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ORIGINAL ARTICLE

CHANGES IN LIVER IN CASE OF INSECTICIDAL AND ALCOHOL POISONING: AN AUTOPSY STUDY

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ABSTRACT: Poison is a substance introduced in the body to produce ill-effect, disease or death. It may be of any origin like synthetic, mineral, animal or vegetable. Death due to poisoning is mostly prevalent in the developing countries, of the total burden of acute pesticide poisoning; the majority of deaths are from deliberate self-poisoning with organophosphorus pesticides, aluminium phosphide and paraquat. Exposure to pesticides is usually occupational, accidental or suicidal. In India very few research works have been undertaken on histopathological changes of liver in different poisoning. In this part of our country a sizable number of cases of poisoning due to insecticides & alcohol are reported. So this current study intends to find out different histopathological changes of liver in insecticidal & alcohol poisoning with regards to time interval between poisoning and death. In our 1 year (November 2012-October 2013) of study we got 143 victims who died due to insecticidal and alcohol poisoning, out of which 132 cases show significant histopathological changes in liver. In this study male subjects (60.83%) outnumber female (39.17%) victims and most common age group affected in this study is between 20-40 years. This study show 29.37% victims died due to organophosphorus poisoning, 25.17% cases of organochlorine poisoning, 11.88% study subjects from carbamate poisoning, 18.88% cases died due to combined alcohol and insecticidal poisoning, and 14.68% victims died due to alcohol poisoning. On microscopically 25.87% of cases show centrilobular necrosis(CN), sinusoidal dilatation(SD) found in 22.37%, fatty changes(FC) in 11.88%,both venous congestion(VC), combined sinusoidal dilatation and degenerative change in 1.39% of cases, each 2.09% of cases show degenerative change(DC), centrilobular necrosis and venous congestion, and sinusoidal dilatation and venous congestion respectively, each 3.49% show combined centrilobular necrosis and sinusoidal dilatation, fatty change and degenerative change respectively, 08.39% of cases show centrilobular necrosis and fatty change, 06.99% cases show sinusoidal dilatation and fatty change, 07.69% have no significant histopathological changes, 0.69% case show centrilobular necrosis and degenerative change.

KEYWORDS: Histopathology, poison, centrilobular necrosis, fatty change, sinusoidal dilatation.

INTRODUCTION: Poison is a substance introduced in the body to produce ill-effect, disease or death. It may be of any origin like synthetic, mineral, animal or vegetable. It may be introduced through any route like mouth, nostril, anus, vagina, ears, eyes, or by injection or inhalation. Human poisoning can be accidental, suicidal or homicidal. The term insecticide is used to denote agents designed to kill only insects, but the term pesticide has a broader connotation and also includes herbicides, rodenticides, fumigants, nematocides, algaecides, ascaricides, molluscicides, disinfectants, defoliants and fungicides.[1] Most of the poisonous elements undergo first pass metabolism in liver, causing number of changes.[2,3] According to World Health Organization (WHO) reports 8 million people in the world consume poison every year. Out of which about 2, 20,000 people die. About 50, 000 deaths occur in India due poisoning every year.[4]

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The first known pesticide was probably elemental sulphur dust used in Sumeria about 4500 years ago. In recorded history, nicotine sulphate was extracted from tobacco leaves for use as an insecticide in the seventeenth century.[5] In India, the use of pesticides began in 1948 with the introduction of dichlorodiphenyltrichloroethane (DDT) for the control of malaria and benzene hexachloride (BHC) for locusts. Production of these substances in India started in 1952.[6] Acute, deliberate self-poisoning with agricultural pesticides is a global public health problem but reliable estimates of the incidence are lacking. Most estimates of the extent of acute pesticide poisoning have been based on data from hospital admissions, which would include only the more serious cases and hence merely reflect a fraction of the real incidence. On the basis of a survey of self-reported minor poisoning in the Asian region, it is estimated that there could be as many as 25 million agricultural workers in the developing world who suffer from an episode of poisoning each year.[7]

