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Pattern of poisoning in a developing agricultural country

B. SENEWIRATNE AND SHANTHI THAMBIPILLAI

Department of Medicine, University of Ceylon, Peradeniya, Ceylon, and Clinical Research Unit, General Hospital, Kandy, Ceylon

SUMMARY

Four hundred and seventy-two cases of poisoning were seen over a two-year period in Kandy, Ceylon. The overall mortality was 23·7%. The pattern of poisoning was different from that in western countries in that 49·8% of the cases were due to insecticide poisoning and only 10·7% were due to drugs, including barbiturates. Insecticides accounted for 73·2% and drugs for only 4·5% of the 112 fatal cases. Of the fatal cases 51·7% were between the ages of 20 and 40 years and only 6·2% were over 50 years. The wastage of economically useful lives indicates the need for a poison centre.

INTRODUCTION

The causes, pattern, and result of poisoning in a particular community depend on a variety of factors such as the easy availability of a particular poison, the sophistication of the populace, the stress of the environment, and the standard of emergency medical care.

The new and easy availability of agricultural chemicals, especially in developing countries, and the lack of sophistication of the populace may result in a pattern of poisoning which is different from that seen in western countries. Although several extensive studies on poisoning have been done in the west (Schmidt, O'Neal, and Robins, 1954; Ettlinger and Flordh, 1955; Kessel, 1965) and in sophisticated agricultural countries with a western background, such as Australia (Boxall and Chauvel, 1966), there have been few studies in developing agricultural countries. Such studies would be of considerable interest for several reasons. These chemicals, some of which are highly lethal and whose sale cannot be effectively controlled, are found in many village homes. The people exposed to these chemicals, because of their lack of education, are often unaware of their extreme potency. In addition, special units to deal with cases of poisoning are lacking in these countries.

This study was done because of the general impression that a number of young people in Ceylon were losing their lives, often after suicidal gestures, and that agricultural poisons such as insecticides were largely responsible for this. It was hoped that a survey of the problem would help to assess the need for a special poison centre and to determine what preventive steps should be taken to decrease the incidence of poisoning and its attendant mortality.

THE PRESENT STUDY

A retrospective study was done of all the cases of poisoning admitted over a two-year period (1970 and 1971) to the General Hospital, Kandy. This teaching hospital with about 2,000 patients is the second largest hospital in Ceylon and serves a population of about 900,000. Although there are several smaller hospitals in this area, almost all cases of poisoning are promptly transferred to this hospital.

As it was a retrospective study, detailed information concerning the social and psychiatric states of the patients was not available. All cases of poisoning admitted to this hospital, whether accidental, suicidal or homicidal, are reported to the Judicial Medical Officer. A scrutiny of his records was made in order to trace the hospital records.

RESULTS

TOTAL NUMBERS

All cases of poisoning, however mild, were admitted to hospital. Of the 472 cases of poisoning admitted to hospital during the two-year period, 387 (82·0%) were due to acts of self-poisoning, which constitute the major problem in poisoning. This includes suicides, attempted suicides, and suicidal gestures. In 85 (18·0%) the poisoning was accidental. There were no cases of homicide due to poisoning.

MORTALITY

The overall mortality was 112 (23·7%), resulting in an average loss of two lives per week in this area.

Of the 387 cases of self-poisoning, 103 (26·6%) died. This was significantly higher ($\chi^2 = 10{\cdot}05$, $P < 0{\cdot}005$) than the nine fatalities among 85 (10·6%) patients who took poison accidentally.

Mode of Poisoning

The poisons taken in 472 cases of self-poisoning and accidental poisoning are shown in Table I.

TABLE I
MODE OF POISONING IN 472 CASES

Poison	Self-poisoning (387 cases)		Accidental Poisoning (85 Cases)		All Cases (472 cases)	
	No.	%	No.	%	No.	%
Insecticides ..	175	45·2	24	28·2	199	42·2
Kerosene oil ..	27	7·0	14	16·5	41	8·7
Rat poison ..	21	5·4	4	4·7	25	5·3
Barbiturates ..	21	5·4	4	4·7	25	5·3
Other drugs ..	14	3·6	9	10·6	23	4·9
Acetic acid ..	10	2·6	1	1·2	11	2·3
Gloriosa superba	8	2·1	3	3·5	11	2·3
Miscellaneous	43	11·1	18	21·2	61	12·9
Unknown ..	68	17·6	8	9·4	76	16·1

Twenty-two cases for which the hospital records could not be traced and information regarding the type of poison taken was not available have been included in the 'unknown' group.

The most common poison taken was an insecticide, which was responsible for 45·2% of the cases of self-poisoning, 28·2% of cases of accidental poisoning, and 42·2% of all cases of poisoning. Drugs including barbiturates accounted for only 10·2% of all cases of poisoning. Acetic acid, which is used for the coagulation of rubber, accounted for 2·3%. Kerosene oil (paraffin) was taken frequently (8·7%) but caused no deaths. The other poison of interest is the tuber of *Gloriosa superba* (2·3%), which is also taken as an abortifacient.

