

Original Article

# Organophosphorus Compound as Suicidal Poison in Rural Areas of Bangladesh: A Medicolegal Study

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## Abstract

**Background:** Suicide by poisoning is a major public health problem in Bangladesh and other developing countries in the world. Among the poisonous substances, Organophosphorus compounds (OPC) poisoning is more common. Easy accessibility of the poison is the number one reason for the preference of OPCs as suicidal agents. **Objective:** This study was designed to find out demographic characteristics and postmortem findings related to suicide by OPC poisoning in Manikganj. **Methodology:** This retrospective cross-sectional study was carried out during January, 2019 to December, 2020 in the district hospital, Manikganj, Bangladesh. **Results:** During the study period, a total of 381 medico-legal autopsy have been done- among them, 83 (21.78%) cases were death due to OPC poisoning. Maximum (24, 28.91%) deaths were between ages of 21-30 years, among them majority were males (49, 59.03%). People of different occupations were involved in OPC poisoning- maximum of them were housewives (27, 32.53%), followed by agricultural workers (13, 15.66%). Regarding motive of poisoning, the most common was suicidal intent (58, 69.88%) among both males (22, 37.93%) and females (36, 62.07%), followed by accidental (25, 30.12%). About one third of the cases were illiterate (26, 31.33%). Financial constraint was the main cause of suicide. **Conclusion:** OPC poisoning is a burning problem in our health sector. Improvement of awareness, elimination of unemployment, financial stability, limiting availability and banning more toxic compounds would reduce the OPC poisoning rate to a considerable number.

**Key Words:** Organophosphorus compounds; suicidal poisoning; rural Bangladesh

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## Introduction

Bangladesh is an agriculture-based developing country. The rural population of this country earns their livelihood mainly through agricultural sector. Over time, pesticides are now routinely used for modern farming practices, and suicides by pesticide have also increased due to their easy availability.<sup>1</sup> It is not only in the developing countries, but is a global public health problem. The World Health Organization (WHO) estimates that approximately

250,000 deaths worldwide are caused by poisoning each year, of which 150,000 are caused by pesticides alone.<sup>2,3</sup> The United States Environmental Protection Agency estimates that 3,000 people are hospitalized each year for pesticide poisoning with mortality rate of 50% in the paediatric age group and 10% in adults.<sup>4</sup> Currently, self-poisoning by pesticide has become a major clinical problem in developing countries.<sup>5</sup>

The mortality rate for self-poisoning in developing countries is estimated to be 10-20%, but for organophosphorus compound (OPC), it may be as high as 50-70%.<sup>6,7</sup> The OPCs are used for various purposes like Insecticides, Pesticides, Herbicides, Rodenticides, Fungicides etc.<sup>8</sup> They are introduced by inhalation and readily absorbed through intact skin, mucous membranes and the gastrointestinal tract.<sup>9</sup> Fruits and vegetables are also the sources of poisoning and agricultural workers are the most vulnerable for accidental poisoning while working.<sup>10</sup> For easy availability and being cheaper than other sophisticated agents, OPCs are the most popular suicidal agents used in developing countries.<sup>6</sup> Hence, there is an urgent need for government to save the farmers by enacting Farmer Protection Act like crop insurance schemes, value added pricing of agricultural commodities, free contract of pesticides as well as antidotes are made available.<sup>11</sup>

However, the purpose of this study was to know the incidence of death due to OPC poisoning among the rural people of Manikganj district.

### Methodology

This retrospective cross-sectional study was conducted during January, 2019 and December, 2020 at District Hospital, Manikganj. A total of 381 medicolegal autopsies were conducted during that period of which 83 deaths were due to Organophosphorus compound (OPC) poisoning. Pertinent data like age, sex, occupation, socio-demographic status, educational qualification and motive of poisoning had been collected from inquest report, register book and history from relatives of the deceased persons. All autopsies had been conducted at Manikganj district hospital.

The ethical clearance was approved by proper authority. Data were analyzed using descriptive statistics and presented with appropriate tables.

Statistical analysis was performed by using window-based computer software devised with Statistical Packages for Social Sciences with 95% confidence limit.

### Results

Among 381 medico-legal autopsies conducted during the study period, 83 (21.78%) deaths were due to organophosphorus compound (OPC) poisoning. In terms of

sex, majority (49, 59.04%) of the victims were males and others remaining were female (34, 40.96%). (Table 01)

Table I: Sex wise distribution of autopsy cases of Organophosphorous poisoning (n=83)

Sex	Frequency	Percentage
Male	49	59.04
Female	34	40.96
Total	83	100.00

Regarding the age groups, the highest risk was observed in 21-30 years with total 24 (28.92%) cases and the lowest in 61 years and above (06, 7.23%). (Table II)

Table II: Age wise distribution of autopsy cases (n=83)

