

Study Of Histopathological Changes In Fatal Poisoning In Vadodara Region Of Gujarat.

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ABSTRACT:

Background: The exact incidence of poisoning in India remains uncertain due to lack of concrete data and under reporting. The effects of different poisons on the various organs have not been studied in details.

Aims & Objectives: The current study was designed to study the gross and histopathology changes in viscera of death due to poisoning and to know that weather specific poisoning can be diagnosed by examining these changes.

Methods: The present study was carried out in forensic medicine and pathology departments, which are attached to tertiary health center of MS University Baroda. All the deaths with history of suspected poisoning and the cases which were diagnosed later as death due to poisoning by medico legal autopsy examination were included for this study.

Results: Predominant findings are pulmonary edema with congestion was seen in 90.0% of cases followed by intrapulmonary hemorrhages in 14 (4.98%) cases. Stomach found congested & hemorrhagic in 89.3%, congested, hemorrhagic with ulceration in 0.3%, with perforation in 1.4% & congested in 7.8% of total 281 cases.

Conclusion: The present study helps to interpret that changes in the organs in poisoning cases are not often easy to interpret and that they may be due to further presence of old/recent disease in the deceased that is unrelated to the cause of death. This also calls for intense research in the field with specific effects on the organs by particular poison.

Key-words: Autopsy, Unnatural death, Histo-pathology and Poisoning.

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INTRODUCTION:

Acute poisoning is one of the most common causes for emergency hospital admissions and it commonly occurs when any substance is swallowed, inhaled, injected, or absorbed in the body and interferes with normal body functions. Acute poisoning defined as- poisoning

caused by an excessive single dose or several smaller doses of a poison taken over a short interval of time.¹ The incidences of all kind of poisoning e.g. accidental poisoning, suicidal and homicidal poisoning are increasing in India because of the greater use of the chemicals for industrial and domestic purposes and due to easy availability of the

poisoning almost at all places.² Lack of specialized toxicological services in developing countries like India has further contributed to the higher rate morbidity and mortality.³

Knowing the pattern of poisoning in a region helps not only in early diagnosis & treatment but also to take preventive measures. Histopathological examination (HPE) can reveal some pathology in all the internal organs where poison has acted, absorbed, & eliminated. In this study we attempted to correlate the signs and symptoms, gross findings and histopathological changes to ascertain the cause of death in cases of poisonings and to find some specific changes in viscera of autopsy, which can be helpful to the investigations in difficult or suspected cases of death.

MATERIAL & METHOD:

The present prospective and longitudinal study was done in the department of forensic medicine in Medical College, Baroda, Gujarat to assess histopathological changes in visceral organs of deaths due to poisoning. From all dead bodies coming for Post-mortem examination at S.S.G. Hospital, Vadodara, cases with history of suspected or confirmed poisoning & those persons declared dead on arrival in the causality and suspected to be a case of poisoning were selected. Total 2084 autopsies were conducted during the period of one year from 14th September 2011 to 13th September 2012 and out of these 281 cases

of death due to poisoning were selected. Each poisoning case was studied in detail during autopsy examination and in every case routine viscera were sent for the histopathological examination to the pathology department in our institute, where the samples were examined grossly and microscopically by senior pathologist and reports were prepared. All data collected from different sources were recorded in specially designed pro-forma for each case for further collective evaluation.

RESULTS:

During the 1 year study period, total 2084 autopsies were carried out at the SSG Hospital & Medical College Vadodara, out of which 281 cases (13.4%) of poisoning were encountered. When the samples of viscera were examined, then it was observed that congestion was seen in maximum number of cases 75.8% followed by congested with edema in 23.8% cases.

The effect of poison was examined on lungs, which shows that grossly combination of congestion and edema of lungs were seen in maximum number (258 or 91.8%) of cases followed by a combination of congestion and edema with sub-pleural hemorrhages in 17(6.0%) cases. On microscopic examination, pulmonary edema with congestion was confirmed in majority of the (90.0%) cases followed by intrapulmonary hemorrhages in 4.98% cases. Lobar pneumonia and bronchopneumonia were seen in 2.84% and 1.0% cases respectively.

