Short Communication

Emergence of entirely new poisoning in rural India; An upcoming health hazard to the community health.

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ABSTRACT

Acute agrochemical poisoning is a leading cause of mortality and morbidity in India. Pendimethalin (herbicide) and Pancycuron (fungicide) are frequently used worldwide and considered quite a remarkably safe one for humans. Their acute toxicity is not yet widely known. Here we are reporting cases of their acute poisoning in young. To the best of our knowledge not a single such case of their poisoning has been reported so far in india.

Such poisoning by entirely new compounds is an emerging problem in the tropics. In this communication we are reporting such unusual and entirely new toxicities and trying to highlight the need of their early recognition and timely management in rural regions where health facilities are already at the stake.

Keywords: Pancycuron, fungicide, pendimethalin, herbicide, poisoning, India.

Introduction:

Since civilization poison and poisoning is known to mankind. Everyday around the world, almost 700 people die from poisonings and for every person that dies, several thousands more are affected by poisoning[1,2]. Poisoning occurs in all regions and countries and affect people in all ages and income groups. According to WHO (1999)[2] more than three million poisoning cases with 251,881 deaths occur worldwide annually, of which, 99% of fatal poisonings occur in developing countries, particularly among agricultural workers. Agrochemical poisoning is an important global health problem especially in developing countries and particularly in setting of low education and poor regulatory frameworks. The scenario is still more awful in the Asia - Pacific region including India, which is a predominantly agrarian country with large rural population (60 – 80 %) and these compounds (pesticides, insecticides, herbicides etc.) are an integral part of agriculture within this region. their poisoning is typically suicidal, at times accidental and rarely homicidal. Suicide is ranked as third leading cause of death in age group 15-44 years. Toxicity of available poisons and paucity of medical services ensure that the mortality is greater in developing countries than in industrialized world. Medical management is difficult, with high case fatality up to 46 %, generally more than 15%[3]. After accidents and maternal mortality; suicide is the leading cause of death among the young in India, with a high prevalence in rural areas. Suicide is second leading cause of death among young people and with the decline in maternal death rates; it could soon become the leading cause of death among young women in India. Ingestion of agrochemical compounds is the principle mode for suicide. Of the 1.87 lakh people who committed suicide in India in 2010, around half (49% men and 44% women) consumed poison, mainly pesticides[4].

Agrochemical poisoning is mostly due to exposure to organophosphates (most common in India), organochlorines, and aluminium phosphide compounds which are an integral part of agriculture within this region and are readily available at a cheaper rate. Due to their intrinsic toxicity, new chemicals of high potency and low toxicity continue to be developed e.g. imidacloprid, pendimethiline, and pencycuron etc. But they are released to the market without appropriate data on direct human toxicity. Instead, human toxicity is often extrapolated from toxicological studies in animals, the relevance of which is poorly defined. They are classified as a "moderate toxic", and generally demonstrate low human lethality but at times they may be hazardous. Here we present patients who suffered severe acute poisoning by such widely-used compound which are supposed to exhibit least human toxicity.

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Case – 1 :

A young 25 years old female, was admitted in causality at 3.00 pm with an acute episode of headache, vertigo, intractable vomiting, difficulty in breathing, and altered sensorium. She was completely alright at 11.00 am when she had some argument with family members and consumed some chemical (fungicide pancycuron - about 70-80 ml) to end her life. Since then she was having recurrent episodes of vomiting along with nausea, headache, dizziness, tinnitus, vertigo and burning sensation and pain in throat and stomach. Later on she became drowsy followed by altered sensorium. She could not be relieved by initial treatment at some local hospital and was finally referred to UP RIMS & R, Saifai, a tertiary level hospital in rural region of north India. On Admission, she was confused, dyspnic and complaining restlessness and pain. Her vital signs revealed temp 98.6 f, pulse rate of 72/ minute, blood pressure of 118/68 mmhg, respiratory rate of 22 per minute with a poor general condition. The examination of other systems and routine laboratory investigations were within the normal limits. She was shifted to ICU and treated symptomatically. with careful observation and maticulous management, she recovered in a week.

Case – 2 :

A young male farmer aged 25 years, was brought to emergency at 7.30 pm with an acute episodes of intractable vomiting which was watery in nature, and altered sensorium. According to his relatives, he was completely alright at 4.00 pm when he deliberately consumed around 50 ml of the herbicide GADAR (pendimethalin 30% E.C.). Thereafter he was having recurrent episodes of vomiting, headache, burning sensation and pain in throat and stomach. Later on he became drowsy followed by unconciousness. At hospitalization, he was restless, confused, and delirious. Vital signs revealed temp 98 F, pulse rate of 74/ minute, B.P. 122/80 mmHg, respiratory rate of 21 per minute. Neurological examination revealed GCS of 9 /15 (E2V3M 4) with reduced movements of all four limbs and normal reacting Pupils. The examination of other systems was within normal limit. The laboratory investigations, routine chemistries, liver and renal function test were within the normal limits. He was managed symptomatically and his psychiatric reference was also done for his irritable behavior and found to be suffering from depressive symptoms with impulsive personality and advised treatment accordingly.

