutic measures used. There were 8 deaths, all due to G. *superba*. There is a need for public education to prevent poisoning, which is a major health concern.[5]

4. Deliberate self-harm is an important problem in the developing world. Ingestion of yellow oleander seeds (*Thevetia peruviana*) has recently become a popular method of self-harm in northern Sri Lanka -- there are now thousands of cases each year. These seeds contain cardiac glycosides that cause vomiting, dizziness, and cardiac dysrhythmias such as conduction block affecting the sinus and AV nodes. This paper reports a study of the condition's mortality and morbidity conducted in 1995 in Anuradhapura General Hospital, a secondary referral centre serving 750 000 people in Sri Lanka's north central province. 415 cases were admitted to the hospital during 11 months; 61% were women and 46% were less than 21 years old. A prospective study of 79 patients showed that 6% died soon after admission. 43% presented with marked cardiac dysrhythmias which necessitated then transfer to the coronary care unit in Colombo for prophylactic temporary cardiac pacing. There is an urgent need for an intervention which could be used in rural hospitals, thus preventing the hazardous and expensive emergency transfer of patients to the capital.[10]

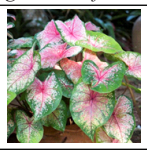
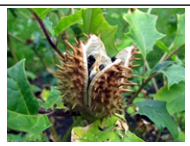
5. BACKGROUND: Severe cardiac glycoside cardiotoxicity after ingestion of yellow oleander seeds is an important problem in rural areas of Sri Lanka. Currently, patients must be transferred to the capital for temporary cardiac pacing. We did a randomised controlled trial to investigate whether anti-digoxin Fab could reverse serious oleander-induced arrhythmias. METHODS: After a preliminary dose-finding study, 66 patients who presented to hospital with a serious cardiac arrhythmia were randomised to receive either 1200 mg of anti-digoxin Fab or a saline placebo. A 12-lead electrocardiogram, 3 min rhythm strip, and blood sample for measurement of electrolytes and cardiac glycosides were taken before treatment and at 12 timepoints thereafter. FINDINGS: 34 patients received anti-digoxin Fab and 32 received placebo. The presenting arrhythmia had resolved completely after 2 h in 15 antibody-treated patients and two controls ($p<0.001$); 24 and five patients, respectively, were in sinus rhythm at 8 h ($p<0.001$). Kaplan-Meier analysis of time to first reversal showed a significant response to anti-digoxin Fab. The heart rate increased in cases, from 49.1 per min at baseline to 66.8 at 2 h, but not in controls (50.6 per min at baseline to 51.5; $p<0.001$). Mean serum potassium concentrations decreased from 4.9 mmol/L to 4.1 mmol/L at 2 h in cases; no such decrease occurred in controls. INTERPRETATION: Anti-digoxin Fab fragments are a safe and effective treatment for serious cardiac arrhythmias induced by yellow oleander. Their use in small rural hospitals in Sri Lanka should minimise costly transfer of patients and reduce the numbers of deaths; however, further study will be required to confirm this reduction.[7,10]

6. This paper describes a simple method for comparing the effectiveness and costs of different cancer control activities and illustrates use of the method by evaluating priorities for controlling oral cancer in developing countries. The method estimates the long-term effect of prevention, screening, detection, treatment, and support activities (e.g., pain control) on morbidity, mortality, measures of quality of life, and cost for a specified population. It can be used to compare the cost effectiveness of various combinations of activities for one or more cancers and to help set priorities for cancer control programs. An analysis of two primary prevention activities, two screening activities, and three treatment activities to control oral cancer in Sri Lanka indicates that highest priority should be given to primary prevention activities such as anti-tobacco education and to screening.[6]

7. We reported a low prevalence (11%) of p53 expression detected by immunohistochemistry in oral squamous cell carcinomas associated with betel/tobacco chewing Sri Lankans (23). Five neoplasms which over-expressed p53 protein were used in the present study of mutations. Despite extensive sequence analysis no mutations were detected in exons 5 through 9 of the p53 gene in all the DNA samples of these neoplasms. The absence of mutations in betel/tobacco related carcinomas in this population may derive from differences in aetiology, carcinogen metabolism and susceptibility, DNA repair mechanisms and/or genetic predisposition.[8,9]

Table 2: Vernacular name of the poisonous plants

No.	Plant	Image	Poisonous part
1	***Thevetia peruviana*** Fam: Apocynaceae, Sin: Kaha kaneru, Tam: Pachchaiyalari, San: Ashvaka, Eng: Yellow olander		
			
2	***Alocasia cucullata*** Fam: Araceae, Sin: Nai Habarala, Tam: Merukankizhangu, San: Manaka, Eng: Dwarf Elephant Ear		
			
3	***Gloriosa superba*** Fam: Colchicaceae, Sin: Niyangala, Tam: Kartikai kizhangu, San: Agnimukhi Eng: Malabar glory Lily		
			

4	***Nicotiana tabacum*** Fam: Solanaceae, Sin: Dumkola, Tam: Pugaiyilai, San: Tamakuh Eng: Tobacco	
		
5	***Jatropha curcas*** Fam: Euphorbiaceae, Sin: Weta Erandu, Tam: Kadalamanaku, San: Dravanti Eng: Physic nut	
		
6	***Abrus precatorius*** Fam: Fabaceae, Sin: Olinda, Tam: Kuntu mani, San: Gunja Eng: Rosary pea	
		
7	***Ricinus communis*** Fam: Euphorbiaceae, Sin: Erandu, Tam: Chittamanaku, San: Eranda Eng: Castor oil plant	
		
8	***Jatropha multifida*** Fam: Euphorbiaceae, Sin: Mayurapada erandu, Tam: Malyilamanaku, San: Bhadradanthi, Eng: Coral plant	
		
9	***Caladium bicolor*** Fam: Araceae, Sin: Rathu Habarala, Tam: Chimai kizhangu, San: Hastikarni *Eng: Heart of Jesus*	
		
10	***Datura stramonium*** Fam: Solanaceae, Sin: Aththana, Tam: Umaththai, San: Dhattura Eng: Thron Apple	
		

<Fam*: Family,* Sin*: Sinhala name,* Tam*: Tamil Name,* San*: Sanskrit name,* Eng*: English name*>

DISCUSSION

According to this research result shows 10 poisonous plants reported in poisonous case in Sri Lanka according to published research articles indexed journals by searching PubMed on 30th of April. 2020 at 19:00 (Table: 1). All taxonomical classification of plants used as poisoning purpose commonly suicidal purpose. Parts used were listed as; seeds were mostly used and other parts which are leaves, tubers, and flowers. (Table: 2)

CONCLUSION

This research finally concluded as Plants which are used as poisoning by purposeful in suicidal and accidently by children used seeds were mostly used and other parts which are leaves, tubers, and flowers of plants such as; *Jatropha curcas, Thevetia peruviana, Abrus precatorius, Ricinus communis, Jatropha multifida, Caladium bicolor, Datura stramonium, Gloriosa superba, Alocasia cucullate* and *Nicotiana tabaccum*

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CONFLICT OF INTEREST

The authors declare that no conflict of interest in this research.

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