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Survey of pesticide poisoning in Sri Lanka

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This study included a sample survey of the clinical records of patients admitted to the different hospitals in Sri Lanka, and showed that approximately 13 000 patients are admitted to hospital annually for pesticide poisoning and that each year 1000 of them die. Suicidal attempts account for 73% of the total, and occupational and accidental poisoning accounts for 24.9%. It is recommended that urgent action be taken to minimize the extent of the problem.

Pesticides are important in developing countries and will continue to be so in agriculture and in public health. The human diseases controlled by pesticides are a particular problem of tropical regions. For example, it is estimated that some 150 million clinical cases of malaria occur annually in the developing countries, and schistosomiasis and filariasis each account for nearly 250 million cases each year. Pesticides are essential for the control of the vectors of all of these diseases.

In this context, it is important that the nature of health problems arising from the use of pesticides be studied. However, in many countries, particularly those of the developing world, there is a great lack of epidemiological data on the extent of the problem of pesticide poisoning. In reponse to this situation, in 1974 the World Health Organization requested Member States to provide information on the extent of pesticide poisoning in their countries. In fact, most of the countries have been unable to provide the necessary data (*1*).

Thus, most of the available data on the subject of pesticide poisoning pertain to the industrialized nations. These data indicate that acute pesticide poisoning has not been identified as an important problem in these countries (*2*, *3*). In 1973 it was estimated (*4*), on the basis of a mathematical model, that accidental poisoning by pesticides resulted in a global total of approximately 500 000 cases each year, with a mortality rate of 1% or possibly more in countries with limited therapeutic facilities.

The present study was undertaken to investigate the overall extent and characteristics of the problem of pesticide poisoning in Sri Lanka in order that appropriate action could be taken to minimize the problem. The data may give an indication of the morbidity and mortality of pesticide poisoning in other developing countries.

METHODS

Sri Lanka is a small densely populated country with an estimated population of 14 471 000 in 1979. The government is responsible for the provision of health services and the country is divided into 19 health service areas for administrative purposes. Each area has a large number of hospitals of different grades providing in-patient care. The largest hospitals are the ten general hospitals; a second category consists of the 14 base hospitals. There is no strict referral system and a patient is entitled to go to any hospital for care.

In the study, data on the number of patients admitted to government hospitals for pesticide poisoning were obtained from the central statistical unit of the Department of Health, and provided an overview of the extent of the problem. However, it was necessary to undertake a national sample survey in order to understand better the problem of pesticide poisoning in Sri Lanka.

The survey was undertaken between March and June 1981. This consisted of examining a random sample of the clinical records of patients discharged during 1979 with a diagnosis of pesticide poisoning from the 10 general hospitals and 5 of the 14 base hospitals. The target was to examine approximately 1000 clinical records — approximately 1 in 10 of all hospital admissions for pesticide poisoning. These records were studied by two of the authors (J. J. and R. S. De A. S.) and their colleagues from the Department of Community Medicine, Faculty of Medicine, Colombo.

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Table 1. Hospital admissions in Sri Lanka for pesticide poisoning

Year	No. of patients	No. of deaths
1975	14 653	938
1976	13 778	964
1977	13 648	1042
1978	14 699	982
1979	11 372	1045
1980	11 811	1112

Table 2. Analysis of cases of pesticide poisoning admitted to hospitals for the health areas with the three highest and three lowest incidence rates, 1979

Health district	No. of cases	Cases/ 100 000	No. of deaths	Case fatality rate
Three highest				
Batticaloa	1 131	367	60	5.3
Varuniya	458	216	43	9.4
Jaffna	1 635	200	112	6.9
Three lowest				
Ratnapura	122	16	61	50.0
Colombo	727	24	158	21.7
Kandy	327	25	32	9.9
Sri Lanka – total	11 372	79	1 045	9.2

RESULTS

The records of the Medical Statistical Unit, Department of Health, Sri Lanka show that in the period 1975 – 80 an average of approximately 13 000 patients were admitted annually to government hospitals for treatment of acute pesticide poisoning and that approximately 1000 of these patients died each year (Table 1). A more detailed analysis of the data for 1979 according to the distribution of patients in six different health service areas is shown in Table 2. The national morbidity rate for pesticide poisoning in 1979 was 79 cases/100 000 population, but some areas had rates far higher than the national average.