Age Group (in years)	Frequency	Percentage
0-10	04	4.82
11-20	11	13.25
21-30	24	28.92
31-40	19	22.89
41-50	11	13.25
51-60	08	9.64
61 and above	06	7.23
<b>Total</b>	<b>83</b>	<b>100.00</b>

Regarding the age groups, the highest risk was observed in 21-30 years with total 24 (28.92%) cases and the lowest in 61 years and above (06, 7.23%). (Table II)

Table III: Occupation wise distribution (n=83)

Occupational status	Frequency	Percentage
Agricultural workers	13	15.67
Students	13	15.66
Housewives	27	32.53
Businessmen	13	15.66
Drivers	04	4.82
Service holders	06	7.23
Others	07	8.43
<b>Total</b>	<b>83</b>	<b>100.00</b>

Regarding motive of poisoning, suicidal intent (58, 69.88%) was more common than accidental one (25, 30.12%). Both modes of poisoning were found more common among females (suicidal 36/58, 62.07% vs 22/58, 37.93% and accidental (14/25, 56.00% vs 11/25, 44.00%) (Table IV)

Table IV: Motive of victims for poisoning

Manner	Male	Female	Total
Suicidal	22 (37.93%)	36 (62.07%)	58 (69.88%)
Accidental	11 (44.00%)	14 (56.00%)	25 (30.12%)
<b>Total</b>	<b>33 (39.76%)</b>	<b>50 (60.24%)</b>	<b>83 (100.00%)</b>

Considering educational status, it was observed in about one third of the victims (26, 31.32%) were illiterate, followed by graduation-completed youths (25, 30.12%). (Table V)

Table V: Education wise distribution of victims (n=83)

Educational status	Frequency	Percentage
Illiterate	26	31.32
Primary	10	12.05
Secondary and Higher Secondary	22	26.51
Graduate	25	30.12
<b>Total</b>	<b>83</b>	<b>100.00</b>

## Discussion

In this study, males show dominance over females (49, 59.04% vs 34, 40.96%). Similar studies had been conducted by Ahamed et al,<sup>12</sup> Faiz and Hasan,<sup>13</sup> and Karim et al,<sup>14</sup> showing male majorities. Prevalence of poisoning was high among males in the present study, because the organophosphorous compound (OPC) were readily available and most of the agricultural workers were exposed to OPC as well as they had changes in their lifestyle and cultural patterns.

Regarding age of the victims of OPC poisoning in this study, the highest cases were from young adults, aged between 21-30 years (24, 28.92%). Similar results have been found in many other studies. Ahmed et al found the highest rate of poisoning (88.3%) among 10-30 years of age.<sup>12</sup> Faiz and Hasan found in their study that 76% of victims were within the age group 11-30 years.<sup>13</sup> The incidence of poisoning was minimum below 10 years and it was mostly due to accidental.

By occupation, maximum victims were housewives (27/83, 32.53%), followed by agricultural workers (15.67%) and students (15.66%). These results are like those of OPC poisoning patients studied at Chittagong Medical College Hospital, where 25.8% were housewives, 14.0% farmers and 16.1% students.<sup>15</sup>

Bangladesh is an agriculture-dependent country, and the main occupation of people in rural areas is agriculture. So, OPCs are used as an insecticides, pesticides and fungicides more in rural areas than the urban areas. The cause of high occurrences among the housewives and agricultural workers was due to easily availability of the OPC. Due to lack of proper knowledge, many farmers were accidentally poisoned while working in the field.

In this study, motives of poisoning were suicidal in 69.88% cases and accidental in 30.00% cases. Another study conducted by Sarkar et al found that 92.2% of the cases were suicidal and 7.8% accidental.<sup>16</sup>

Regarding educational status, OPC poisoning was the highest among illiterates and graduates. Ahmed et al also found highest prevalence of OPC poisoning among illiterate group (53.2%).<sup>12</sup> Illiteracy is a major problem in coping with the adverse situations.

The study has some limitations. Chemical analysis could not confirm the identity of the pesticide used. Carbamate compounds poisoning has similar clinical features to OPCs poisoning. The study was conducted in selected area, so this study may not reflect the actual situation of the country of Bangladesh. Many had incomplete inquest reports and the postmortem findings were not clear in many cases.

## Conclusion

Above study reveals that in rural areas of Bangladesh, organophosphorus compound (OPC) poisoning was very common. Poisoning cases were observed mainly among the young population with a predominance of men from lower socio-economic classes. Housewives, agricultural workers, and students were the commonest victims due to cheap and easy accessibility of the OPCs. Maximum of the motives behind the poisoning were suicide. Illiteracy, poverty, overcrowding, limited sources of employment, family pressure, failure in love, failure in examinations were the common reasons behind poisoning. Proper emphasis should also be placed on the safe use of pesticides to avoid accidental poisoning. Farmers should be properly trained in the use of pesticides.

**Conflict of Interest:** None declared.

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