Section: Medicine

Research

A STUDY OF CLINICAL, BIOCHEMICAL AND ELECTROCARDIOGRAPHIC CHANGES IN OLEANDER POISONING IN A TERTIARY CARE CENTRE

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Abstract

Background: Yellow oleander (Thevetia peruviana) is a typical tropical shrub. High levels of cardiac glycosides, which are harmful to the heart muscle and the autonomic nervous system, are present in all parts of the plant. Here, we studied clinical, biochemical and electrocardiographic changes in oleander poisoning in a tertiary care centre. **Materials and Methods:** A single-centre non-randomized study and a prospective study were conducted at Tirunelveli medical college hospital for eight months between January 2019 to august 2019. Adult patients (50) of yellow oleander seed poisoning above 18 were included. Age, sex, and socio-demographic details were collected. In addition, poisoning details such as the colour and the total number of the oleander seed, the mode and form of consumption, and associated intake were collected. **Result:** Out of 50 patients, 48% were males, and 52% were females. The number of patients taking oleander and fruit seeds was 48 (96%) and 4%, respectively. Nearly 58%, 14%, and 16% of patients consumed oleander seeds in chewed form, grounded, and unchewed form, respectively. In the study, 42% of patients developed vomiting, and 8% developed diarrhoea and vomiting, respectively. In this study, only 10% of patients developed palpitation, while 90% were asymptomatic. Giddiness developed in 4% of patients. There were ECG improvements in patients with a late hospital presentation of more than 6 hours. **Conclusion:** Significant morbidity is brought on by yellow oleander poisoning in South India. Further, research is necessary to understand the mechanism and improve therapeutic management.

INTRODUCTION

Poisoning is one of the suicidal methods highly prevalent within developing countries. It may result in minor symptoms to severe morbidities and even cause death in some cases. The suicide rate has drastically increased in past decades because of the easy availability of poisons, mainly in Southern and Eastern India. Both males and females are involved in suicide, and the common cohort is 15 to 45 years. The most common reasons for suicide are relationship failures, family problems, dowry, poverty, and exam failures.[1,2] Oleander is one of the most commonly grown plants everywhere, mainly in the tropics and subtropical countries. The plant is legendary for its colourfulness, like an ornamental purpose. Currently, 50 different types of oleander plants are grown for gardening purposes. Among these types, white pink and Thevetia peruviana are more commonly grown. The yellow oleander plant is more toxic than white or pink oleander. This oleander contains cardiac glycosides, which are more toxic to the cardiac system.[3,7] The patient may die due to severe shock, and the rationale is an arrhythmia of its cardiotoxic property. Any arrhythmia is caused by oleander poisoning. Arrhythmia can cause reduced cardiac flow rate, causing shock and leading to mortality in severe cases. Moreover, severe hyperkalemia is one of the features of acute oleander poisoning, which aggravates arrhythmia necessitating immediate intervention by correcting the high potassium levels.[1,8] So, serum potassium is serially monitored in patients with oleander poisoning to prevent the harmful effects of potassium on the heart. If any bad effect is observed, it should be treated immediately to prevent arrhythmias. Early treatment saves the patients. It is also wise to remember that potassium is also increased in other diseases, so rule out other causes of hyperkalemia.[1,8,9] So here we are,

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focusing on cardiotoxic poison, especially oleander poison. Therefore, the relation of the oleander with the age, gender, clinical profiles, biochemical changes, and electrocardiographic changes produced by the poison were assessed in the present study.

MATERIALS AND METHODS

A single-centre non-randomized study and a prospective study were conducted at Tirunelveli medical college hospital for eight months between January 2019 to august 2019.

Inclusion criteria:

All adult patients of yellow oleander seed poisoning above the age of 18.