Of the total burden of acute pesticide poisoning, the majority of deaths are from deliberate self-poisoning with organophosphorus pesticides, aluminium phosphide and paraquat. Exposure to pesticides is usually occupational, accidental or suicidal. When suicidal, it is termed as deliberate self-harm, and results in a higher mortality than accidental.[7] Case fatality rate in pesticide poisoning is between 18% and 23%.[8] The highest case fatality rates have been reported with poisoning due to aluminium phosphide, endosulphan and paraquat.[9-11] Death is due to respiratory or circulatory failure while later on, it is due to liver and kidney injury.[12]

In India very few research works have been undertaken on histopathological changes of liver in different poisoning. In this part of our country a sizable number of cases of poisoning due to insecticides & alcohol are reported. So this current study intends to find out different histopathological changes of liver in insecticidal & alcohol poisoning with regards to time interval between poisoning and death.

AIMS & OBJECTIVES:

1. To find out the histopathological changes in liver due to different insecticidal and alcohol poisoning with reference to time interval between poisoning and death.
2. To find out the association between poisoning and various epidemiological factors like age, sex.

MATERIAL AND METHODS: This is an observational, descriptive and cross sectional study which has been done from November 2012-October 2013 in the Department of Pathology of R G Kar Medical College & Hospital with collaboration with Department of Forensic Medicine & Toxicology of R G Kar Medical College. In this study we examined various morphological changes of liver of 143 victims who died due to insecticidal and alcohol poisoning in the above mentioned time period.

We excluded the cases;

1. Pre-existing liver disease due to any other etiology.
2. Poisoning due to any other agents.
3. Liver which are grossly damaged.

We received history, patient details from police inquest form, victims' relatives and post mortem requisition from police morgue of R G Kar Medical College & Hospital, where autopsy of victims was done. After removal of liver, gross examination done such as- weight, size, shape, colour, and any deformity of liver noted. Sections were taken from both right and left lobe of liver and fixed in neutral buffered 10% formalin. Paraffin blocks were prepared following the routine

histopathological techniques. Staining of sections (5µ thick) was done with routine Haematoxylin & Eosin stain. Different gross and histopathological changes were recorded in histopathological data record form.

RESULT AND ANALYSIS: In this study male subjects (60.83%) outnumber female (39.17%) victims and most common age group affected in this study is between 20-40 years. [Table-1]

This study show 29.37% victims died due to organophosphorus poisoning, 25.17% cases of organochlorine poisoning, 11.88% study subjects from carbamate poisoning, 18.88% cases died due to combined alcohol and insecticidal poisoning, and 14.68% victims died due to alcohol poisoning. [Table-2]

It has been found enlarged liver 29.37% cases, congested liver 25.87% cases, enlarged and congested liver 15.38%, 06.99% enlarged and pale liver, pale in color 07.69%, 09.09% of liver show reduced in weight, reduced and pale liver 5.59% of cases.(p value-0.450)[Table-3].

On microscopically 25.87% of cases show centrilobular necrosis, sinusoidal dilatation found in 22.37%, fatty changes in 11.88%, both venous congestion, combined sinusoidal dilatation and degenerative change in 1.39% of cases, each 2.09% of cases show degenerative change, centrilobular necrosis and venous congestion, and sinusoidal dilatation and venous congestion respectively, each 3.49% show combined centrilobular necrosis and sinusoidal dilatation, fatty change and degenerative change respectively, 08.39% of cases show centrilobular necrosis and fatty change, 06.99% cases show sinusoidal dilatation and fatty change, 07.69% have no significant histopathological changes, 0.69% case show centrilobular necrosis and degenerative change (p value-0.0001)[Table-4].

In case of organophosphorus and organochlorine poisoning major histopathological changes are centrilobular necrosis (Fig. 1) and sinusoidal dilatation (Fig. 2), in carbamate poisoning sinusoidal dilatation is major histopathological change, fatty changes is predominant among alcohol poisoning, and combined alcohol and insecticidal poisoning major histopathological changes are fatty change(Fig-3), combined centrilobular necrosis and fatty change, combined sinusoidal dilatation and fatty changes.