Insecticides were the major cause of mortality, accounting for 66·1% of the 112 fatal cases (Table II). Unidentified poisons (11·5%) and acetic acid (6·3%) were the other major causes of death. Agricultural chemicals (insecticides and acetic acid) accounted for 72·4% of deaths while drugs, including barbiturates, accounted for only 4·5% of these fatal cases.

TABLE II
MODE OF POISONING IN 112 FATAL CASES

Poison	Number	Percentage
Insecticides	74	66·1
Acetic acid	7	6·2
Rat poison	4	3·6
Gloriosa superba	4	3·6
Barbiturates	3	2·7
Other drugs	2	1·8
Miscellaneous	5	4·4
Unknown	13	11·6

Potency of Insecticides

Of the 199 people who took insecticides either accidentally of intentionally, 74 (37·2%) died.

The time of ingestion of the poison could be ascertained in 34 fatal cases of insecticide poisoning. In 16 (47·0%) the time between ingestion and death was less then 2½ hours.

Age and Sex

Figures 1 and 2 show the age and sex specific rates in 284 cases of attempted suicide and 103 cases of suicide. The rates in both attempted

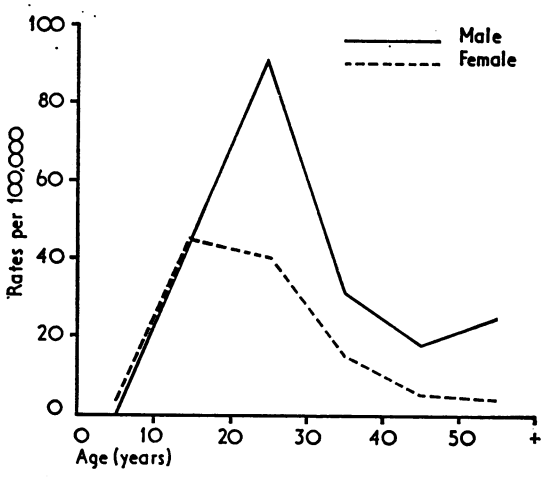

FIG. 1. Age-sex specific rates in 284 cases of attempted suicide.

FIG. 2. Age-sex specific rates in 103 cases of suicide.

suicide and suicides were higher in the males. The peak incidence in both males and females was between the ages of 10 and 30 years.

Of the 112 fatal cases, 58 (51·7%) were between the ages of 20 and 40, indicating a wastage of 'economically important lives'. Only seven cases (6·2%) were over the age of 60 years. Figure 3 shows the age-sex specific rates in the 85 cases of accidental poisoning.

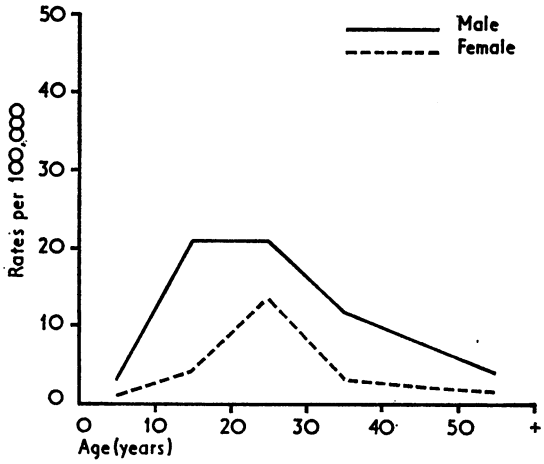

FIG. 3. Age-sex specific rates in 85 cases of accidental poisoning.

RACE

There are four major races in Ceylon. Of a total population of 12·7 million, the Sinhalese, who are the majority race, constitute 71·9%, Tamils 20·5%, Muslims 7·0%, and the Burghers, who are descendants of Dutch and Portugese settlers, constitute only 0·3%.

The racial composition of the study area, which is almost identical with that of the island as a whole, and the racial incidence of poisoning are shown in Table III. There was a significantly higher percentage of Sinhalese and a lower percentage of Tamils and Muslims who took poison.

STATE OF CONSCIOUSNESS

Of the cases of poisoning admitted 59·0% were conscious at the time of admission and almost all of them survived. When first seen in hospital 25·8% of cases were unconscious and 85·0% of them died, indicating that unconsciousness on admission carries a grave prognosis in this hospital.

In the remaining 15·2%, the state of consciousness had not been recorded.

TIME OF ADMISSION

The 'official' working hours of this hospital are from 8 am to 12 noon, and 3 pm to 5 pm. The admissions were found to be higher during non-working hours when the consultant staff was not immediately available and the house staff had left the wards.

Of the 472 admissions, 336 (71·2%) were admitted during 'non-working hours'. However, the mortality rate of those admitted during non-working hours (22·9%) was not significantly different from the mortality rate of 25·0% of the 136 patients admitted during working hours.

