Poisoning : An Unnatural Cause of Morbidity and Mortality in Rural India

AK Batra*, AN Keoliya**, GU Jadhav***

Abstract

Background: Ninety-nine percent of fatal poisonings occur in developing countries, particularly among agricultural workers. In a particular area, it is important to known the magnitude and pattern of acute poisonings, as it is important for early diagnosis and treatment and also for preventive measures.

Methods: Hospital records of all unnatural causes of deaths were reviewed at Shri Vasantrao Naik Government Medical College, Yavatmal, Maharashtra during the five years period, 1997-2001. Autopsy records in fatal poisonings were studied for age, sex, residence, marital status, type of poison and manner of poisoning (accidental, suicidal or homicidal). Admission and death rates of acute poisonings were compared with those from other unnatural causes.

Results: Acute poisoning is the leading cause of unnatural deaths and third common cause of emergency hospitalizations in this rural part of India. Of all fatal cases, 67% were males, 63% married, 83% with rural residence and 63.4% suicides. Responsible poison could not be ascertained in 16% of clinical and 9.9% of fatal cases. Insecticides were responsible for 35% of clinical and 55.4% of fatal cases.

Conclusions: Young married males of rural background with agricultural occupation and failure of monsoon are the risk factors associated with poisoning cases.

INTRODUCTION

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 occur in all regions and countries and affect people in all age and income group. According to WHO (1999)3 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. Pattern of poisoning in any region also depends on availability of poisons, religious and cultural influences, occupation prevalent in the region and likewise. The monsoon dependent agricultural practice and socioeconomic factors related to it play role in the incidence of acute poisonings.

A detailed knowledge about the nature and magnitude of the poisoning cases in a particular area is not only important for early diagnosis and prompt treatment but also is essential for introducing the new and evaluating the old preventive measures. Against this background, the present study was undertaken to know the nature, pattern and magnitude of the morbidity and mortality due to poisonings in this rural health district of Yavatmal of the State of Maharashtra, over the period of five years 1997-2001 (including).

MATERIAL AND METHODS

Yavatmal is a rural district with population of 2,077,144 as per 1991 census spreaded in an area of 13,582 sq kms. The present retrospective study was conducted by Departments of Forensic Medicine and General Medicine of Shri VN Government Medical College, Yavatmal for period of five years from 1st January 1997 to 31st December 2001. The casualty and indoor patient records were studied for information regarding total hospital admissions with number of patients cured, expired or absconded, for all leading unnatural causes of morbidity and mortality. With special reference to the admitted poisoning cases, information about exact poison whether known or not, and if known, the type of poison responsible for toxicity was noted. The mortality

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and autopsy records in fatal poisoning cases were studied for information about age, sex, residence, marital status and type of poison responsible. Manner of poisoning, whether suicidal, accidental or homicidal was confirmed from accompanying police records. The exact types of poisons responsible in fatal cases were confirmed by crosschecking with chemical analyzer’s report whenever possible. In all 1211 poisoning death cases were studied in which medicolegal autopsies were performed. The Medical College, where the present study was conducted, is a referral center for whole of the district and most of the cases are referred here from rural areas and about 60% of total medicolegal work done across the district is performed here. The Medical College center though a tertiary care center, is situated in rural area and only 17% of the cases are from urban areas of the district in this current study.

RESULTS

All leading unnatural causes of morbidity (in the form of emergency hospitalization) and mortality are distributed as in Table 1, which also shows the admission and mortality rates per year per 100,000 populations for each studied unnatural cause. Poisoning is third leading cause with admission rate of 68.12 per year per 100,000 populations, after assault and RTA injuries. The mortality rate per year per 100,000 population for poisoning cases is 19.43 and it tops the list of all unnatural causes. In other way also, the overall mortality associated with the admitted cases is highest for poisonings (28.5%). It clearly places “poisonings” as the most leading unnatural cause of rural burden of the morbidity and mortality in India. Total poisoning deaths over the span of five years were 1211 with annual average of over 242 deaths and range from 192 deaths in year 1998 to 346 deaths in year 2001. Fig. 1 gives the age and sex-wise distribution of all poisoning cases. The most affected age group is 21-30 years in both sexes with 28.4% deaths. Second and third most affected groups are 31-40 and 41-50 years with 25% and 18% deaths respectively. The extremes of ages below 10 years and above 61 years are the least affected ages.