Among histopathological examination findings in liver affected by insecticides and alcohol was obtained maximum amongst the study subjects, who survived for 24-72 hours. This demonstrated that the poison was severely toxic to cause death of victim or it has remained in the body for longer duration injuring the internal organs.

DISCUSSION: Poisoning is the third leading cause of death following firearm injuries and motor vehicle accidents running first and second rank according to International toll.[1] The incidence of poisoning in India is among the highest in the world, and it is estimated that more than 50,000 people die every year from toxic exposure.[13] The common agents causing poisoning in India appear to be pesticides (organophosphorus, organochlorine, carbamate, pyrethroids), sedative drugs, chemicals (corrosive acids, copper sulphate), alcohol, plant toxins (datura, oleander, strychnos, and gastro intestinal irritants such as castor, croton, calotropis etc) and household poisons (mostly cleaning agents).[14] Death may occur immediately after taking poison or may take place after days or weeks, where the poisoning may not be the actual cause of death, although it may occur as a result of some remote intervening cause. In these cases the determination of exact cause of death may be difficult as

external appearance may not give any clue and even internal examination may sometimes does not reveal anything on gross. On gross examination, all organs are congested, However, histopathological examination (HPE) can reveal such pathological change in major organs like lung, liver, kidney where poison is absorbed and eliminated.[1] Hence this study is intended to find out various histopathological changes of liver in insecticidal and alcohol poisoning, which will be helpful to assess prognosis of patient in future.

Most of victims hospitalized with history of abdominal pain, nausea, vomiting and respiratory distress. All these signs & symptoms are due to cholinergic effects. These signs & symptoms were supported by other investigators.

In our study gender and age distribution of affected victims are similar to the study done by Kar N[15], Agarwal SB et al,[16] but opposing to study done by Biswas S et al who found more female victims compared to male victims.[17]

Most common poisons ingested by victims were organophosphorus, organochlorine, carbamate, alcohol & other insecticides and alcohol.

Enlarged and congested liver are two most common gross morphological findings in our study, these are supported by Sutay S, Tirpude BH in 2008 found 119 (85%) cases with congested liver, 09(06.42%) cases enlarged liver, 06 (04.28%) cases have reduced in weight, 07 (05%) have pale in colour, and 03 (02.14%) cases have greasy appearance.[4]

In case of organophosphorus and organochlorine poisoning major histopathological changes are centrilobular necrosis and sinusoidal dilatation, in carbamate poisoning sinusoidal dilatation is major histopathological change, fatty changes is predominant among alcohol poisoning, and combined alcohol and insecticidal poisoning major histopathological changes are fatty change, combined centrilobular necrosis and fatty change, combined sinusoidal dilatation. These microscopic findings are supported by Sutay S, Tirpude BH[4], Dalal et al,[18] Job C,[19] Arora et al.[20]

CONCLUSION: Increasing trend of poisoning in rural as well as urban set up for committing suicides must drive attention of law enforcing agencies to restrict its use and providing better methods for pest control. One of the organs suffered by such poisoning is liver, as most of the drugs undergo first pass metabolism in liver. This study highlights the usefulness of autopsy findings in diagnosis of insecticidal and alcohol poison causing death. Indiscriminate use of insecticides increases the potential for self-poisoning. Restrictions on access to toxic insecticides through national policies and enforcement, strategies on integrated pest management, public education on toxicity, storage and safe use, early recognition of poisoning, and appropriate medical management may reduce the incidence of poisoning and death.

