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Epidemiology of Fatal Poisoning from Organophosphorus Compounds in Rangpur District, Bangladesh

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ABSTRACT: ***Background:*** Organophosphorus compounds poisoning is a major public health problem in low- & middle-income countries. The WHO estimates that three million cases of pesticide poisoning occurred world-wide annually with 2,20,000 deaths, the majority international. In Bangladesh OPC is used for suicidal purpose in rural area due to its cheapness, toxicity & availability. ***Objective:*** The aim of this study was to estimate the prevalence of area, incidence of age and sex, marital status of victim in case of death due to organophosphorus poisoning. ***Methods:*** It was a retrospective study of all medico-legal autopsies performed between Oct.2005 to Jan. 2007, at mortuary of Rangpur Medical College, based on history and preliminaries of the deceased. ***Results:*** Out of total 282 medicolegal autopsies were performed during this study period, 60(21%) were death due to organophosphorus poisoning. Most of the victim were female 31(52%) while male was 29(48%) in number. Prevalence of organophosphorus poisoning was more in Mithapukur area 17(28%) in number and according to age group the maximum incidence of poisoning was observed in 21-30 yrs (38%). Acute poisoning was observed more in married group (80%) than unmarried group (20%). ***Conclusion:*** Organophosphorus poisoning is an important health care problem in our country. Improved awareness, restricting availability and taking preventive methods may reduce mortality and morbidity due to organophosphorus poisoning.

Keywords: Organophosphorus Compound, Age, Sex, Poisoning.

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INTRODUCTION

Bangladesh is a developing country of South Asia. Rural area of this country is mostly dependent on agricultural cultivations. With the advance of time, pesticides are, now a days routinely used for modern cultivation methods. These are readily available as over the counter (OTC) drugs in village shops and act as a common method of suicide attempt and less commonly accidental poisoning.[1] Based on tests controlled, pesticides include insecticides, herbicides, acaricides, fungicides, rodenticides etc.[2] Until 2013 ;2894 different types of pesticides are approved in Bangladesh.[3] Organophosphate compounds are the most frequently reported pesticides used for poisoning in Bangladesh.[4-6] Industrialized countries are also affected by it, where a significant proportion of suicidal death are caused by pesticide ingestion.[7, 8] During 19th century organophosphates were first synthesized as chemical curiosities. In 1920 German chemist Gerhard Schrader started research for insecticides. By 1939, German Armed Forces stockpiled huge amount of Schrader's insecticides (Tabun) for using as Military nerve agents. At the same time Allies stockpiled DDT (Dichloro-diphenyl-trichloroethane), imported covertly from German chemical industry. The use of DDT substantially reduced the rate of morbidity from arthropod borne diseases and stopped epidemic of typhus in Naples in 1944. But at the same time, the indiscriminate use of DDT caused dramatic drop in bird population. Also, pesticide accumulated in marine species, turning them into poisonous food for human consumption. Hence gradually the use of organochlorine has been replaced by organophosphorus compounds.

Nowadays OPC are used as ship drips, military nerve agents, pour-Ons in cattle farms, preservatives for crop and store grains, domestically

as fly strips, wood worn preservatives, pet flea preparation and treatment of human arthropod infestation (malathion) etc.[9, 10] The organophosphate compounds are most associated with serious human toxicity, accounting for more than 80% of pesticides related to hospitalizations.[11] Organophosphorus pesticide exposure occurs through inhalation, ingestion and dermal contact because organophosphorus pesticides disintegrate quickly in air and light. OPC causes poisoning by inhibition of the enzyme cholinesterase with subsequent accumulation of acetylcholine and symptoms relating to overactive cholinergic action. Death is caused by paralysis of respiratory muscles, respiratory arrest due to failure of respiratory center or intense bronchoconstriction's. Poisoning can be in any nature-accidental, homicidal, suicidal or self-inflicted. In the vast rural area of Bangladesh OPC are commonly used as suicidal poison due to easy availability as insecticides, whereas it is rare in urban area.[12] In Indian OPC intake is the commonest method of suicide (40.5%) after hanging (49%).[13] Accidental poisoning can occur in children, insane, intoxicated, manufacturers, packers, sprayers, users and due to contamination of food grains with insecticides preserved for seedling purposes. Poisoning also occurs from fruits and vegetables.[14] Homicidal poisoning by OPC usually does not occur, since the smell of the subject used as diluent (aromax) of the poison and due to alarming signs and symptoms which appear rather early. Due to ease of detection, homicide by poisoning is now relatively rare in advanced countries. But it is more common in developing countries where public awareness and availability of diagnostic method is less. In China and South- east Asia pesticides account for about 300000 suicides each here.[15] In Sri-Lanka incidence of suicide due to poisoning was more than 80% followed by hanging, which is constituted 10.7%.[16] Whole cover the world acute poisoning is a very common medico-social problem. The agents vary from country to country depending on easy availability of poisoning, socio-economic conditions and educational background of the people. In Bangladesh, acute poisoning is an important cause of mortality and morbidity. Mortality rate from 4%-38% in Indian studies. World Health Organization (WHO) and several other studies have estimated that organophosphorus pesticides were responsible for mortality of self-attempted deaths in the developing world.

