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Pattern of Pesticide and Herbicide Poisoning Among People Admitted to Medicine Wards of a Tertiary Care Hospital

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Abstract

Introduction:*Acute poisoning has become a major public health problem accounting for significant morbidity and mortality around the globe[2]. According to WHO data, an estimated 193,460 people died worldwide in 2012 from unintentional acute poisoning. 84% of these deaths occurred in resource-lacking low- and middle income countries[3]. The toxicity of accessible poisons and the scarcity of adequate medical facilities for poisoning management is responsible for a such a high mortality rate in this region[4]. Acute pesticide poisoning usually occurs during agricultural use either by accidental exposure or by suicidal attempt, rarely as homicidal[2,5&8]. This study is designed to assess the patterns of pesticide & herbicide poisoning among rural & urban peoples admitted to medicine ward of a tertiary level hospital and to find out the sociodemographic characteristics of the respondents. So that the supply of these agents be properly regulated to prevent easy accessibility and misuse.* ***Materials and Methods:*** It was a hospital based cross-sectional observational study conducted at indoor Department of Medicine, Chittagong Medical College Hospital for six months period from 01/01/2019 to 31/06/2019. Ethical clearance was taken from ethical review committee of Chittagong Medical College and informed consent was obtained from each participants. Hundred patients above 12 years of age with a relevant history and clinical signs and symptoms of any type of pesticides and herbicides poisoning who fulfilled the selection criteria were selected consecutively for the study. Data was collected using a pretested, multi-structured questionnaire which comprised of questions to identify demographic data, type and circumstances of poisoning. ***Results:****Regarding motive of poisoning in our study 81% patient took pesticide & herbicide poisoning for suicide and 19% admitted with accidental case. This result is consistent with the study where most common reason of pesticide & herbicide poisoning was suicide (93.3%) [20]. A study performed at Rajshahi Medical College from January 1991 to December 1994 showed that out of those 405 cases of OPC poisoning 310 were suicidal (76.54%) and 95 were homicidal (23.45%) poisoning[28]. The present study revealed that factors responsible for the suicidal attempt were familial disharmony in 46% of cases, marital problems in 19%, financial problem in 16%, mental disorder in 3% and 11% due to other reasons. Shadequl-Islam et al. reported the motive of pesticide poisoning in their study that 45% of cases were due to familial disharmony, 15% unknown, 13.3% depression, 8.3% marital problems, 5% financial problems and 13.3% due to other reasons[26]. In most cases, the patient could access to the poison by self-purchasing from poison retailers.* ***Conclusion:*** *This study has indicated that young adults, males and socially underprivileged people are at a higher risk of pesticides and herbicides poisoning. This study showed pesticides & herbicides poisoning is the most common modes of suicidal deaths. Pesticides are mostly misused purposefully as an easy means for committing suicide. Early diagnosis and treatment is mandatory in order to minimize mortality from these potentially lethal compounds. It is recommended that the supply of pesticides be properly regulated to prevent easy accessibility and misuse.*

Key words: Pattern, Pesticide, Herbicide, Poisoning.

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Introduction:

Death is the inevitable outcome of human life but unnatura[1] deaths whether suicidal, accidental or homicidal, causes a terrible waste of valuable human life and resources[1]. Acute poisoning has become a major public health problem accounting for significant

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morbidity and mortality around the globe[2]. According to WHO data, an estimated 193,460 people died worldwide in 2012 from unintentional acute poisoning. 84% of these deaths occurred in resource-lacking low- and middle-income countries[3]. Mortality due to self-poisoning is very low (0.5%-1%) in most industrialized countries while in the developing world, the rate is high (10%-20%). The toxicity of accessible poisons and the scarcity of adequate medical facilities for poisoning management is responsible for a such a high mortality rate in this region[4]. This is reflected by the fact that acute poisoning by various modalities, amount to a massive 300,000 deaths each year in the Asia Pacific region5. Much of this burden is borne by developing countries where more than 80% of cases are fatal pesticide poisoning related hospitalization[3]. Bangladesh is a developing tropical country in the South East Asia having seventy percent of its population dependent on agriculture directly or indirectly. In Bangladesh poisoning is an important health problem causing around 2000 deaths per year[7]. Acute pesticide poisoning usually occurs during agricultural use either by accidental exposure or by suicidal attempt, rarely as homicidal[2,5&8]. Pesticides are very easily available here having been used in agriculture, industries and for domestic purposes;[8] but these are extensively used in the agricultural field for the better outcome of cultivation[9]. But due to lack of training facilities to farmers, they spray excessive amount of harmful chemicals without taking any protective measures[10]. The consequences of the overuse of insecticides lead to ecological imbalance and environmental pollution. The poisoning agents differ regionally depending on easy availability of poisons, socio-economic condition status, educational level, awareness of our people. In tropical countries organophosphorus compounds are the commonly used agent[6].There is also increasing use of herbicides in agriculture for weeding control. Though most of the herbicides are less toxic but some are highly toxic (e.g. Paraquat). This study is designed to assess the patterns of pesticide & herbicide poisoning among rural & urban peoples admitted to medicine ward of a tertiary level hospital and to find out the socio-demographic characteristics of the respondents. So that the supply of these agents be properly regulated to prevent easy accessibility and misuse.