Table 1
Relation between Poisons and Histopathological changes in Brain (in %)

| Name of poisons | Congested | | Congested & Edematous | | Congested, Edematous & Hemorrhagic | | Total |
|----------------------|-----------|------|-----------------------|------|------------------------------------|------|-------|
| | Gross | HPE | Gross | HPE | Gross | HPE | |
| OP | 82.9 | 74.8 | 17.1 | 22.9 | 0 | 2.2 | 135 |
| OC | 100 | 70.0 | 0 | 30 | 0 | 0 | 20 |
| Herbicide | 100 | 75 | 0 | 25 | 0 | 0 | 8 |
| Alcohol | 0 | 0 | 100 | 100 | 0 | 0 | 1 |
| Fumigant | 100 | 76.9 | 0 | 23 | 0 | 0 | 13 |
| Synthetic pyrethroid | 100 | 33.3 | 0 | 66.6 | 0 | 0 | 3 |
| Carbamate | 100 | 33 | 0 | 66.6 | 0 | 0 | 3 |
| Corrosive | 0 | 0 | 100 | 100 | 0 | 0 | 3 |
| Metallic | 100 | 100 | 0 | 0 | 0 | 0 | 1 |
| Antimalarial | 100 | 100 | 0 | 0 | 0 | 0 | 2 |
| Antihypertensive | 100 | 100 | 0 | 0 | 0 | 0 | 1 |
| Organic | 5.6 | 72.2 | 94.4 | 16.6 | 0 | 11.1 | 18 |
| Mixed | 14.3 | 71.4 | 85.7 | 28.6 | 0 | 0 | 7 |
| Unknown | 67.5 | 70 | 30 | 27.5 | 2.5 | 2.5 | 40 |
| Pending | 80.7 | 65.3 | 19.3 | 26.9 | 0 | 7.6 | 26 |
| Total | 75.8 | | 23.8 | | 0.3 | | 281 |

LBP = Lobar pneumonia, BP = Bronchopneumonia,
 Tbl = Tuberculus inflammation, SCC = Squamous cell carcinoma

Table 2 - Relation between Poisons and their effect on Lungs

| Name of poisons | LBP | BP | Tbl | SCC + BP | Total |
|----------------------|-----------------|-----------------|-----------------|-----------------|------------|
| OP | 4 (2.9%) | 0 | 1 (0.7%) | 0 | 135 |
| OC | 0 | 0 | 1 (5.0%) | 1 (5.0%) | 20 |
| Herbicide | 0 | 0 | 0 | 0 | 8 |
| Alcohol | 0 | 0 | 0 | 0 | 1 |
| Fumigant | 0 | 0 | 0 | 0 | 13 |
| Synthetic pyrethroid | 0 | 0 | 0 | 0 | 3 |
| Carbamate | 0 | 0 | 0 | 0 | 3 |
| Corrosive | 0 | 0 | 0 | 0 | 3 |
| Metallic | 0 | 0 | 0 | 0 | 1 |
| Antimalarial | 0 | 0 | 0 | 0 | 2 |
| Antihypertensive | 0 | 0 | 0 | 0 | 1 |
| Organic | 0 | 0 | 0 | 0 | 18 |
| Mixed | 1 (14.2%) | 0 | 0 | 0 | 7 |
| Unknown | 2 (5.0%) | 3 (7.5%) | 0 | 0 | 40 |
| Pending | 1 (3.9%) | 0 | 0 | 0 | 26 |
| Total | 8 (2.8%) | 3 (1.0%) | 2 (0.7%) | 1 (0.3%) | 281 |

Cong – Congestion, SHE – Subendocardial hemorrhages, MH – Myocardial hypertrophy, PH – Petechial hemorrhages.