In the present study male poisoning deaths are observed more than twice the female deaths with male to female ratio of 1:0.49, which is maintained more or less same in all age groups. Married persons (both sexes combined) outnumber the unmarried persons and constitute for over 62% deaths. In 6.2% people, their exact marital status could not be known. Fig. 2 shows a sharp rise in the deaths due to poisonings in two rainy or “monsoon” months of August and September, each accounting for more than 12.5% of total deaths and 25.18% of all poisoning deaths, when taken together.

The study about the status of exact poison responsible whether identified or not, in both admitted and fatal cases revealed that in over 16% admissions (680 cases), the exact poison responsible for toxicity could not be confirmed from history and clinical presentation. Of these cases, in 120 cases, it could not be ascertained even after death, including by chemical analysis of the viscera and/or blood. Table 2 shows distribution of all admitted and fatal poisoning cases according to the poison responsible for the toxicity. Organophosphorus group of insecticides leads both, total number of hospital admissions (23%) and total number of deaths (43.4%). Alcohol is the second common poison responsible for 21.5% of admissions and 25.9% of deaths. Organochloride insecticide group is responsible for about 12% of admissions as well as fatalities. Next accountable poisons in the rank are kerosene, zinc phosphide, vegetable poisons and medicinal drugs. Miscellaneous group (Table 2) accountable for 8.1% admissions and 2.5% deaths comprise.

Table 1: Leading unnatural causes of morbidity and mortality over a period of five years, 1997-2001

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Leading unnatural cause</th>
<th>No. of hospital admissions</th>
<th>No. of deaths</th>
<th>No. of cures</th>
<th>No. of absconded or DAMA*</th>
<th>Admission rate per year per 100,000</th>
<th>Mortality rate per year per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RTA</td>
<td>15034 (3007)</td>
<td>0565 (113)</td>
<td>12664 (361)</td>
<td>1805 (361)</td>
<td>241.26</td>
<td>09.06</td>
</tr>
<tr>
<td>2</td>
<td>Assault</td>
<td>10549 (2110)</td>
<td>0066 (13)</td>
<td>10489 (2098)</td>
<td>10 (02)</td>
<td>169.28</td>
<td>01.05</td>
</tr>
<tr>
<td>3</td>
<td>Poisoning</td>
<td>4245 (849)</td>
<td>1211 (242)</td>
<td>2694 (539)</td>
<td>340 (68)</td>
<td>068.12</td>
<td>19.43</td>
</tr>
<tr>
<td>4</td>
<td>Burns</td>
<td>2433 (487)</td>
<td>0942 (188)</td>
<td>1479 (296)</td>
<td>12 (02)</td>
<td>039.04</td>
<td>15.11</td>
</tr>
<tr>
<td>5</td>
<td>Other accidents</td>
<td>2094 (419)</td>
<td>0064 (13)</td>
<td>1829 (366)</td>
<td>201 (40)</td>
<td>033.60</td>
<td>01.02</td>
</tr>
<tr>
<td>6</td>
<td>Snake and other bites</td>
<td>2065 (413)</td>
<td>0125 (25)</td>
<td>1931 (386)</td>
<td>09 (02)</td>
<td>033.13</td>
<td>02.01</td>
</tr>
<tr>
<td>7</td>
<td>Miscellaneous</td>
<td>1624 (325)</td>
<td>0331 (66)</td>
<td>1200 (240)</td>
<td>93 (19)</td>
<td>026.06</td>
<td>05.31</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>38044 (7609)</td>
<td>3304 (661)</td>
<td>32286 (6457)</td>
<td>2470 (494)</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Figures in parenthesis are annual averages; *DAMA comprises of a group of patients who got themselves “Discharged against medical
Death rates for all other unnatural causes show variations, both positive and negative, over a period of five years, the poisoning death rate is on a constant rise every year from 1998 (15.4) to 2001 (27.8), which means that the share of poisoning deaths in all unnatural deaths and in all suicidal deaths is on a constant rise, year by year in this rural health district.

Discussion

Poisoning caused about 30% of all medicolegal deaths (1211/4042) in the region over the period of five years. A study from Rohtak, Haryana too reported 26.6% of all medico-legal deaths to be due to poisoning.\(^3\) Poisoning has share of about 37% in all unnatural deaths which is far higher than that of metro area of Delhi (10%).\(^4,5\)

In that study,\(^4\) more than 42% of total poisoning deaths occurred in one month only due to a tragedy following the unknowing consumption of spurious alcohol (Sura) by the victims. In a study at Singapore, which has two monsoon seasons, the peaks for Indian suicides were noted in April, September and November.\(^6\) In current study, these peaks are noted in midmonsoon months of August and September, probably due to socioeconomical reasons like monsoon-dependent cultivation practice, agriculture-based economy, crop failures, exorbitant rates of interest and indebtedness to private usuries, financial crisis, hunger, denied minimum wages and increased work and labour pressure in rainy season which lead to constant anxiety coupled with an easy availability of insecticidal poisons, as it is purchased and kept at farms and houses for use when the agricultural activities are at its peak.

