

## **Original and Paper**

### **Pattern of histo pathological changes of liver in poisoning**

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#### **Abstract**

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, which is studied in detail in this study with special reference to histopathological finding. Out of total 140 autopsies 78 cases revealed histopathological finding in liver which varies with treatment, duration of survival, death autopsy interval. This may be helpful to conclude cause of death in obscure autopsies or even at each poisoning autopsy where opinion is reserved till viscera report is available. This may cut short time required for court proceeding, insurance claims based on these opinions.

**Key Words:** *Histopathology, Liver, Poisoning, Cause of death*

#### **Introduction**

Today at every center carrying out the medicolegal work, poisoning autopsies form a sizable group and the medical officer is often required to give his opinion in cases of deaths which is a prime concern to the people in general and to law enforcing agencies, social scientist and researchers.

Poisoning is the third leading cause of death following motor vehicle and firearm injury running first and second rank according to international toll causing death rate more than 7.2 per 100,000 populations according to NCHS.<sup>1</sup> According to WHO reports 8 million people in the world consume poison every year. Out of them about 2,20,000 people die. Most of the cases of poisoning occur in the developing countries. About 50, 000 deaths occur in India due poisoning every year.<sup>2</sup>

In spite of such a sizable number of deaths due to poisoning opinion to cause of

death is reserved till viscera shows evidence of poisoning which takes a long duration for reporting and due to this court proceeding ,death certificates, insurance claims of relatives of deceased etc. remain pending.

Death may occur immediately after taking poison or may get delayed for days or weeks together, 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 or internal examination may even sometimes does not reveal anything on gross.

On gross examination, all organs are congested, However, Histopathological examination (HPE) can reveal such pathology in major organs like lung, liver, kidney where poison is acted, absorbed and eliminated. N' number of literatures have mentioned poisoning trends and histopathological changes in animal organs only. In rural setup like Sewagram it is very common to see suicidal poisoning by pesticide and almost all are metabolized in liver . Hence in this paper his to pathological examination of liver is performed in the humans who died due to poisoning. This can be very much helpful to assess prognosis of the patient and enhancing prompt treatment, the patient and enhancing prompt treatment, which will include liver enzymes and other liver tonics.

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## Material and Methods

This study was carried out in the Department of Forensic Medicine and Toxicology in collaboration with Department of Pathology, Mahatma Gandhi Institute of Medical Sciences, Sewagram. study. Cases with no laboratory confirmation of poisoning and those who had associated illness were excluded from the study. The cases were thoroughly studied using specially designed

Poison	Admitted cases	Expired during Rx	Case fatality rate(%)	Brought dead	Total
Organophosphorous	104 (87.39)	66 (55.46)	63.46	15 (12.61)	119 (19.38)
Organochlorous	17 (65.38)	12 (46.15)	70.59	9 (34.62)	26 (4.23)
Carbamate	02	0	0	0	02 (0.33)
Poi + Alcohol	165 (95.93)	21 (12.21)	12.73	7 (4.93)	172 (28.01)
Ethyl Alcohol	98 (97.93)	3 (2.97)	1.02	3 (2.97)	101 (16.45)
Other Insecticides	100 (99)	3 (2.97)	5	1 (0.99)	101 (16.45)
Unknown	91 (97.35)	3(3.23)	3.31	2(2.15)	93 (15.15)
<b>Total</b>	<b>577</b> (93.97)	<b>108</b> (17.59)	<b>18.72</b>	<b>37</b> (6.03)	<b>614</b>

Table 1 Mortality Trends (Figures in parenthesis represent percentage)

Gross finding of liver	OP	OC	Poi+OH	OH	Others	Total
Enlarged	3 (33.33)	1 (11.11)	2 (22.22)	2 (22.22)	1 (11.11)	09 (6.42)
Reduced	3 (50)	0	1 (16.66)	1 (16.66)	1 (16.66)	06 (4.28)
Congested	75 (63.0)	19 (15.96)	20 (16.80)	4 (3.36)	1 (0.84)	119 (85)
Pale	5 (71.4)	2 (28.57)	0	0	0	07 (5)
greasy	1 (33.33)	0	2 (66.66)	0	0	3 (2.14)

Table 2 Gross examination findings of liver in poisoning

This was a prospective study of 2 years' duration from June 2003 to June 2005. All the autopsies with the history of poisoning were studied. The cases confirmed for poisoning based on the toxicological reports were included in the proforma that included- Demographic profile of the deceased.

