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OLCOTT MEMORIAL ORATION 2008:

## Poisoning: A modern epidemic in Sri Lanka

by Professor Ravindra FERNANDO

**Professor Ravindra Fernando, Senior Professor of Forensic Medicine and Toxicology, University of Colombo, and the Founder Head of the National Poisons Information**

**Centre, National Hospital of Sri Lanka, delivered the Centenary Olcott Memorial Oration of the Old Boys' Association of Ananda College, Colombo.**



Toxicology is the science of poisons. It can also be defined as the discipline that integrates all scientific information to help preserve and protect health and the environment from the hazards presented by chemical and physical agents. Toxicology is certainly not a new science.

Early humans learned about the harmful properties of plants, insects, venomous snakes and chemicals through experience. Concerns about prevention and treatment of poisoning gradually emerged while antidotal activities of some substances were recognised.

The Ebers papyrus written between 1553 and 1550 BC in Egypt, contained a great deal of information on toxic substances including opium, aconite, lead and copper. The Sanskrit documents Rig Veda, written between 1500 and 1500 BC and 1200 BC and Ayurveda, written about 700 BC also mentioned poisons and antidotes.

In Sri Lanka, the first report on poisoning was published in a western medical journal in 1865. It was about the poisonous properties of *Calotropis gigantea* (Wara). Since then, poisoning with different plants and chemicals appeared in medical literature.

The first case of drug poisoning with reserpine or "Serpasil", an anti-hypersensitive drug was documented in 1955, while the first report of pesticide poisoning with parathion or "Folidol" was published in 1962.

Even in developed countries like the United States of America and the United Kingdom, healthcare professionals usually have little knowledge of what toxic ingredients are contained in various pesticides and household chemicals.

Although medical professionals are aware of toxic effects of some chemicals and adverse effects of drugs, their knowledge is limited regarding management when they are presented with patients with drug overdose, chemical accidents and envenomations with poisonous snakes.

This is why poison information centres were established in developed countries - to provide quick, accurate and tailor-made information on toxic ingredients of poisons, their chemical effects and complications, and management of patients presenting with poisoning.

The National Poisons Information Centre, the first such Centre in the South East Asia was established in 1988.

This was made possible from a project grant I received from the International Development Research Centre, Canada in 1986, and the technical support of the National Poison Unit, London and its staff. The cooperation of the International Programme of Chemical Safety, the joint venture of the ILO, WHO and the United Nations Environmental Programme was extremely useful.

The Centre provides information on any toxic natural or synthetic chemical substance, their nature and the management procedures to all doctors throughout the island, to all medical personnel. When requested, information is also provided to the public. The Centre holds awareness programmes on prevention of poisoning, first aid and safe use of



A deadly cobra

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chemicals publish educational material.

In 1988, when the Centre was established, the situation of poisoning is shown in table 1. Today the hospital admission of poisoning cases have increased by threefold.

**Table 1**  
**Hospital admissions and deaths**  
**from poisoning 1988**

	<b>Admissions</b>	<b>Deaths</b>
Pesticides	12,997	1,524
Drugs	3,331	47
Snake bites	6,843	156
Others	9,677	836
<b>TOTAL</b>	<b>32,848</b>	<b>2,563</b>

Incidence of poisoning, which was steadily increasing in the last few decades, reached a peak in 2006 with 97,367 admissions resulting in 1,797 deaths. These statistics are from State hospitals only. It has to be noted that no data were available from some districts in the North and the East, while even in other districts, all deaths and admissions were not analysed.

According to police statistics 2,787 committed suicide by taking poisons.

**Table 2**  
**Hospital admissions and deaths from**  
**poisoning 2006**

	<b>Admissions</b>	<b>Deaths</b>
Pesticides	18,760	1,242
Drugs	3,331	47
Snake bites	6,843	156
Others	9,677	836
<b>TOTAL</b>	<b>32,848</b>	<b>2,563</b>

In 2006 for example, the leading cause of hospital deaths was ischaemic heart disease or coronary heart disease. Poisoning was the sixth leading cause of death in State hospitals.