The results of the sample survey showed that males represented 72% of all cases of pesticide poisoning (Table 3). The age groups most concerned were

Table 3. Age and sex distribution of cases of pesticide poisoning admitted to hospitals in Sri Lanka, 1979

Age groups (years)	Males	Females	Sex not specified	Total	
				No.	%
0 – 10	2	3	–	5	0.5
11 – 20	199	119	–	318	30.8
21 – 30	368	117	–	485	46.9
31 – 60	138	39	–	177	17.1
61 – 70	10	6	–	16	1.5
> 70	8	1	–	9	0.9
Age not specified	20	2	2	24	2.3
Total	745	287	2	1034	100.0

Table 4. Causes of poisoning

	Males		Females		Sex not specified		Total	
Cause of poisoning	No.	%	No.	%	No.	%	No.	%
Suicide	494	66.3	260	90.6	2	0.2	756	73.1
Occupational	170	22.8	7	2.4	–	–	177	17.1
Accidental	64	8.6	16	5.6	–	–	80	7.7
No information	17	2.3	4	1.4	–	–	21	2.1
Total	745	100.0	287	100.0	2	–	1034	100.0

Table 5. Type of pesticide and case fatality rate

Type of pesticide	Cases		Deaths		Case fatality rate
	No.	%	No.	%	
Organophosphorus compounds	786	76.0	171	73.7	21.8
Organochlorine compounds	42	4.1	6	2.6	14.1
Carbamates	14	1.4	1	0.4	7.1
Organophosphorus and organochlorine compounds	21	2.0	7	3.0	33.3
Organophosphorus compounds and pyrethrins	3	0.3	nil	–	0.0
Pyrethrins	3	0.3	nil	–	0.0
No information	165	15.9	47	20.3	28.5
Total	1034	100.0	232	100.0	22.4

11 – 20 years and 21 – 30 years, these accounting for 77.7% of cases (Table 3). Poisoning was more frequent among males than females in the 31 – 60 years age group. Twenty-two clinical records did not indicate the age, while two clinical records did not indicate the sex of the patient.

Analysis of the cause of poisoning is shown in Table 4. The data show that suicide and occupational exposure were the two most common causes of poisoning, the former particularly among women. On the basis of these figures it can be estimated that 1046 deaths occurred in 1979 due to occupational and accidental exposure. The type of pesticide responsible for poisoning and the respective case fatality percentages are shown in Table 5. A relatively large proportion (15.9%) of the clinical records had no information as to the name or type of pesticide. The organophosphorus compounds were responsible for most (76%) of the poisonings. The case fatality rate was highest (33.3%) among patients poisoned by a mixture of organophosphorus and organochlorine compounds and was 28.5% in those patients for whom no information as regards type of pesticide was available. The overall case fatality rate in this series was 22.4%.

DISCUSSION

The only previous data showing a national morbidity rate as high as 79 cases/100 000 population were those published by Zegarski et al. (*5*) for Poland in 1968, although it is possible that in other predominantly agricultural countries of the Third World the figures will be equally high. In Sri Lanka in 1978, where over 1000 deaths were due to pesticide poisoning, there was a total of only 572 deaths due to poliomyelitis, diphtheria, tetanus, and whooping cough, and malaria did not result in a single death. In spite of the extent of the problem of pesticide poisoning, it has for a variety of reasons so far not been highlighted.

Analysis of the epidemiological data by health service area (Table 2) indicates a wide range in the morbidity rates in the different areas. Agriculture is the main occupation in the areas with the highest rates (Batticaloa, Varuniya, and Jaffna) where the cash crops (vegetables, tobacco, onions, and chillies) and paddy require extensive use of pesticides. Such areas clearly require urgent and priority action to minimize the extent of the problem. In contrast the areas with the lowest rates were those where agriculture is not a major occupation or where rubber or coconuts are the main crops.

The health service areas with high morbidity rates seem to have somewhat lower case fatality rates (Table 2), probably because the hospitals and staff in these areas are better equipped to manage the frequent cases of pesticide poisoning. The extremely high case fatality rate (50%) recorded for the Ratnapura area in 1979 is inexplicable, as the case fatality rates for the years 1978 and 1980, though higher than the national average, were well below that figure.