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Total no of cases	Male	Female
143	87 (60.83%)	56 (39.17%)

Table 1: Distribution of study subjects with gender

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Name of poison	No. of cases (143)	No of cases show significant histopathological changes (132)
Organophosphorus	42 (29.37%)	41 (31.06%)
Organochlorine	36 (25.17%)	31(23.48%)
Carbamate	17 (11.88%)	16 (12.13%)
Alcohol+ Other insecticides	27 (18.88%)	25 (18.94%)
Alcohol	21 (14.68%)	19 (14.40%)

Table 2: Distribution of significant histopathological changes among the total numbers of study subjects

Poison (143)	Congested (37)	Enlarged (42)	Enlarged+ Congested (22)	Enlarged+ Pale(10)	Pale (11)	Reduced (13)	Reduced+ Pale(08)	P value
Organophosphorus (42)	14 (9.79%)	10 (6.99%)	04 (2.79%)	03 (2.09%)	05 (3.49%)	05 (3.49%)	01 (0.69%)	0.450
Organochlorine (36)	05 (3.49%)	13 (9.09%)	08 (5.59%)	00 (0%)	02 (1.39%)	04 (2.79%)	04 (2.79%)	
Carbamate (17)	04 (2.79%)	08 (5.59%)	03 (2.09%)	01 (0.69%)	00 (0%)	01 (0.69%)	00 (0%)	
Alcohol+ Insecticide (27)	08 (5.59%)	04 (2.79%)	04 (2.79%)	04 (2.79%)	04 (2.79%)	01 (0.69%)	02 (1.39%)	
Alcohol (21)	06 (4.19%)	07 (4.89%)	03 (2.09%)	02 (1.39%)	00 (0%)	02 (1.39%)	01 (0.69%)	

Table 3: Shows gross findings of liver among study subjects in different poisonings

Poison	CN	CN + FC	CN + SD	CN + VC	DC	FC	FC + DC	SD	SD + FC	VC	No changes	CN + DC	SD + DC	SD + VC	P value
Organo phosphorus	21	00	01	00	00	00	00	17	00	02	01	00	00	00	0.0001
Organo chlorine	14	00	02	01	02	00	00	08	00	00	05	00	01	03	
Carbamate	02	00	02	02	01	00	00	07	00	00	01	01	01	00	
Alcohol+ Other insecticids	00	10	00	00	00	06	02	00	07	00	02	00	00	00	
Alcohol	00	02	00	00	00	11	03	00	03	00	02	00	00	00	
Total 143	37	12	05	03	03	17	05	32	10	02	11	01	02	03	

Table 4: Shows different histopathological findings among study subjects in different poisonings

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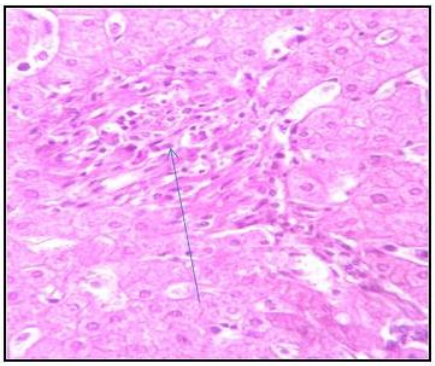

Fig. 1: Show histopathology of centrilobular necrosis of liver (H & E × 400)

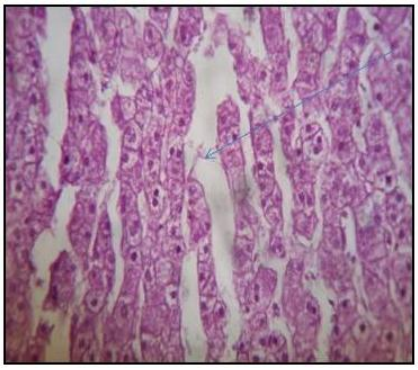

Fig. 2: Show histopathology of sinusoidal dilatation of liver (H & E× 400)

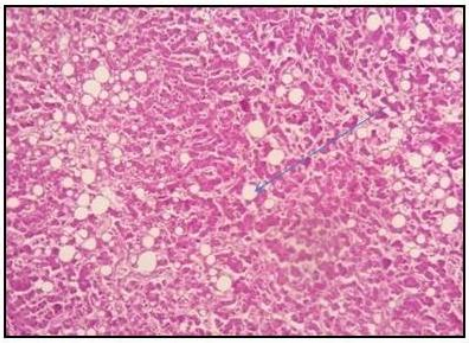

Fig. 3: Show histopathology of combined fatty liver (H & E × 400)

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