**Table 3**  
**Leading causes of hospital deaths 2006**

<b>Cause</b>	<b>Number</b>
1. Ischaemic heart disease	4,125
2. Pulmonary heart disease	3,276
3. Cancer	3,241
4. Respiratory disease	2,255
5. Gastrointestinal disease	2,255
6. Poisoning	1,797

Poisoning with therapeutic drugs, the major concern in developed countries in the West, is increasing in Sri Lanka.

Poisoning with chemical pesticides was not a health issue during the time of Colonel Olcott, an agricultural expert at the age of 26 years, who edited the book, "Outlines of the First Course of Yale Agricultural Lectures" and the agricultural editor of the New York tribune.

Today in many countries especially in the developing world, pesticides are the commonest toxic chemical substances causing poisoning. This is not surprising when one considers the fact that agriculture is the most important sector in Sri Lanka's economy, employing over half the labour force. Pesticides accounted for 18,760 admissions and 1,242 deaths in 2006.

Admissions from snake bites are also increasing. Others shown in this table include plants, industrial and household chemicals, cosmetics and substances abused.

Deaths from poisoning was the third leading cause of death in 1995. This has now gone down to the sixth place. The reason for this is clearly multifactorial.

Improved first aid and hospital management of poisoning cases is one reason. The

awareness campaigns, books and publicity material published by the National Poisoning Information Centre and information provided by the Centre in the last 20 years all helped the medical profession to manage cases of poisoning.

Banning of highly toxic pesticides such as the organophosphates 'monochrotophos', and 'methamidophos' and the organochlorine 'endosulfan' by the Registrar of Pesticides, on the suggestions made by the National Poisons Information Centre, is another reason. Endosulfan is a highly toxic insecticide that causes repeated untreatable fits causing death.

In 2006, the highest number of hospital admissions and deaths were recorded in Kurunegala district. There were 2,800 admissions and 160 deaths. There were 2003 admissions and 74 deaths in Anuradhapura district.

Although Colombo district had 142 deaths, the majority must have been transferred patients to the National Hospital, and Colombo South and Colombo North Teaching Hospitals.

When one compares the number of hospital admissions in 1988 and 2006, pesticide poisoning has shown an increase of almost 300 per cent. Poisoning with drugs increased by 678 per cent. Admissions for snake bite increased by 583 per cent. Poisoning with all the other substances, such as plants, mushrooms, household poisons and industrial chemicals increased by nearly 200 per cent.

Since the establishment of the National Poisons Information Centre, every enquiry received by the Centre was recorded on a standard call sheet.

The time, date, mode of enquiry, enquirer's name and location, details of the victim, toxic agent and quantity, route and circumstances of poisoning, symptoms and signs, treatment, investigations performed, adequacy and source of information provided to the requirer were documented. In cases of acute poisoning a follow-up call was made by the Centre within 48 hours, and if necessary later, to ascertain the outcome.

The National Poisons Information Centre (NPIC) has received 10,520 enquiries from 1988-2007. Over 90 per cent of enquiries were on management of poisoned patients.

Medical Officers, other helthcare personnel and many other categories of individuals contacted the Centre for information. Over 90 per cent of the enquirers were Medical Officers.

Others were paramedical personnel, members of public, and representatives of industrial and commercial organisations.

**Table 4**

<b>Toxic Agent</b>	<b>Number</b>	<b>%</b>
Drugs	2,338	22.2%
Industrial/ commercial products	1,460	13.9%
Household/leisure/ cosmetics	1,566	14.9%
Pesticides	3,226	30.7%
Agrochemicals other than pesticides	156	1.5%
Plants	676	6.4%
Snake bites	170	1.6%
Others	579	5.5%
Unknown	349	3.3%
<b>TOTAL</b>	<b>10,520</b>	

Analysis of agents responsible for poisoning showed that pesticides accounted for 31 per cent, the largest group. This is not surprising as I mentioned earlier, Sri Lanka has a very high incidence of pesticide poisoning and the numbers are increasing.

Although in State hospitals poisoning from drugs and therapeutic agents amounted to about 19.7 per cent of all cases of poisoning, 22 per cent of the calls to the Poisons Centre were for those.

Commonly used drugs such as paracetamol, salbutamol, phenobarbitone, antidiabetic and antihypertensive drugs and diazepam are responsible for many incidents.