Exclusion Criteria

- Pediatric patients
- Patients who had coexisting cardiac diseases
- Patients who were on cardiotoxic drugs
- Patients who had ingested other plant parts with oleander seed.
- Patients who were known cases of electrolyte abnormalities
- Known cases of renal diseases

Clinical Details

All cases were followed up till the cases were discharged or dead. Personal details like age, sex, and socio-demographics were obtained and recorded. Clinical details about the poisoning, such as the colour of the oleander seed, the number of seeds, and the mode and form of consumption, taken on an empty stomach or with food, were asked and recorded. The time window between poisoning and hospitalization and more details of first aid was obtained. Any Clinical symptoms experienced by the patients were recorded. The clinical Examination was well wiped out in-depth, vital signs were recorded, and every one of the system examinations was carried out. Electrocardiogram (ECG)

Monitoring

ECG is an important parameter in these poisoning patients. Routine conventional all the limb leads, chest leads and long strips were recorded. Continuous cardiac monitoring was done in the first 24-hour period for each patient and after that in some particular patients. After that, ECG was recorded twice within the second day and after that daily once until discharge. Laboratory investigations: Laboratory investigations, including random glucose, blood urea, serum creatinine, serum potassium, and serum sodium, were performed. Then, routine urine investigations were performed for all patients.

Treatment

All the oleander poisoning patients were admitted and initially treated with lavage with normal saline. Next, they were treated with NPO and IV fluids. If any sinus bradycardia was there, then tablet orciprenaline was started orally and given until the bradycardia resolved. Suppose there was any severe bradycardia with a heart rate <40; the patients were kept in the ICU and treated with small doses of atropine. If they do not respond, they are started with an injection of isoprenaline. If immune to all the above medical management, the patients are treated with temporary pacemakers. Unfortunately, digoxin-specific antibodies are not available in our hospital. The categorical variables all are described as proportions and percentages. Continuous variables are expressed as mean and variance. The effect of various clinical and biochemical factors on the presence of ECG changes and no ECG changes were analyzed by unpaired 'T-test for continuous data. The chi-square and Fischer's exact test were used to compare the specific data. The p-value <0.05 was considered significant in the study.

RESULTS

In the present study, out of 50 patients, 48% were males, and 52% were females. In addition, 9 (18%), 33 (66%), and 8 (16%) patients belonged to <20, 21-40, and >41 years old. Cases consume more of the oleander seeds from nearby villages. The number of patients taking oleander seeds was 48 (96%), and the number of fruit seeds taken was 2 (4%). The oleander seeds can be eaten in chewed, grounded, and not chewed forms. In our sample, nearly 28 patients (58%) consumed oleander seeds in chewed form, 14 patients consumed as grounded (14%), and the remaining 8 patients consumed in unchewed form in our study (16%). Oleander seeds are typically eaten by patients with alcohol or food or taken on an empty stomach. In this report, almost 23 patients (46%) took seeds with food. Six male patients were taking alcohol (12%), and twenty-one patients with an empty stomach (42%) [Table 1].

Table 1: Associated intake with poison

Associated intake	Frequency	Percentage
Alcohol	6	12%
Empty stomach	21	42%
Food	23	46%

Gastrointestinal, Cardiac, and CNS Symptoms: Some patients can experience gastrointestinal symptoms, such as vomiting, diarrhoea, or both. In the study, 21 patients (42%) developed vomiting and 4 developed diarrhoea and vomiting, respectively (8%). In this study, only 5 patients developed palpitation (10%), while 45 (90%) were asymptomatic. CNS symptoms such as giddiness, seizures, syncope, and loss of consciousness due

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to cardiac arrhythmia may occur in some patients with oleander poisoning, leading to reduced cerebral blood flow. In our sample, giddiness developed in 2 patients (4%) [Table 2].

Table 2: Gastrointestinal, Cardiac, and CNS Symptoms

Symptoms	Frequency	Percentage
Gastrointestinal Symptoms		
Vomiting	21	42%
Both diarrhoea and vomiting	4	8%
Cardiac symptoms		
Palpitation	5	10%
Asymptomatic	45	90%
CNS Symptoms		
Giddiness	2	4%
No	48	96%

ECG Changes

In this study, 50% of patients developed ECG modifications, and 50% had regular ECG. The most common ECG changes seen in oleander seed poisoning are sinus bradycardia. In this study, nearly 10 patients developed sinus bradycardia (40%). Besides sinus Brady cardia, other changes like first-degree heart blocks, premature atrial complexes, ST depression, T inversion, and tall T waves can also occur.