Tabl-3 shows effect of poisons on heart and it shows that heart was grossly normal in 261(92.8%) cases and was found enlarged in 20(7.2%) cases. On histopathological examination, congestion was seen in maximum (244 or 86.8%) cases followed by myocardial hypertrophy and atherosclerosis in 22(7.8%) cases and congestion with petechial hemorrhages in 13 (4.6%) of cases.

The effect of poisonous substances on liver shows that congestion was observed in maximum number (259 or 92.1%) of cases followed by combination of congestion and fatty changes in 12 (4.2%) cases.

On gross Examination of kidneys, it was observed that congestion was present in most of the cases (250 or 88.9%) followed by a combination of congestion and enlargement of kidneys in 23 (8.1%) cases. On histopathological examination, congestion was confirmed only in 186 (66.1%) cases, tubular necrosis in 52 (18.5%) of cases and Cloudy degeneration in 40 (14.2%) cases.

Table 3 - Relation between Poisons and their effect on Heart (in %)

| Name of poisons | HPE | | | | Total |
|----------------------|------|-----------|----------|----------------------|-------|
| | Cong | Cong +SHE | Cong +PH | MH + Atherosclerosis | |
| OP | 87.4 | 0 | 5.1 | 7.4 | 135 |
| OC | 90 | 0 | 0 | 10 | 20 |
| Herbicide | 87.5 | 0 | 0 | 12.5 | 8 |
| Alcohol | 0 | 0 | 0 | 100 | 1 |
| Fumigant | 76.9 | 0 | 0 | 23.1 | 13 |
| Synthetic pyrethroid | 100 | 0 | 0 | 0 | 3 |
| Carbamate | 100 | 0 | 0 | 0 | 3 |
| Corrosive | 100 | 0 | 0 | 0 | 3 |
| Metallic | 100 | 0 | 0 | 0 | 1 |
| Antimalarial | 100 | 0 | 0 | 0 | 2 |
| Antihypertensive | 0 | 0 | 0 | 100 | 1 |
| Organic | 88.8 | 11.2 | 0 | 0 | 18 |
| Mixed | 100 | 0 | 0 | 0 | 7 |
| Unknown | 82.5 | 0 | 7.5 | 10 | 40 |
| Pending | 88.4 | 0 | 11.6 | 0 | 26 |
| Total | 86.8 | 0.7 | 4.6 | 7.8 | 281 |

Table 4 - Relation between Poisons and their effect on Liver (in %)

| Name of poisons | HPE | | | Total |
|----------------------|--------------|------------------------|-------------|-------|
| | Fatty change | Centrilobular necrosis | Cholestasis | |
| OP | 2.2 | 0.7 | 1.4 | 135 |
| OC | 10 | 0 | 0 | 20 |
| Herbicide | 2.5 | 0 | 0 | 8 |
| Alcohol | 100 | 0 | 0 | 1 |
| Fumigant | 0 | 0 | 0 | 13 |
| Synthetic pyrethroid | 0 | 0 | 0 | 3 |
| Carbamate | 0 | 0 | 0 | 3 |
| Corrosive | 0 | 0 | 0 | 3 |
| Metallic | 100 | 0 | 0 | 1 |
| Antimalarial | 0 | 0 | 0 | 2 |
| Antihypertensive | 0 | 0 | 0 | 1 |
| Organic | 0 | 0 | 0 | 18 |
| Mixed | 71.4 | 14.2 | 0 | 7 |
| Unknown | 10 | 2.5 | 0 | 40 |
| Pending | 0 | 0 | 0 | 26 |
| Total | 6 | 1 | 0.7 | 281 |