1. Complete history related to poisoning obtained from police, relatives or hospital records.

2. Thorough external and internal post mortem examination was performed and recorded.

Each autopsy was treated as a special research project. Special morphological examinations of the viscera were routinely performed. Particular attention was also given to study of respiratory and cardiovascular

**Poison analysis**

Analysis of gastric contents, urine and blood was done in toxicology laboratory in the Department of Forensic Medicine and Toxicology by high performance thin layer chromatography (*camag*).

Group	FCL	Cong	CLN	AH	SDL	Total
<b>OP</b>	15 (34.88)	20 (46.51)	4 (9.30)	1 (2.33)	3 (6.98)	43 (55.13)
<b>OC</b>	4 (36.36)	5 (45.45)	0	1 (9.09)	1 (9.09)	11 (14.10)
<b>Poi+OH</b>	6 (35.29)	9 (52.94)	2 (11.76)	0	0	17 (21.79)
<b>OH</b>	1 (33.33)	0	0	2 (66.67)	0	3 (3.85)
<b>Other</b>	1 (25)	2 (50)	0	1 (25)	0	4 (5.13)
<b>Total</b>	<b>27</b> <b>(34.62)</b>	<b>36</b> <b>(46.15)</b>	<b>6</b> <b>(7.69)</b>	<b>5</b> <b>(6.41)</b>	<b>4</b> <b>(5.13)</b>	<b>78</b> <b>(55.71)</b>

**Table-3 Histopathological changes in liver**

(Figures in parenthesis represent percentage)

{FCL= fatty changes in liver, Cong= Congestion, CLN= Centrilobular necrosis in liver, AH= Alcoholic hepatitis, SDL= Sinusoidal dilatation in liver, OP = Organo Phosphorous, OC = Organo Chlorine, Poi = Poison, OH = Alcohol }

HPE finding	Duration of Survival(Hours)					Total
	0-12	13-24	25-48	49-72	>72	
<b>FCL</b>	12	08	0	3	4	27(34.62)
<b>Cong</b>	17	03	04	2	10	36(46.15)
<b>CLN</b>	1	1	1	0	3	6(7.69)
<b>AH</b>	1	1	2	0	1	5(6.41)
<b>SDL</b>	2	0	1	0	1	4(5.13)
<b>Total</b>	<b>33(42.3)</b>	<b>13(16.67)</b>	<b>8(10.26)</b>	<b>5(6.41)</b>	<b>19(24.36)</b>	<b>78(55.71)</b>

**Table -4 Association of duration of survival and Histopathological changes**

(Figures in parenthesis represent percentage)

structures. Every attempt was made to shorten interval between and analysis in order to reduce the problem of postmortem tissue autolysis, which occurs at greatly increased rates in poisoning and sometimes results in difficult and misleading interpretation.

**Histopathological investigations:**

The histopathological study of heart, brain, liver, lung, kidney, spleen of all subjects was carried out under the guidance of Histopathologist of MGIMS Sewagram.

## Observations

During the period from April 2003 to July 2005, Total 614 cases of poisoning were reported. Out of them 577 cases were admitted to Kasturba hospital, Sewagram with history of some kind of poison and 108 cases died during treatment. Out

different from the study by Dakhankar<sup>4</sup> where case fatality rate of Zinc Phosphide is maximum i.e. 33.3% followed by 27.9% in OPP and 21.58% in OCP. While Aggarwal<sup>5</sup> et al found 38.21% CFR in Aluminium Phosphide poisoning and 25.20% in Sulphos poisoning.