DURATION OF STAY IN HOSPITAL

The average duration of stay is important from the point of view of organizing and running a poison unit. The mean duration of stay was three days, including the day of admission and day of discharge.

FOLLOW-UP

None of the 472 cases was referred to a psychiatrist either during their stay in hospital or subsequently.

DISCUSSION

The occurrence of 472 cases of poisoning in a single hospital over a period of two years, with a mortality of 23·7%, emphasizes the seriousness of the problem of poisoning in this country. As the hospital serves about 900,000 people, the annual rate of poisoning is 26·2 per 100,000 of the population

TABLE III
RACIAL COMPOSITION OF 472 CASES OF POISONING

Race	Racial Composition of Area % (N=932,069)	Racial Composition of Cases of Poisoning (%)		
		Self-poisoning (N=387)	Accidental Poisoning (N=85)	All Cases (N=472)
Sinhalese	71·3	85·2	83·5	85·0*
Tamils	19·4	10·1	11·7	10·4*
Muslims	8·9	4·6	3·5	4·4*
Burghers	0·2	0·0	1·1	0·2

* Significantly ($P < 0·01$) different from racial composition of area

There are striking differences in the pattern of poisoning between the more sophisticated western countries and a developing agricultural country such as Ceylon. The vast majority of cases of poisoning in western countries are due to drugs, mainly barbiturates (Myschetzky, 1964; Kessel, 1965). In Ceylon only 9·6% of cases were due to drugs. Here the place of barbiturates is taken by agricultural chemicals (mainly insecticides) which accounted for 49·8% of all cases of poisoning and for 72·4% of the fatal cases.

In this country insecticides are widely used in numerous small home gardens as well as in the cultivation of vegetables, rice, and tobacco. These insecticides consist of two main groups of chemicals, the organophosphates and the halogenated hydrocarbons. The halogenated hydrocarbons constitute a greater risk because of the absence of antidotes, such as pralidoxime and atropine, which are effective against organophosphates.

Acetic acid, which is used in the coagulation of rubber, is another important agricultural poison which accounted for 2·3% of all cases of poisoning and for 6·2% of the fatal cases.

The potency of some of these poisons and the rapidity of death after their ingestion are shown by the fact that of 199 people who took insecticides, 74 (34·1%) died, and in 47 death occurred within 2½ hours of ingestion of the poison. It is doubtful whether their potency is known to the general public in this country. It is well established (Lennard-Jones and Asher, 1959; Kessel, 1965) that the majority of those who indulge in acts of self-poisoning had no intention of killing themselves. A lack of knowledge of the potency of these insecticides may have led to an unintended tragedy.

Kessel (1965) in Scotland and Swinscow (1951) in Britain found a female preponderance of attempted suicide under the age of 40. However, in Ceylon there is a male preponderence in this age group in both suicides and attempted suicides. This could be a reflection of a greater sense of family responsibility in the females of the eastern races.

There was a higher incidence of self-poisoning among the Sinhalese than among the Tamils. Straus and Straus (1953), in their study of suicide in Ceylon, found that there was a higher rate of suicide among the Tamils and thought that this was due to the tightness of the social structure among the Tamils. Our findings do not support this suggestion.

In this series, only 6·2% of cases of self-poisoning were over the age of 50 years. This is in contrast to the findings in England (Strauss, 1956) where an appreciable proportion of the patients admitted after a serious suicidal attempt were old people who regarded themselves as 'useless mouths to feed'.

Kessel (1965) and Stengel and Cook (1958) rightly advocate that cases of self-poisoning should be seen by a psychiatrist early, preferably while the patient is in hospital. It is of interest that none of our cases was referred to a psychiatrist. This is partly due to the lack of realization of the value of psychiatric help and, possibly, to the difficulty in arranging for a psychiatric consultation during the patient's short (3 days) stay in hospital. This can be overcome by having a psychiatrist attached to a special poison unit, as is done in most western countries. The alternative, which is the referral of the patient to a psychiatric clinic, has been shown to be unsuccessful (James, Derham, and Scott-Orr, 1963).

Poison units have been set up in several western countries (Myschetzky, 1964; Matthew, Proudfoot, Brown, and Aitken, 1969) which have resulted in a drastic reduction in the mortality from poisoning. In the Copenhagen Poison Centre there was a fall in mortality from 23% to 2% over 15 years (Myschetzky, 1964). This centre, which had only nine beds, handled 800 unconscious patients per year. The cost of setting up such a unit would be relatively low compared with the cost of the loss of young and useful lives. In this hospital alone about two lives per week are lost due to poisoning. Most of these deaths are among young adults between the ages of 20 and 40 years. This is an important reason for setting up poison units in this country as the vast majority of people who take poison are young adults indulging in an act, often as a demonstration, and taking a poison whose potency they are unaware of and whose sale cannot be effectively controlled.

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