Discussion:

Different agrochemical compounds which have been developed to protect crops are now themselves causing significant morbidity and mortality this is mostly due to exposure to organophosphates, organochlorines and aluminium phosphide. Due to their high intrinsic toxicity, new chemicals of high potency and low mammalian toxicity with favorable persistence; continue to be developed to replace them e.g. imidacloprid, pendimethiline, pencycuron etc. Pancycuron and pendimethalin are such widely-used compounds which are supposed to exhibit least human toxicity which may present as headache, drowsiness, nausea, vomiting, etc. There is dearth of literature on their toxicities. Acute severe poisoning by them has not been reported till date.

Pencycuron is a urea derivative fungicide of low toxicity. It is recommended for different agricultural uses like seed treatment for potatoes[5]. and protection of sugar beet, vegetables, paddy crops, ornamentals etc. It is also recommended as a preventive application for Sheath Blight control - mostly targeting first round of application. Pancycuron is IPM friendly, reliable & give excellent results[6]. Pencycuron is not acutely toxic via the oral, dermal or inhalation routes; it does not irritate skin or eye, and is not a skin sensitiser[7]. It does not inhibit acetyl cholinesterase, also it is not a neurotoxicant but it is a respiratory tract irritant[8]. The target organ after repeated exposures (both subchronic and chronic) is the liver. On chronic exposure pencycuron is not mutagenic, and was not carcinogenic or teratogenic and did not induce birth defects in animal studies[5]. It is classified under group IV by US EPA Classification (formulation) and is considered - Not acutely toxic. According to WHO also, it is unlikely to present an acute hazard[8].

Pendimethalin ($C_{13}H_{19}N_3O_4$) is a dinitroanaline herbicide, freely available in India and widely-used for the control of annual grasses and certain broadleaf weeds in commercial crops[9]. Pendimethalin is a slightly toxic compound in EPA toxicity class III and is listed in the K1-group according to the HRAC classification and is approved in Europe, North America, South America, Africa, Asia and Oceania for different crops including cereals (wheat, barley, rye, triticale), corn, soybeans, rice, cotton, potato, tobacco, legumes, fruits, vegetables, nuts as well as lawns and ornamental plants. It is considered safe for humans and generally demonstrates low toxicity on ingestion and very low

toxicity if it is inhaled or gets on the skin. Only a few cases of its toxicity have been reported till date around the world, but not in India.

The clinical consequences and management of poisoning with such newer chemicals are not very well described. They are released to the market without appropriate data on direct human toxicity. Instead, human toxicity is often extrapolated from toxicological studies in animals, the relevance of which is poorly defined. On the basis of animal studies, they are classified as a "moderate toxic". Though they generally demonstrate low human lethality even in large ingestions but at times they may be hazardous as seen in present incidence.

Poisoning is a major problem throughout the world. In India the exact incidence of poisoning is not known due to lack of central registry but approximately it accounts for 10% of admissions in medical emergency. Poisoning is typically suicidal in nature which is ranked as third leading cause of death in age group 15-44 years. It was responsible for around 600,000 deaths in 1990s[10]. In the past 50 years suicide rates have increased by 60%[11] .

Over last few decades poison control training and research centers have been created globally to encounter this problem. These centers also focus on prevention of poisonings. But unfortunately there is a complete lack of such centers in rural regions where these are needed most. It is important for physicians to know about the manifestations of such newly emerging toxicities for their early detection and prompt management. The public must also be educated simultaneously.

Prevention:

In agrochemical poisoning, since death is rapid and survival after significant toxicity is rare, prevention is the logical option to reduce fatalities. The most effective way for prevention is to either ban or impose strict regulation on the sale of these compounds, but that is not feasible. Therefore, we have to promote various preventive measures like:

I. Prophylaxis:

a. Adequate washing facility should be available at time of application of these compounds.
b. Eating, drinking, smoking should be prohibited during and before washing after handling.
c. During their application, operator must be given efficient respiratory protection.
d. Wear synthetic rubber gloves, boots, light weight impervious clothes, apron, and suitable eye protective during their application and at the time of opening the container.
e. Always open the container in air.

II. Awareness and Education:

Farmers handling these chemicals must be made aware of their toxic and lethal aspects. They should demand the required amount of chemicals and should keep them away from the reach of children and other family members. They should be advised to properly dispose the empty containers after their use.

III. Advice to Concerned Authorities / Government Agencies:

Government Agencies should restrict the open sales of these chemicals. They should not be given to young persons and children without proper verification and confirmation. Dealers not following the Government instructions should be punished. The manufacturers should be advised to make small packs with suitable container. If possible they should be banned.

Conclusion:

Emergence of such entirely new poisoning by the so called non toxic compounds is a big challenge to community health especially in rural population. There clinical outcomes rely on early recognition, prompt referral and aggressive treatment in collaboration with different specialties. Awareness programs about such new toxicities should be implemented at different levels. This article illustrates that ingestion of these so called non toxic and safe compounds may also lead to significant toxicity which has not been reported earlier. The treating physicians should have a close watch and pay more attention to these patients.

The clinical consequences of poisoning with such relatively newer and nontoxic compounds are not very well described therefore such information / case reports are valuable for clinicians and concerned authorities and may help to save a number of precious lives.

Key message:

The exposure of so called non toxic compound should not be ignored as they may also lead to significant toxicity which has not been reported so far. The treating physicians should be vigilant and must have a close watch till full recovery of these patients.

Conflict of Interest: None declared.

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