HPE finding	Death autopsy interval		
	<12(Hours)	>12(Hours)	Total (140)
	78(55.7 )	62(44.2 )	
FCL	13(32.5)	14(36.84 )	27( 34.6)
Cong	19(24.33)	17( 44.73)	36( 46.15)
CLN	3( 7.5)	3(7.89 )	6(7.69 )
AH	3( 7.5)	2( 5.26)	5( 6.41)
SDL	2(5 )	2( 5.26)	1(1.28 )
<b>Total</b>	<b>40( 51.28)</b>	<b>38( 61.29)</b>	<b>78 (100)</b>

**Table . 5 Showing association of HPE of liver and death autopsy interval**

of them we have studied 140 cases in the present study which had shown definite poison in toxicology report. Those, which did not detect any poison, were excluded from the study. Also those cases which were associated with some illness (5 cases) were excluded from the study.

## Results & Discussion

### Mortality trend

As Shown in Table No. 1, out of total 614 cases 577(93.97%) cases were admitted to Kasturba Hospital during the period from June 2003 to July 2005. We studied total 140 cases in this Research in which 108 cases expired during treatment and 37 cases were directly brought for postmortem examination. 5 cases were excluded from the study which showed associated illnesses like sickle cell disease, some cardiac disease, etc.

Amongst total 614 cases were admitted in hospital, 108(17.59%) expired during treatment. Organophosphorous poisoning constitute the maximum No. either alone (19.38%) or combined with alcohol with cases fatality rate as 63.46% . Ethyl alcohol poisoning and other insecticides are higher in incidence i. e. 16.45% and 28.01% respectively. However case fatality rate is maximum in Organochlorous poisoning. Similarly Zine<sup>3</sup> et al found the 44.82% CFR in OPP and 37.93% CFR in Alcohol poisoning Which is

Because of easy availability in such rural area and better efficacy against plant insects, OP & OC are widespread in use. They are as fatal to human as to plant insects. In spite of admission to hospital such fatality explains the notoriety of OP & OC poisons in this area. No cases of Alluminium phosphide or Sulphos poisoning is reported in our study.

Amongst them total 78(55.71%) involved liver which were studied in detail.

### Manner of Death

We found maximum cases as suicidal i.e. 125(89.29%), Accidental [13(9.29%)] and 1.43% unknown as per history and information from Police. This is similar with finding of Zine<sup>3</sup> et al (49%), Dakhankar<sup>4</sup> et al, Naik<sup>7</sup> et al (53.95%) where Suicidal poisoning is more common.

In Suicidal poisoning the Histopathological findings obtained are maximum because dose taken in suicidal poisoning is as high as to cause death of persons.

### Signs and symptoms in poisoning

Out of total 140 cases, 87% cases presented with vomiting, 85% with pain in abdomen, 72.14% with convulsions and 85% had respiratory distress at end stage. while on postmortem examination 66.43 cases revealed froth and 94.29 had cyanosis at fingernails.

All cases of poisoning were presented with above symptoms in more or less same proportions. These signs and symptoms are in agreement with authors Karalliede<sup>8</sup> et al, Pillay<sup>9</sup>.

Reddy<sup>10</sup>, Knight<sup>11</sup>, Modi, et al. Also external examination finding by Dalal<sup>12</sup> et al shows that 53.01% cases had cyanosis at fingernails and 25.15% at lips. Froth from mouth and nose was observed in 70% cases. As shown in Table No. 2 On gross examination, 6.42% cases had enlarged liver while 4.28% had shown reduced size. 85% were congested and 5% were pale on cut section. 2.14% cases had greasy feel.