METHODS

This retrospective study was conducted in Rangpur Medical College from Oct. 2005 to Jan. 2007. Total 282 autopsies were committed by Asst. Prof. Dr. Md. Abdus Samad, Head of the Department of Forensic Medicine, Rangpur Medical College, during this period. Out of them 60 cases (21%) had died because of OPC poisoning. The 60 cases were meticulously studied by considering various parameters like preliminaries of the deceased, history, place of incidence and postmortem findings etc. All information regarding study has been picked up from the department register book.

Observations and Results

After observation, collected data were analyzed by using SPSS software version 16.0. The results were presented in the forms of table and chart. Incidence of organophosphorus poisoning death was 60 (21%) of total 282 autopsies in the present study (Table 1).

Table 1: Incidence of Opc Poisoning Deaths

Total number of autopsies	282
Number of OPC poisoning deaths	60
Percentage	21%

The majority of the victim were females 31 (52%) while males were 29 (48%) in number (Table 2). Male and Female ration found to be 1:1.07.

Table 2: Incidence of Sex:

Sex	**Number of cases**	**Percentage**
Male	29	48%
Female	31	52%
Total	**60**	**100%**

Table 3 shows that, according to the age group, the maximum incidence of poisoning was found 21-30 yrs (38%) which gradually decreases and at a minimum more than 50 yrs.

Table 3: Incidence of Age:

Age group(yrs)	Number of cases	Percentage
11-20	19	32%
21-30	23	38%
31-40	09	15%
41-50	07	12%
51-60	02	03%
Total	**60**	**100%**

In figure 1 shows distribution of OPC poisoning cases according to marital status where 80% were married and 20% were unmarried.

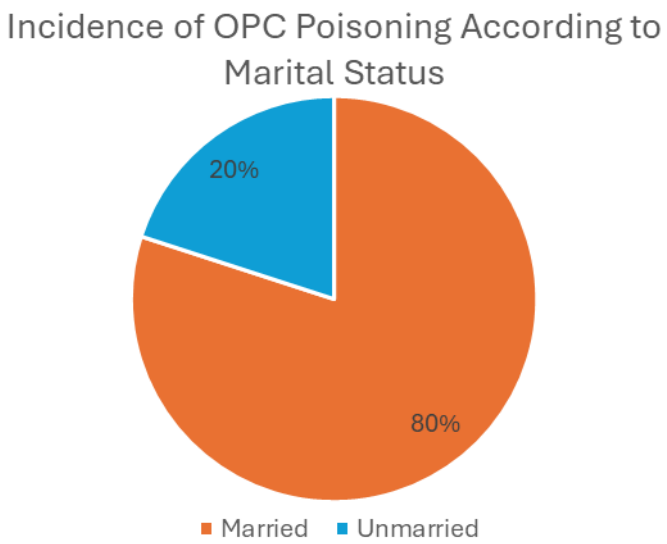

Figure 1: Incidence of OPC Poisoning According to Marital Status

Table 4 shows that prevalence of OPC poisoning among the Upazila of Rangpur district, more in Mithapukur 17(28%) in number, gradually the prevalence was decreased in the other Upazila. We also noticed that most of the victims came from rural areas.