Table 5 - Relation between Poisons and their effect on Kidney

| Name of poisons | HPE | | | Total |
|----------------------|------------------|---------------------|-------|-------|
| | Tubular necrosis | Cloudy degeneration | Edema | |
| OP | 21.4 | 11.8 | 1.4 | 135 |
| OC | 30 | 20 | 0 | 20 |
| Herbicide | 0 | 0 | 0 | 8 |
| Alcohol | 0 | 0 | 0 | 1 |
| Fumigant | 0 | 15.4 | 0 | 13 |
| Synthetic pyrethroid | 0 | 0 | 0 | 3 |
| Carbamate | 0 | 0 | 0 | 3 |
| Corrosive | 0 | 0 | 0 | 3 |
| Metallic | 100 | 0 | 0 | 1 |
| Antimalarial | 0 | 0 | 0 | 2 |
| Antihypertensive | 100 | 0 | 0 | 1 |
| Organic | 16.6 | 22.2 | 0 | 18 |
| Mixed | 0 | 0 | 0 | 7 |
| Unknown | 25 | 17.5 | 0 | 40 |
| Pending | 7.6 | 26.9 | 3.8 | 26 |
| Total | 18.5 | 14.2 | 1 | 281 |

Table 6 - Relation between Poisons and their effect on Stomach

| Name of poisons | Congestion | Gastritis | Necrotic changes | Sub mucosal hemorrhage | Total |
|----------------------|------------|-----------|------------------|------------------------|-------|
| OP | 91.1 | 0 | 0 | 8.8 | 135 |
| OC | 85.0 | 0 | 0 | 15 | 20 |
| Herbicide | 100 | 0 | 0 | 0 | 8 |
| Alcohol | 100 | 0 | 0 | 0 | 1 |
| Fumigant | 84.6 | 0 | 0 | 15.4 | 13 |
| Synthetic pyrethroid | 100 | 0 | 0 | 0 | 3 |
| Carbamate | 100 | 0 | 0 | 0 | 3 |
| Corrosive | 66.6 | 0 | 33.3 | 0 | 3 |
| Metallic | 100 | 0 | 0 | 0 | 1 |
| Antimalarial | 100 | 0 | 0 | 0 | 2 |
| Antihypertensive | 100 | 0 | 0 | 0 | 1 |
| Organic | 72.2 | 0 | 0 | 27.7 | 18 |
| Mixed | 71.4 | 28.5 | 0 | 0 | 7 |
| Unknown | 82.5 | 0 | 5 | 12.5 | 40 |
| Pending | 84.6 | 0 | 0 | 15.4 | 26 |
| Total | 87.1 | 0.7 | 1 | 11 | 281 |

Sample of stomach was also examined histopathologically for the effect of poisons and we found that stomach was congested and hemorrhagic in 89.3% cases on gross examination, congested and hemorrhagic with ulceration in 0.3%, with perforation in 1.4% and congested in 7.8% of total 281 cases. On histopathological examination, congestion of mucosa was observed in 245(87.1%) cases, followed by sub mucosal hemorrhages in 31(11.0%) of cases and gastritis in 2(0.7%) cases. Necrotic changes of mucosa were seen in 3(1.0%) cases only.

DISCUSSION:

Findings of our study were compared with the previous studies done at other centers.

Relation between poisoning and gross changes in visceral organs

Table-1 shows gross appearance of viscera due to effect of poisoning, which shows that congestion was seen in maximum number of cases (85.7%) in brain followed by edema in (14.2%). In lungs congestion and edema were seen in 158 (98.1%), in liver, congestion was seen in maximum number (152 or 94.4%) of cases. This coincides with findings quoted in textbook of Reddy¹ and also similar with findings of study of Sutay et al.⁴ In stomach, congestion and hemorrhage was seen in maximum number (158 or 98.1%) cases. In kidneys, congestion was seen in maximum number (138 or 85.7%) cases.