Poisoning with drugs is now reaching alarming proportions in cities. Colombo district has recorded 2,642 cases of poisoning in 2006. Paracetamol is the commonest drug used for self-poisoning.

A couple of years ago a young lady was brought to hospital with paracetamol poisoning and the parents brought a bag containing 197 tablets. She had bought drug cards containing 360 paracetamol tablets and therefore we were certain that she took 163 tablets. She survived after treatment with expensive paracetamol antidotes.

The third group responsible for most number of calls was household and leisure products and cosmetics. I have seen poisoning with almost every household product and cosmetics.

Toilet disinfectants, detergents, dish washing liquids, mosquito repellants and coils, nail varnish removers, after shave solutions all have been taken deliberately or accidentally.

The fourth group responsible for poisoning is industrial and commercial products.

Plant poisoning accounted for 6.4 per cent of enquiries. In the last two decades Yellow Oleander (Kaneru) poisoning following suicidal attempts showed a marked increase.

The other plants responsible for poisoning included Gloriosa superb (Niyangala) and Adenia hondala. Enquiries were also received on haemolysis following ingestion of *Acalypha indica* (Kuppameniya) in patients who have a deficiency in the enzyme called G6PD.

There were a few enquiries on mushroom poisoning. Sri Lanka does not have mushrooms causing serious toxicity.

A few decades ago those living in rural agricultural districts did not believe that Western drugs are effective for snake bites. However, hospital admissions from envenomation from snake bites showed a tremendous increase mainly because of the public education campaigns and publications of the Health Education Bureau of the Ministry of Health and the Sri Lanka Medical Association.

There was an 86 per cent increase of hospital admissions from snake bites in the decade ending 2002. But enquiries to the NPIC on snake bites amounted to only about 2 per cent as many doctors are aware of the correct management of snake bite patients.

**Table 5**

**Hospital admissions and deaths from snake bites 1994-2006**

Year	Admissions	Deaths
1994	20,705	159
1995	25,912	190
1996	27,251	164
1997	28,582	141
1998	33,607	169
1999	32,303	181
2000	37,081	194
2001	38,705	144
2002	37,240	81
2003	36,740	92
2004	34,596	102
2005	36,727	134
2006	39,693	100

The 7 venomous snakes in Sri Lanka are cobra, russell's viper or Thith Polanga, Ceylon krait or Dunu Karawala, common krait or Thel Karawala also known as Maga Maruwa saw scaled viper or Veli Polanga, green pit viper or Pala Polanga, and humped nose viper or Kuna Katuwa. As shown in Table 6, age groups of patients showed that nearly one third were between 19 to 40 years while one fourth were between 19 to 25 years. This is entirely consistent with the pattern of poisoning in Sri Lanka where the youth are mostly the victims of suicidal poisoning.

**Table 6**

Age of patients	Number	%
0-5 years	2,117	20.1
6-12 years	648	6.2
13-18 years	1,171	11.1
19-25 years	2,269	21.6

26-40 years	1,534	14.6
41-60 years	914	8.7
over 60 years	229	2.2
Unknown	1,638	15.6
TOTAL	10,520	

Poisoning in children less than 13 years amounted to 26 per cent of enquiries. With changes in the socio-economic environment in many countries, the importance of childhood poisoning has been highlighted even at global level.

These facts on childhood poisoning highlight need for educational programmes for parents to keep toxic substances securely stored.

In most homes, especially those of low income groups, storage facilities may be inadequate both for household products as well as for medicinal agents and even for known toxic substances such as pesticides. As Joseph R. Christian, an American paediatrician stated, "The accidental death of a child is a dramatic and tragic result of someone's mistake".

Distribution of patients by circumstances of poisoning is shown in Table 7.

Distribution of patients by circumstances of poisoning is shown in Table 7.

**Table 7**

**Circumstances  
of poisoning**

	<b>Number</b>	<b>%</b>
Self poisoning	5,005	48.6
Accidental	3,716	35.3
Occupational	114	1.1
Homicidal	81	0.8
Others	351	3.3
Not recorded	1,253	12.0
TOTAL	10,520	

As I mentioned earlier, most of the enquiries, nearly 48.6 per cent were for suicidal poisonings.