Table 4: Prevalence of OPC Poisoning:

Area	Number of cases	Percentage
Mithapukur	17	28%
Pirganj	12	20%
Pirgacha	10	17%
Badarganj	07	12%
Rangpur Sadar	05	08%
Kaunia	04	07%
Gangachara	03	05%
Taraganj	02	03%
Total	**60**	**100%**

DISCUSSION

In Bangladesh poisoning is an important health problem causing around 2000 deaths per year.[17] Organophosphate pesticides are one of the top causes of poisoning worldwide with an annual incidence of poisoning among agricultural workers varying from 3-10% per country.[18] A study has shown that, mortality rate with acute poisoning was 16.4% mainly due to organophosphorus compound. However, poisoning is the commonest from of self-poisoning in rural Asia, accounting for over 60% of all deaths and is of for greater importance than hanging and other physical forms of self-harm.[19-21] A recent survey in Bangladesh showed that 14% of all deaths (3971 of 28, 998) of women between 10 and 50 years of age were due to self-poisoning, the majority with pesticides.[22] The problem is particularly severe in Sri-Lanka.[23] where pesticides poisoning was the commonest cause of hospital death in 6 rural districts during 1995.[24] In many countries the wide spread availability of acutely toxic pesticides used in agriculture has made selection of pesticides as the agents of choice for self-harm well known to both health care workers and public health authorities.[25-27] The International Agency for Research on Cancer (IARC), found that organophosphates may possibly increase cancer risk.[28] Prenatal exposure has been linked to impaired fetal growth and development. Mental disturbance, infertility, GIT disturbance, Liver and Kidney failure etc are the harmful effects of insecticides to human body. In Western countries every vegetable is checked for Maximum Residual Limit (MRL) of insecticides but not followed in Bangladesh.

A study performs by Islam and Islam at Sir Salimullah Medical College from January 1993 to December 1997.[29] A total 2534 medico-legal autopsy cases were carried out during this period and 273 deaths by poisoning. OPC poisoning was the most common one, 37.7%. In the study of Rahman *et al*. from July 2005 to May 2006 showed that death due to OPC poisoning were 28%.[30] From the previous study we observe that the death due to OPC poisoning gradually reduced year by year due to may be social awareness and consciousness. Another study at Dhamrai Thana Health Complex perform from January 1993 to December 1997 showed that males 61.30% were predominant than females 38.70% in poisoning cases. In a study of Khan *et al*. total 67 cases were selected as study population. Among the cases 38 (57%) were male and 29 (43%) were female.[31] Majority victims were male which is like the findings of Ahmed *et al*.[32] in the study of Faiz *et al.* and Karim *et al.*but in our study in Rangpur district, death occurs predominantly in female than male. This may be due to variation from place to place, racial to racial.

Nowadays young adult patients 21-30 yrs suffer from OPC poisoning. Faiz *et al.* (33), in their study report it among 11-30 yrs of age group 76%. Ahmed *et al.* and khan *et al.* showed highest incidence of OPC poisoning among 10-30 yrs of age 88.3%. And in the study of Isalm *et al.* indicate the highest victim also the age group 16-35 yrs of age.[33-36] Our findings are like the findings of others. Another study of Md. Hasib-Ul-Haque Sunny *et al.* at Rajshahi Medical College, total 1290 medico legal autopsy cases were carried out during this period, out of which 359 were death due to OPC poisoning.[37] In this study female 232 (64.62%) is slightly higher than male 127(35.37%) and the maximum incidence of age group found among 21-30 yrs (41.50%) which is similar to our study. In our study we also found that, in Rangpur district most of the OPC poisoning cases came from Mithapukur upazila 17 (28%) while the death was decreased in the other upazila and most of the victims were from rural area. As Bangladesh is an aerobated country, suicide by agrochemical compounds is increasing day by day in this country. Poverty, less sources of work, familial disharmony, frustration, gaining attention or gate revenge, failure to love, affairs are the notifiable reasons for taking poison. Mental illness or chronic illness sometimes proposed for a background of poisoning. During our study we found those causes were the motives behind poisoning. Measures like restricting availability and banning more toxic organophosphorus compounds may help to reduce the incidence of OPC poisoning related to mortality. By increasing facilities of chemical identification of poisoning cases, availability of more effective and specific treatment, awareness and education may decrease the fatality of OPC poisoning.

CONCLUTION

Organophosphorus poisoning in a country like Bangladesh is not only a public health problem but also related to economies and culture. There is great need to enhance stress on prevention of poisoning. A co-ordinated and comprehensive response is needed to make an impact. Prompt recognition and aggressive treatment of acute

intoxication are essential in order to minimize the morbidity and mortality from these potentially lethal compounds. In future, the ministry of agriculture of developing countries especially Bangladesh, should concentrate on the optimization and monitoring of usage of organophosphorus compounds as pesticides and furthermore encouraging the farmers to use natural pesticides rather than chemical pesticides.

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