Age group and ECG changes:
The typical age range for consuming oleander poisoning was 21 to 40 years. Oleander seeds were taken from a total of 33 patients in this group. Of the 33, 16 patients had ECG alterations [Figure 1].

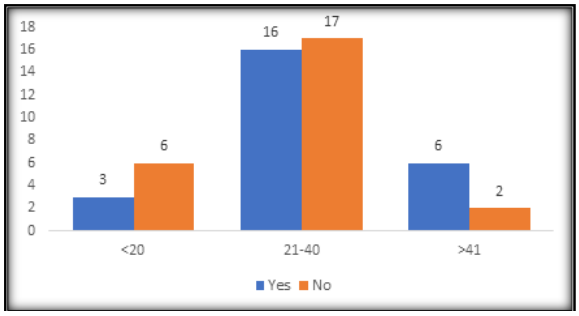

Figure 1. Age group and ECG changes

Plant parts consumed and ECG changes:
The Oleander plant's components include flowers, seeds, leaves, shrubs, fruits, etc. Patients may take all of these parts or in combination, and the toxic and clinical presentation features depend on the intake of these pieces [Figure 8].

Number of days in the hospital and ECG changes:
Patients may stay in the hospital depending on the cardiac status and the ECG changes [Figure 2].

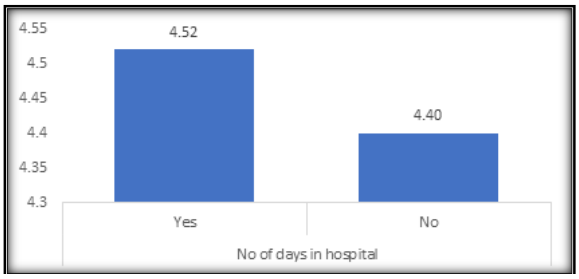

Figure 1. Age group and ECG changes

The number of seeds consumed: The mean number of ingested seeds was 4.36. There was a selection of 1 to 10 seeds, and a minimum of 1 seed in 4 patients and 10 seeds in 1 patient.

Correlation between biochemical levels and ECG changes: Certain biochemical values like serum potassium altered in oleander seed poisoning will lead to ECG changes. However, we only observed a significant difference in serum potassium.

Table 3: Biochemical values and ECG changes

ECG changes		Mean	Std deviation	P-value
Sr. Na	No	139.76	3.29	0.504
	Yes	140.32	2.54	
Sr. K	No	4.42	0.65	<0.0001
	Yes	5.71	0.59	
Sr. Urea	No	22.04	5.24	0.365
	Yes	20.72	4.96	
Sr. Creatinine	No	0.85	0.16	0.629
	Yes	0.83	0.12	
RBS	No	111.32	12.42	0.687
	Yes	109.72	15.32	

GIT symptoms and ECG changes

Patients with Oleander seed poisoning usually experience gastrointestinal symptoms, such as vomiting and diarrhoea. In our study, 21 patients reported vomiting, including 15 patients with ECG shifts. 4 patients had vomiting and diarrhoea, including ECG changes in two patients.

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Correlation between Time window and ECG changes

There were ECG improvements in patients with a late hospital presentation of more than 6 hours. In this study, 9 patients reported ECG changes for more than 6 hours, including 7 patients. In addition, 41 patients had less than 6 hours at an early stage, and 18 had ECG shifts.