#### **Histopathological changes in liver**

As shown in Table No 3, Out of total 78(55.71%) cases affecting liver organophosphorous constitute 43(55.13%) and cause fatty changes in 15(34.88%); congestion in 20(46.51%); centrilobular necrosis in 4(9.30%); and alcoholic hepatitis in 1(2.33%) and Sinusoidal dilatation in 3(6.98%). Organochlorous group affected liver in 11(14.10%) and revealed microscopic findings as fatty changes in 4(36.36%); congestion in 5(45.45%); alcoholic hepatitis in 1 and Sinusoidal dilatation in 1(9.09%). Poisons in alcoholic intoxication [17(21.79%)] showed fatty changes in 6(35.29%); congestion in 9 (52.94%); centrilobular necrosis in 2(11.76%) cases. Purely Alcoholic intoxication affected liver in 3 (3.85%) and showed fatty changes in 1(33.33%); and alcoholic hepatitis in-2(66.67%). Other poisons [4(5.13%)] revealed fatty changes in 1(25%); congestion in 2(50%); and alcoholic hepatitis in-1(25%).

Dalal<sup>11</sup> et al in OPP, Cyriac job<sup>13</sup> in Alcohol and Arora<sup>14</sup> et al in Aluminium phosphide poisoning are in agreement with fatty changes in liver contributing death of patients.

S. Sriramachari<sup>15</sup> in MIC & HCN poisoning showed hepatic cord cell necrosis.

Sabina<sup>16</sup> et al in Malathion intoxication to rats noticed parenchymatous degeneration in 80% of animal and El elaimy<sup>17</sup> et al in OPP showed focal degeneration of cytoplasm in OPP. No other authors have mentioned the findings quantitatively.

#### **Duration of Survival**

As shown in Table No 4, out of total 78 (55.71%) cases of poisoning affecting liver 33 cases (42.31%) survived less than 12 hours .

Maximum cases i.e. 12 (36.36%) showed fatty change in liver and 17 (51.52%) showed congestion in liver.

#### **Death Autopsy Interval (DAI)**

As per Table-5; total 78(55.71%) had less than 12 hours death autopsy interval. Out of them 40(51.28%) affected liver and out of total 62 (44.28%) which had more than 12 hours interval. 38(61.29%) cases had shown changes in liver.

There is no significant difference found in the cases (78) studied in less than 12 hours of death and cases studied(62) more than 12 hours of death. All possible Histopathological findings of poisons are shown in table as per death autopsy interval.

Although, We shortened interval between preservation and analysis as less as possible to prevent autolytic changes. However, in some cases of brought dead where time elapsed most, have shown changes in organs. Although maximum [103(17.59%)] autopsies are done on dead bodies who were admitted to Kasturba hospital and died during treatment, thus reduced the death autopsy interval, it is seen that histopathological examination has revealed much of changes.

#### **Summary and conclusion**

1. In the present study, the mortality due to poisoning is more common in Insecticides that too in OP i.e. 70.59% with cases fatality rate of 63.46% followed by Organochlorous and insecticides taken either in intoxicated state or with adulterated alcohol.
2. The most common Age group affected by poisoning was 21-40 years, which committed suicides.
3. Duration of survival was least in OPP (58.77%) i.e. less than 12 hours followed by Organochlorous and alcohol poisoning. The histopathological examination findings in major organs affected by pesticides were obtained maximum amongst the cases, which survived less than 12 hours and next commonly in more than 72 hours. Thus meaning thereby that either the poison was severely toxic to cause death of victim or it has remained in the body for longer duration injuring the internal organs.

4. However we studied association of death autopsy interval and effect of treatment with the histopathological changes in liver. From this we conclude that as the maximum cases were hospitalized initially and hence death autopsy interval was not lengthened more than 24 hours and received emergency treatment in 75% cases. Yet significant histopathological changes in organs show that there is no effect of duration between death and autopsy.
5. Out of total 78 (55.71%) cases affecting liver, Organophosphorous poisoning caused fatty changes in 34.62% cases. Alcohol poisoning caused death by Alcoholic hepatitis in 5 cases. Cases of Centrilobular necrosis and sinusoidal dilatation have also been observed in our study.

Thus, at last we conclude that HPE can support to estimate cause of death in death due poisoning while viscera report is awaited and can cut short the legal proceeding which used to remain pending for evidence of poison in laboratory.

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