Materials and Methods:

It was a hospital based cross-sectional observational study conducted at indoor Department of Medicine, Chittagong Medical College Hospital for six months period from 01/01/2019 to 31/06/2019. Ethical clearance was taken from ethical review committee of Chittagong Medical College and informed consent was obtained from each participants. Hundred patients above 12 years of age with a relevant history and clinical signs and symptoms of any type of pesticides and herbicides poisoning who fulfilled the selection criteria were selected consecutively for the study. If pesticide poisoning is doubtful and patient not willing to participate are excluded from the study. Data was collected using a pretested, multi-structured questionnaire which comprised of questions to identify demographic data, type and circumstances of poisoning. Data was recorded, collected, organized and analyzed according to prescribed proforma.

Procedure of data analysis:

After collection of all the data, these were checked, verified for consistency and tabulated using the SPSS/PC 21 software. Statistical significance is set as 95% confidence level at 5% acceptable error level. Data were presented as proportion for discrete variables and as means±SD and/or medians with interquartile ranges for continuous variables. Differences in baseline characteristics was compared using both the student t-test and the Pearson chi square test. A p value of <0.05 was considered significant.

Ethical Implication:

Patients (subjects) and key relatives were clearly informed about the scope and limitations of the study. Informed written consent was obtained from the patients (subjects). Confidentiality of the patients (subjects) about personal information was strictly maintained. The study did no hazard to environment.

Result:

Table I: Demographic characteristics of the study subjects (n=100)

Age	Number	Percentage (%)
10-19 years	29	29.0
20-29 years	36	36.0
30-39 years	23	23.0
40-49 years	6	6.0
≥50 years	6	6.0
Sex		
Male	68	68.0
Female	32	32.0
Place of residence		
Urban	36	36.0
Rural	64	64.0
Occupation		
Govt. Employee	11	11.0
Non govt. employee	9	9.0
Business	17	17.0
House wife	26	26.0
Unemployed	28	28.0
Others	21	21.0

Age	Number	Percentage (%)
Educational qualification		
Illiterate	36	36.0
Below SSC	27	27.0
SSC	22	22.0
HSC	11	11.0
Graduate and above	4	4.0
Marital status		
Unmarried	33	31.0
Married	58	58.0
Separated	5	5.0
Divorced	2	2.0
Widow	1	1.0
Monthly family income		
<10000 taka	47	47.0
10000 to 20000 taka	34	34.0
20000-40000 taka	18	18.0
>40000 taka	12	12.

Most of the patients 36% were between 20-29 years followed by 29% from 10-19 years and 23% belongs to age group 30-39 years. Among these, 68% were male and 32% were female patients. Maximum number of poisoning patients was from rural area. Most of the patients were un employed and housewife. Majority of the patients are illiterate and below SSC level. Out of 100 patients 76% had monthly family income less than 10000 taka.

Table II: Patient status when coming to the hospital (n=100).

	Frequency	Percent
Conscious	82	82.0
Unconscious	18	18.0
Total	100	100.0

Most of patients 82% were conscious and 18% were unconscious.

Table III: Type of pesticide use (n=100).

	Frequency	Percent
Pesticides	89	89.0
Herbicides	11	11.0
Total	100	100.0

In majority of cases 89% were poisoning with pesticides and 11% were herbicides.

Table IV: Pattern of pesticide poisoning

	Frequency	Percent
Suicidal	81	81.0
Accidental	19	19.0
Total	100	100.0

Majority (81%) cases of poisoning were suicidal and 19% were accidental poisoning.

Table V: Factors responsible for this suicidal attempt (n=100)

	Frequency	Percent
Family disharmony	46	46.0
Marital disharmony	19	19.0
Unknown	5	5.0
Mental disorder	3	13.0
Financial problem	16	16.0
Others	11	11.0
Total	100	100.0

In majority of cases 46% were due to familial disharmony followed by marital problems and financial problems in 19%, 16% respectively.