It was observed in the present study that suicides were the commonest cause of poisoning (73%) among both males and females. A similar pattern was also observed in Malaysia, where almost 82% of all cases of poisoning admitted to hospitals were attempted

suicides (*6*). In the present study, though 90.6% of poisoning among females were suicidal attempts, it cannot be interpreted that this indicates that females in Sri Lanka are more prone to suicide. In the study series, only 27.8% of poisonings were among females whereas nationally females constitute 48% of the total population (*7*). Senewiratne & Thambapillai have previously observed that suicides and suicide rates are in fact higher among males in Sri Lanka (*8*).

On the basis of the observation that 24.8% of cases (Table 4) in the sample surveyed were caused by occupational or accidental exposure to pesticides, it can be estimated that in 1979, 2820 patients were admitted to hospital for this reason. Assuming that all the occupational and accidental poisonings occurred among the 472 435 agricultural workers in Sri Lanka,[a] it would appear that 5/1000 of the agricultural workers are hospitalized annually for pesticide poisoning. However, this must be an under-representation of the true state of affairs for two reasons. Firstly, the rate refers to all agricultural workers, whereas the majority are plantation workers among whom poisoning by pesticide is relatively uncommon. Secondly, since the series refers only to poisonings that required hospitalization, the total number of poisoning episodes must be much greater than this figure.

The high mortality of cases due to mixtures of organophosphates and organochlorines is an indication of the therapeutic difficulties of managing patients poisoned with pesticide preparations containing such mixtures. The situation could be avoided if manufacturers were to agree not to market such mixtures of pesticides. The high case fatality rate of 28.5% recorded among patients whose clinical records did not show the type of pesticide indicates problems of therapy when full information is not available to the physician. The great variety of trade names of pesticides often creates problems for the physician, as he is unable to classify the pesticide and thus to institute appropriate therapy. To lessen this problem, Lionel (*9*) published a list of all pesticides available in Sri Lanka, indicating the class to which they belong.

The present study demonstrates the fact that the problems of acute pesticide poisoning in Sri Lanka and possibly also in other developing countries seem to be of greater severity than those in the developed nations. This difference implies that the approach of developing countries to the control of health-related problems due to pesticides must be different from that of the industrialized nations. Every effort must be made to reduce the number of cases of acute pesticide poisoning, leaving the developed countries to direct their scientific efforts to identifying unknown or long-term problems associated with pesticides.

Although 73.0% of the cases of pesticide poisoning in Sri Lanka were due to suicide, it must be conceded that the control of suicide is difficult and requires action related to the many aspects influencing its occurrence. In contrast, although the proportion of cases resulting from occupational or accidental causes was 24.8%, these could be considered more important since they are more readily preventable. For this, it is necessary that preventive measures be centred around educating users about safe practices in nationally relevant terms and that an effective national system of control of pesticides be developed. Such a programme must necessarily involve the ministries of health and agriculture, representatives of the workers, and the companies that manufacture and sell pesticides.

[a] *Employment survey — 1978.* Department of Labour, Government of Sri Lanka.

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RÉSUMÉ

ENQUÊTE SUR LES INTOXICATIONS PAR LES PESTICIDES À SRI LANKA

Environ 13 000 malades sont admis annuellement dans les hôpitaux à Sri Lanka pour le traitement d'intoxications aiguës par les pesticides et environ 1000 d'entre eux meurent chaque année. Pour l'année 1979, on a estimé la moyenne nationale à 79 cas pour 100 000 habitants, avec une mortalité de 9,2%. On a observé de grandes variations entre les

zones agricoles et les autres, les premières comptant le nombre le plus élevé de cas, soit 367 pour 100 000 habitants. Les plus atteints étaient les hommes (72%). De tous les cas, 24,8% résultaient d'accidents professionnels ou fortuits, tandis que 73,0% étaient dus à des suicides. Les composés organophosphorés représentaient le type de pesticides le plus couramment responsable d'intoxications, étant impliqué dans 786 cas sur 1034 examinés. La mortalité était la plus élevée pour les pesticides contenant un mélange de composés organophosphorés et organochlorés.

Etant donné qu'une large proportion des intoxications était de caractère professionnel ou accidentel, il est recommandé qu'une action préventive soit prise immédiatement pour réduire l'échelle du problème.

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