Mortality rate for poisoning deaths in various studies\(^1,7-11\) is reported between 11% to 34%, which is 28.5% (1211/4245) in the present study. Male deaths more than twice the female deaths are also reported in other studies.\(^1,3,7-11\) This male preponderance may be attributed to the reason that males are more exposed to stress and strain associated with monsoon dependent cultivation practice, agriculture-based economy, crop failures, exorbitant rates of interest and indebtedness to private usuries, financial crisis, hunger, denied minimum wages and increased work and labour pressure in rainy season which lead to constant anxiety coupled with an easy availability of insecticidal poisons, as it is purchased and kept at forms and houses for use when the agricultural activities are at its peak.

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### Table 2: Distribution of all poisoning cases in relation to poison responsible

<table>
<thead>
<tr>
<th>Type of poison</th>
<th>No. of fatalities</th>
<th>No. of clinical cases (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organophosphorus insecticides</td>
<td>526 (43.43)</td>
<td>977 (23.01)</td>
<td>1211</td>
</tr>
<tr>
<td>Organochloro insecticides</td>
<td>145 (11.97)</td>
<td>510 (12.01)</td>
<td>655</td>
</tr>
<tr>
<td>Alcohol</td>
<td>314 (25.93)</td>
<td>913 (21.05)</td>
<td>1227</td>
</tr>
<tr>
<td>Kerosene</td>
<td>030 (02.48)</td>
<td>428 (10.08)</td>
<td>458</td>
</tr>
<tr>
<td>Zinc phosphide</td>
<td>018 (01.49)</td>
<td>178 (04.19)</td>
<td>206</td>
</tr>
<tr>
<td>Vegetable origin</td>
<td>018 (01.49)</td>
<td>140 (03.29)</td>
<td>158</td>
</tr>
<tr>
<td>Medicinal drugs</td>
<td>009 (00.75)</td>
<td>072 (01.69)</td>
<td>81</td>
</tr>
<tr>
<td>Unknown</td>
<td>120 (99.90)</td>
<td>680 (16.01)</td>
<td>800</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>031 (02.56)</td>
<td>347 (08.17)</td>
<td>378</td>
</tr>
<tr>
<td>Total</td>
<td>1211</td>
<td>4245</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 2: Monthwise distribution of fatal poisoning cases over five years, 1997-2001

Distribution of fatal poisoning cases (n=1211) according to manner of death, viz. suicidal, accidental and homicidal, reveals no homicidal poisoning case in this region. Sixty-three percent of all poisoning deaths are due to suicides. Poisoning is the most preferred method of committing suicide in males (74.8%) and second most in females (33.8%) after burns (60.3%). Suicide rate for the region, for all causes combined, is 22.2 per year per 100,000 population and by poisoning alone is around 12.3 per year per 100,000 population. When both sexes combined, poisoning is the most leading method of committing suicide adopted by 55.4% victims. Accidental poisoning is responsible for 36.6% of all deaths due to poisoning. Involvement of rural population in fatal poisonings comprise of 83% of all poisoning deaths. Seventeen percent of the deceased belonged to urban areas. The higher death ratio in rural population (83%) and highest deaths by insecticides (55.4%) is the striking feature of this analysis.

Annual rate of death per 100,000 population due to poisoning (19.4) is far high than other unnatural causes like burns, RTA injuries, drowning, snakebites and assaults. While death rates for all other unnatural causes show variations, both positive and negative, over a period of five years, the poisoning death rate is on a constant rise every year from 1998 (15.4) to 2001 (27.8), which means that the share of poisoning deaths in all unnatural deaths and in all suicidal deaths is on a constant rise, year by year in this rural health district.
Poisoning has been regarded as a leading cause of death in rural and agricultural areas across the world. According to WHO; 99% of fatal poisonings out of annual 251,881 occur in developing countries and particularly among agricultural workers. Like in present study, in most of the other studies done in rural parts of Asia, organophosphorus insecticidal poisons were most commonly responsible agents for toxicity in poisoning cases. In some of the studies conducted at urban places, aluminium phosphide was reported as commonest poison followed by organophosphorus compounds. In India, opium and arsenic were very commonly used poisons in the past, but with the change of time, commonest cause of poisonings in India and other developing countries is pesticides, the reasons being agriculture based economy, poverty and easy availability of highly toxic pesticides.