Discussion:

Pesticide & herbicide poisoning is a common method of suicide attempt and less commonly accidental poisoning in Bangladesh. This study reflects that young peoples from 10 to 39 years are commonly affected 88% by pesticide & herbicide poisoning. Cha et al. reported 76% of OPC was 11-30 years of age group[13]. Sarkar in Rangpur Medical College Hospital also reported similar result. So this study is consistent with findings of other study carried out in Bangladesh[5]. Gyenwali et al. reported that the age of the patients with poisoning varied from 20 to 70 years with 65% of them between 21-30 age group and 58% belonged to lower socioeconomic status[12]. Among the studied patients, 68% were male and 32% were female. Male to female ratio is 2.1:1. Dewan et al. showed male to female ratio in pesticide & herbicide poisoning is 1.6:1[14]. Cha et al. showed male to female ratio 2.21:1[13]. Yadav et al. reported male to female ratio is 3.3:1[19]. So this study shows increasing trend of pesticide & herbicide poisoning in male and is consistent with other study.

This study shows majority (66%) were from rural area and (34%) from urban residence. This findings are in well contract with the findings of the other research works (Cha et al. also Nabih et al.)[13 & 17]. Pesticide poisoning rates were higher in rural areas, agricultural workers, and unemployed individuals and is the most common method of self-harm resulting in death in Sri Lanka[20] Taiwan[21] and China[22]. Numerous aspects of rural life, such as socioeconomic disadvantages, limited availability of and access to emergency medical services may contribute to the elevated rates of suicide in rural areas[23,24]. The present study showed majority of patients (58%) were unmarried. Marital status was reported in two studies and showed that most of the patients were unmarried (56.4%) [11,17]. Our study revealed Pesticide & herbicide poisoning was common among unemployed and housewife group 28% and 26% respectively. This findings consistent with Dewan et al.[12] Another study showed, 47% of patients were farmer, 16% student and 13% housewife[25]. Illiteracy observed in 36% cases in our study which is similar to other study[26].

In this study shows 89% were pesticides and 11% were herbicides. Previous studies showed that OPCs are the most common pesticides used for poisoning (89.8%). However, the reported frequencies ranged from 12% to 100% in different series[9,11,12,27]. Twelve-year statistics of national forensic science

laboratory of Nepal showed that among 1016 poisoning cases, the poisons used by 34% of cases were insecticides and by 4% of cases were rodenticides[18]. Among insecticides, OPCs were used by 71% of cases, pyrethroids by 13%, mixed insecticides (OPC + Pyrethroid) by 7%, carbamates by 5% and OCCs by 4%[11]. In Mysore (South India) pesticides were responsible for 39.5% of poisoning cases and frequency of different pesticides were OPCs in 71%, rodenticides in 13%, pyrethroids in 7%, carbamates in 6.5% and OCCs in 2.5% of cases[27]. Frequency of carbamate and rodenticides used in Bangladesh were almost identical with Nepal but that of OPC and pyrethroids were noticeably different from what in India and Nepal (~70%) as the rate of use of OPCs in Bangladesh is about 90% and for pyrethroids is less than 1%[18].Therefore, the findings of the study are in well agreement with the findings of the other research works (Cha et al. and Nabih et al. Yadav et al.) [13,17, 19]. Regarding motive of poisoning in our study 81% patient took pesticide & herbicide poisoning for suicide and 19% admitted with accidental case. This result is consistent with the study where most common reason of pesticide & herbicide poisoning was suicide (93.3%)[20]. A study performed at Rajshahi Medical College from January 1991 to December 1994 showed that out of those 405 cases of OPC poisoning 310 were suicidal (76.54%) and 95 were homicidal (23.45%) poisoning[28].

The present study revealed that factors responsible for the suicidal attempt were familial disharmony in 46% of cases, marital problems in 19%, financial problem in 16%, mental disorder in 3% and 11% due to other reasons. Shadequl-Islam et al. reported the motive of pesticide poisoning in their study that 45% of cases were due to familial disharmony, 15% unknown, 13.3% depression, 8.3% marital problems, 5% financial problems and 13.3% due to other reasons[26]. In most cases, the patient could access to the poison by self-purchasing from poison retailers.

Conclusion:

This study has indicated that young adults, males and socially underprivileged people are at a higher risk of pesticides and herbicides poisoning. This study showed pesticides & herbicides poisoning is the most common modes of suicidal deaths. Pesticides are mostly misused purposefully as an easy means for committing suicide. Early diagnosis and treatment is mandatory in order to minimize mortality from these potentially lethal compounds. It is recommended that the supply of pesticides be properly regulated to prevent easy accessibility and misuse.

Conflict of Interest: None.

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The Principal Investigator, Dr. Mohammad Abu Naser Siddique, oversaw all activities related to the conduct of the study and contributed to the study idea, discussion, and writing of the manuscript. Dr. Ummay Fatema Khatun contributed to the data collection. Dr. Imran Uddin Robel contributed to the literature review .We are very much grateful to Prfessor Dr. Md. Abdus Sattar, Head of the Department of Medicine, Chittagong Medical College for his guidance. We are also grateful to all indoor medical officers and assistant registrars of Medicine for their help in collecting data. All authors accepted the final version. All authors read and approved the final manuscript.

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