This is consistent with the fact that Sri Lanka has one of the highest death rates from poisoning in the world.

Enquiries on occupational poisoning accounted for only 1 per cent while homicidal poisoning accounted for only 0.8 per cent.

Homicidal poisonings, though rare, are reported.

There were instances where patients have taken drugs to procure abortions. In one such case, an unmarried young girl, a university student, died of chloroquine poisoning, which she took to procure an abortion.

"Others" in this Table include (a) overdoses taken to relieve pain or to cause an abortion, (b) doctors have prescribed an overdose of a drug, (c) adverse reactions and toxic effects of prescribed Ayurvedic preparations, (d) eating preparation of curries and Kanjis using non edible plants, and (e) poisoning after taking meals such as manioc leaves and tubers.

Several publications of mine and the Centre either highlighted problems clinicians were facing in the management of poisoning or informed them of various aspects of poisoning such as symptoms, signs and clinical management.

Seminars, conferences and workshops have been held for different groups of healthcare professionals and non-medical personnel who can in turn disseminate knowledge on first aid and prevention of poisoning.

Among my publications intended to reduce morbidity and mortality from poisoning, the publication, "Management of Poisoning" is widely used by hospital doctors since 1991 as it provides information on all common toxic agents. Three further editions of this book were published in 1998, 2002 and 2007. They were sponsored by the World Health Organisation.

The effects of these publications are difficult to evaluate quantitatively. No one could determine how many lives were saved or serious toxicity was prevented by following advice or reading information given in these. The constant enquiries for copies of the publication are a source of encouragement. The book on "Management of Poisoning" for example is undoubtedly widely used. I have been informed that this publication is consulted 3 to 4 times a day in some hospitals.

To fulfil needs felt by many, I have commenced many courses related to toxicology. They are the multi-disciplinary Post Graduate Diploma in Toxicology in the University of Colombo, a Diploma on Substance Abuse Management (through the National Dangerous drugs Control Board) and a course leading to an MSc in Medical Toxicology in the Post Graduate Institute of Medicine, University of Colombo. Knowledge and skills learnt from these courses will help to reduce the modern epidemic of poisoning in Sri Lanka.

Recognising the gravity of the problem of pesticide poisoning the Presidential Task Force on Formulation of a National Health Policy suggested several measures in 1993. They include, ensuring the use of safety measures and protective equipment against accidents and pesticide poisoning through an appropriate pricing and distributing mechanism, introducing pesticide epidemiology and toxicology in the curricula of medical officers and public health inspectors to analyse, prevent and cure health problems caused by the use and abuse of pesticides and strengthening the National Poisons Information Centre.

Some of these measures can be used to prevent poisoning from other chemicals as well. One specific action that can be taken to reduce morbidity and mortality from poisoning is to improve the treatment facilities in State hospitals. Providing essential drugs and other equipment in hospitals and establishing more intensive care units in hospitals can reduce morbidity and mortality from poisoning which will increase further causing a tremendous burden to health services in the country. Poisoned patients will require expensive antidotes such as antivenom. They need treatment in intensive care units, which cost several thousand rupees per patient per day. The non-availability of laboratory facilities in Sri Lanka is costly.

Except a few private hospitals, the State hospitals have no facilities to analyse any poison. The recent melamine scare clearly showed that we had to rely on laboratories in India and Singapore to determine melamine levels in our milk powder, chocolate and biscuits.

The cost of poisoning to the health sector has not been properly assessed. Based on some studies the total financial cost to the health services to manage poisoning cases is a staggering 200 million rupees. This amounts to about .30 per cent of the total health budget. This is a very conservative estimate or perhaps a gross under-estimate. Unless urgent steps are taken to prevent poisoning and to manage patients efficiently the State will continue to spend a tremendous amount of money and valuable foreign exchange in the future. It is high time that the State and all other concerned parties take effective action to reduce the rising morbidity and mortality from poisoning - a modern epidemic.

I wish to conclude with a quote from Margaret Mead, a cultural anthropologist who said, "Never doubt that a small group of thoughtful, committed citizens can change the world: indeed, it's the only thing that ever does."

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