Relation between insecticides and histopathological changes in visceral organs

In present study, when the viscera were examined for any specific changes due to insecticides then it was observed that congestion was seen in maximum number (72.6%) of cases in brain followed by combination of congestion and edema in (25.4%) cases, while in lungs and liver, congestion and edema were seen in (95.0%) of cases and in heart, it was observed in (88.1%) cases. Our findings coincide with study of Sutay et al and Khurram et al.^{4,5} In stomach congestion was seen in most of the cases (90.6%) and hemorrhagic congestion in mucosa of stomach was observed in rest 9.4% cases. In kidneys, congestion was there in almost two third cases (64.5%) followed by tubular necrosis (21.7%) and cloudy degeneration (12.4%), which was also observed by Sutay et al and Dalal et al in their studies.^{4,6}

Relation between HCL poisoning and changes in visceral organs

Viscera examined for the effect of hydrochloride (HCL) poisoning were showing congestion predominantly, while the stomach was also showing hemorrhage and inflammation in combination with congestion, which was also noticed by others.^{1,2,7} These findings are due to corrosion and destruction of the tissues coming in contact with the acid and coagulative necrosis of proteins. On microscopic examination, brain was found congested and edematous and heart was

congested in all cases and stomach congestion was confirmed in 66.6% cases while necrotic changes in rest 33.3% cases.

Relation between Copper Sulphate poisoning and gross changes in visceral organs

When the viscera affected by Copper sulphate poison were examined then it was found on gross examination that brain and lungs were congested with edematous and liver were showing fatty change with congestion. Stomach mucosa was congested and hemorrhagic in most of the cases, while kidneys were congested. On HPE, congestion was seen in brain, heart, lungs and stomach, with edema in lungs. In kidneys, tubular necrosis was seen and liver were showing fatty changes.

Relation between Chloroquine overdose and changes in visceral organs

Congestion was common in brain, liver and kidneys. In lung, congestion and edema was seen. Stomach mucosa was congested and hemorrhagic. On HPE, Congestion was seen in brain, heart, liver, stomach and kidneys. In lungs, pulmonary edema was seen.

Relation between Antihypertensive overdose and changes in visceral organs

Congestion was seen brain, lungs, liver, stomach and kidneys. On HPE, in brain and stomach congestion was seen. In lungs, congestion, edema & hemorrhage were seen. Myocardial hypertrophy with atherosclerosis was seen in heart. In liver,

congestion was seen. In kidneys, tubular necrosis was seen.

Relation between Snake bite and changes in visceral organs

Congestion, edema with sub pleural petechiae in the lungs, congested and hemorrhagic mucosa in stomach was seen in all cases. Liver was congested in all cases. Brain was congested and edematous in all cases. Congestion was seen in the kidneys. This coincides with study of Khadgawat et al and findings quoted in textbook of Modi.^{1,8,9} Viperine venom produces cytolysis of cells of vascular endothelium causes destruction of red cells and other tissue cells and coagulation disorder.^{1,2,10}

Relation between Snake bite and histopathological changes in visceral organs

In brain, congestion was seen in 12(70.5%) cases, edema with congestion in 3 (17.6%) cases and subarachnoid hemorrhages in 2(11.7%) cases. In heart, congestion was seen in 15(88.2%) cases and subendocardial hemorrhages in 2(11.8%) cases, in stomach congestion was seen in 12 (70.5%) cases and submucosal hemorrhage in 5(29.5%) cases, in liver congestion was seen in all cases. In lungs congestion and edema were seen in all cases. In kidneys, congestion was seen in 11(64.7%) cases, cloudy degeneration in 4(23.5%) cases and tubular necrosis in 2(11.7%) cases.

Relation between Herbicide and gross & HPE changes in visceral organs

All the visceral organs were congested. Stomach mucosa was congested and hemorrhagic. Lungs were congested and edematous. On HPE, Brain was congested in 6 cases and edema with congestion seen in 2 cases, lungs were congested, edematous with areas of hemorrhage seen in all cases, heart was congested, liver congestion seen in 7 cases and fatty changes of liver in 1 case, stomach mucosa and kidneys were congested in all cases of herbicide poisoning.

CONCLUSION:

The present study helps to interpret that changes in the organs in poisoning cases are not often easy to interpret and that they may be due to further presence of old/recent disease in the deceased that is unrelated to the cause of death. This also calls for intense research in the field with specific effects on the organs by particular poison.

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