Another social factor, which seems related to poisonings in rural parts, is the marital status of the victim. The present study shows that over 62% of the victims of fatal poisonings were married ones, which is almost similar to a report from another rural area. The reasons for such a predisposition may be related to marital conflicts, sterility or more issues and more financial responsibilities on the shoulders of the victim.

The constantly rising poisoning hospitalizations and the death rate as well, in the present study as per indoor Governmental Hospital statistics, do not include the poisoning cases admitted, treated and cured at private hospitals. Also the medical College where the current study was undertaken will be considered as a qualified tertiary care center even though situated in a rural area. Hence, it is highly likely that many poisoning cases would not have come up here, especially the minor poisoning cases. Hence the present study many not truly represent the epidemiology, still these morbidity and mortality statistics are useful indicators not only in this evaluation and research in this rural area, but also indicate the success and failure of various interventions for prevention of poisonings in the area. Apart from 15.4 deaths and 68.2 hospitalizations per year per 100,000 populations and subsequent hospital stay, poisonings are known to have the after effects in the patient and the relatives. These effects may be reflected not only in the mental and physical health of the victim but also in the legal social, familial and occupational health of the society at large. The traces (of these effects) may be noticed in livings long after actually suffering the toxicity, as those (of the poison) can be noticed long after the death in arsenic and other metallic poisoning cases.

From the study, it may be concluded that male sex, young age, married status, rainy season and rural residence (mostly with low socio-economic class) are the risk factors for poisoning with positive correlation. More importantly, poisoning is the preventable non-random event and developing effective poisoning prevention strategies can effectively reduce its impact on the health of the general rural population. It is a high time to evaluate the old and to introduce the new and latest effective preventive measures. Especially, the incidence of insecticidal poisoning can be reduced by strict control of sales, distribution and storage by mass awareness and suitable legislation. Further, developing satisfactory interpersonal relationship through proper scientific counseling can check the high incidence of poisoning in young and married population by the way of effectively tackling the social, marital and psychological problems. Poison information centers should be set up apart from first aid facilities and manpower provisions at PHC level, as immediate treatment can help in saving the lives in many cases. Apart from medical efforts, social efforts in the form of Governmental, NGO and other social group’s help through sincere and severe work at many levels like economy, poverty, agriculture, irrigation and markets is the need of the hour. The fundamental dictum being “prevention is better than cure”, most of the poisoning deaths can be and should be prevented or at least reduced by drastic and combined efforts of all concerned.

Acknowledgements

We are thankful to Dr AC Mohanty, Dean, Terna Medical College, Nerul, New Bombay - 76; Dr AP Dongre, Professor of Forensic Medicine and Dr Bansode, Professor of Medicine, Shri VNGMC; Yavatmal, MS.

REFERENCES

12. Samaria JK, et al. Study of different poisonings in nearby Nagpur district as well.1


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Announcement

The Association of Physicians of India

Orotations:

Suggestions are invited from members of the Association of Physicians of India for the following assignments so as to reach Dr. Sandhya Kamath, Hon. General Secretary, not later than 10th December, 2003.

Ranbaxy Oration - 2005
Hoechst Senior Lectureship - 2005

There are no prescribed nomination/application forms for the above orations but, persons are selected from the recommendations received from members of the Association. The recommendations for the above assignments must be accompanied with reasons for recommending a particular person showing the value of his/her research and 8 copies each of three of his/her publications. All papers in connection with the suggestions such as the bio-data, list of publications etc., should be submitted in 8 sets by the proposer. The recipient of the above oration should deliver a lecture pertaining to his/her work at the Annual Conference of API in January 2005.

The completed application form for the above assignment should reach to Dr. Sandhya Kamath, Hon. General Secretary of API,  Laud Mansion, 3rd Floor, 21 Maharshi Karve Road, Opp. Charni Road (East), Mumbai - 400 004, not later than 10th December, 2003.

Those who have already been conferred an Oration/Lectureship are not eligible to apply for the same category.

The members of the Governing Body of API and the members of the Faculty Council of ICP are not eligible to receive any Oration/Lectureship/Award.

Sd/-
Sandhya Kamath
Hon. General Secretary

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Announcement

Silver Jubilee APGCON

The Annual Conference of the Association of Physicians of Gujarat (APGCON) will be held at Bhavnagar on 27th and 28th Dec. 2003.

For registration and details kindly contact: Dr. Deepak Gupta, Organizing Secretary, Silver Jubilee APGCON. Conference Secretariat: Dr. Deepak Gupta, D-2/24 Govt. Qtrs. Panwadi, Bhavnagar, Gujarat.

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