DISCUSSION

Yellow oleander is one of the plants in our geographical region that is commonly found. In the Tirunelveli area, poisoning is epidemic and most commonly consumed in the middle age group (20-40 yrs-66%), as shown in the results. This will contribute to increased morbidity in the predominant labour force of our district's prosperous agricultural population.[9] Our research results are observed and consistent with the other few studies already reported from our country and other sub-continental countries. Every part of the oleander plant is very poisonous, as well developed in the literature review. Via inhalation paths, even the smoke from burning the twigs can also cause toxicity and change the ECG. We included seed ingestion patients in our research.[5] One of the most dangerous components of the plant is oleander seeds. The lethal dose of the oleander seeds and how the seeds were consumed varies in each patient. The typical lethal findings in ECG are seen in patients taking a maximum number of seeds and those taking crushed grounded forms.[7,9] We have found maximum clinical manifestations in patients taking nearly four to eight seeds. As said earlier, oleander seeds can be taken in different forms. In our study, a maximum number of patients were taken in the chewed and grounded forms and have shown many ECG changes like bradycardia, premature atrial contractions, heart blocks, etc., This oleander poison is mainly found to be cardiotoxic. Very minimal patients only suffered from neurological symptoms, but many have experienced gastrointestinal symptoms like vomiting and loose stools. This is not life-threatening, so not that much discussed in detail.[9,10] Vomiting is due to gastritis that is caused by medications. We have also found major cardiac signs in patients with gastrointestinal symptoms, such as vomiting and diarrhoea. The plausible reason is that the patient who took the oleander seed's most toxic form had both gastrointestinal and cardiac symptoms. The characteristic of oleander seed poisoning is cardiac toxicity. Inhibiting the Na+/K+ ATPase pump, cardiac glycosides increase intracellular Na+ and Ca+. Intracellular hypercalcemia contributes to spontaneous depolarization, thereby increasing the risk of arrhythmogenicity. From basic sinus bradycardia to complex Brady arrhythmias, the rhythm disturbances differ.[11] Multiple Brady arrhythmias are comparable to other oleander studies in our research. Our research findings are correlated with the most recent data available in the literature. The occurrence of various heart rhythm disturbances in yellow oleander poisoning was published by Zamani et al. in 2010.[12] There was a 40% incidence of Brady arrhythmias in that study. This is similar to our study, which found 50% bradycardia and 25% heart block incidence. We have not found any ventricular fibrillation or ectopic in this study. This study also considered the relationship between oleander seed poisoning and the various biochemical parameters. For example, the relation between oleander and serum potassium is found to have hyperkalemia. But this finding was observed only in a small number of patients. So, an increase in serum potassium is not a common finding but a lethal manifestation of oleander seeds. There was no association between blood sugar, serum urea, creatinine, and oleander poisoning. But in patients with chronic kidney diseases, we should be very careful because the disease can increase serum potassium and decrease serum calcium. Time plays a vital role in oleander poisoning. If the patients get delayed in transport and admission, the seeds take adequate time for more absorption from the gastrointestinal tracts, leading to more severe cardiac effects. The patients who entered the hospital early in the different studies had less morbidity and mortality. In our Tirunelveli report, the morbidity was also lower before entry. This is also illustrated by the fact that in patients with cardiotoxicity, the mean time from poisoning to hospital admission was 6.0±1.0 hours, compared to 3.0±1.3 hours in those without cardiotoxicity. The cardiac effects are the source of morbidity in oleander seed glycoside toxicity.[13,14] The average hospital stay period was substantially higher in patients with cardiac morbidity. In patients with an irregular electrocardiograph, the mean stay was 4.4±1.3 days vs 3.2±0.43 days in patients with a normal electrocardiograph. This is equivalent to other studies performed in other parts of the subcontinent. The oleander plant is grown in large numbers in tropical and subtropical areas, but the seed poisoning rate is still very high only in the southern villages of India. Some studies are exploring that polyclonal antibodies against digoxin are being prepared. But how effective these antibodies are debatable. Because these antibodies have shown varying effects in animal studies, no proper clinical trials have been conducted to see adequate effects. Hope for the trials to conduct this study to get a better polyclonal antibody for effective and quick treatment of oleander poisoning.[15,16]

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CONCLUSION

Yellow oleander poisoning in the district of Tirunelveli is one of the most common suicidal poisoning forms. There was also a female preponderance in our Oleander sample in Tirunelveli, and poisoning was more frequent in the 20-40 age group. The most toxic form is the chewed form, with 90% of patients displaying signs such as gastrointestinal and cardiac manifestations. In 16% of patients, a first-degree AV block was created. No other patients had heart block of the second or third degree. Significant morbidity is brought on by yellow oleander poisoning in South India. In these patients, dyselectrolytemia and irregular ECGs were frequent. In our study, no cases of ventricular fibrillation or tachycardia were reported, and there were no cases of mortality from oleander seed poisoning. At discharge, all patients had regular ECGs. Further, research is necessary to understand the mechanism and improve therapeutic management.

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