Original Research Article

Gross and Histopathological Findings of Stomach in Cases of Fatal Poisonings Reported at a Tertiary Care Hospital

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Abstract

Poisoning deaths are a major public health concern in India because of intentional consumption of toxic substances to commit suicide. Poisoning related mortality is huge compared to the morbidity in our country. This is one of the reasons for more number of poisoning cases in our autopsy work. Undoubtedly, autopsy is a very essential tool in knowing the exact cause of death in all these cases. The gross and histopathological examination of post-mortem specimens is crucial for the accurate identification of the cause of poisoning-related deaths along with chemical analysis. In this autopsy-based study, we investigate the gross and histopathological changes in the stomach associated with poisoning caused by various substances, including pesticides, corrosive substances, and medications.

The study included 118 poisoning fatality cases autopsied at Osmania General Hospital, Hyderabad. The main objective of this study was to investigate the effects of different poisonings on the stomach wall by conducting gross and histopathological examination of gastric tissue. In addition, the study aimed to evaluate the potential use of stomach pathology findings as a diagnostic criterion for various poisonings and to establish a correlation between these findings and the chemical analysis of viscera data. The sociodemographic data, circumstances of poisoning and reasons for suicide were also studied.

The study revealed that the major gross changes observed in the stomach were congestion, erosion, haemorrhage, and paleness, listed in descending order of occurrence. Similarly, the major histopathological findings identified in the stomach were congestion, gastritis, necrotic changes, and submucosal haemorrhages, listed in descending order of frequency.

In conclusion, this study provides valuable insights into the effects of different poisonings on the stomach wall through gross and histopathological examination of gastric tissue. The findings indicate that while gross and

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histopathological findings alone may not be sufficient for diagnosis, they can be used in conjunction with other diagnostic tools to accurately identify the cause of poisoning-related deaths. Moreover, the study suggests that the development of gastric mucosa specific immunohistochemistry techniques may offer a promising on-spot diagnostic tool for poisoning cases.

Keywords: Poisoning, Suicide, Stomach histopathology, Autopsy, Chemical Analysis

Introduction

Poisoning-related deaths are a significant concern in India, with thousands of fatalities being reported annually. These incidents can occur accidentally or intentionally and are usually caused by ingestion of poisonous substances, exposure to toxic chemicals or gases, and consumption of contaminated food or water. Pesticides are a leading cause of poisoning-related deaths in India, especially in rural areas where they are frequently used in agriculture. Other common causes include drug overdose, alcohol poisoning, and carbon monoxide poisoning[1].

The investigation of poisoning deaths often relies on findings during medicolegal autopsy, histopathological examination, and chemical analysis of the viscera. The gross and histopathological examination of stomach, which is the major site of onslaught, and a key site of absorption is of paramount importance in knowing the cause of death. Gross findings, such as the presence of foreign material or haemorrhagic lesions, can provide crucial insights into the aetiology of poisoning. Furthermore, histopathological examination of stomach tissue can reveal the nature and extent of tissue damage, as well as the characteristic features of specific poisonings[2].

This study primarily aimed to identify the effects of various poisonings on stomach wall by way of gross and histopathological examination of the gastric tissue. The other aims of the study included assessing the scope of *histopathological findings of stomach* as an exclusive criterion for diagnosis of various poisonings and correlation of stomach pathology findings with chemical analysis of viscera data.

Materials and Methods

The present study was conducted between August 2016 to August 2017 at Osmania General Hospital, Hyderabad. All the poisoning cases reported at the medico-legal centre during the said period were taken up for initial review. However, cases where chemical analysis of viscera turned out to be negative or inconclusive, cases where the samples preserved for histopathology got autolysed, cases with history of poisoning in advanced state of decomposition and cases where the patient survived more than hundred hours after poisoning and succumbed later were excluded from the final study.

All the tissue samples were subjected to histopathology processing using standard automated tissue processing and sections were made at the Department of Pathology, Gandhi Medical College, Secunderabad. The gross examination of stomach was conducted using a hand lens and the histopathology was studied using the standard Haematoxylin and Eosin staining technique.

The sociodemographic data of the cases, inquest, witness statements, chemical analysis of viscera reports were studied vis a vis gastric finding.

Results

Out of the total 4185 cases subjected to autopsy during the study period a total of 224 poisoning related deaths occurred constituting 5% of the total case work dealt with. However, the final study sample in accordance with the inclusion and exclusion criteria worked out to be a total of 118 cases. Organophosphorus compound poisoning is the most common one comprising 67.79% of the poisoning cases, seconded by 10.16% of corrosive poisonings, followed by 8.47% of alcohol intoxications, 6.76% of rodenticide poisonings, 2.54% of herbicide poisonings, 1.69% of metallic and organic poisonings each

35.6% of the sample were in 20-29 years age group, 21.2% in 30-39 years age group, 19.5% in 40-49 years age group, 9.3% in 50-59 years age group, 5.9% in 60-69 years age group, 4.2% were in 10-19 years age group, 2.5% in 70-79 years age group and 1.7% of the sample were in 0-9 years age group.

72% of the study group were male and 28% of them were female. 79.66% of the study group were married and 20.44% were unmarried. 42.4% of them belonged to rural areas and 57.6% of them belonged to urban areas. 72.9% of them were from nuclear families and 27.1% of them were from non-nuclear families.

The frequency of sample with respect to occupations was as follows, 21 each in business, student and home making vocations; 17 of them were daily wage labourers, 15 were farmers, 10 were privately employed, 5 were drivers, 4 each were in public employment and retired from service.

69.5% of the sample consumed poison at home, 8.5% on roads, 6.8% in agricultural fields, 6.7% at workplace, 5.7% at a public outlet, 1.7% at a hotel, 0.8% each at a hostel and in a train. The frequency of the sample with respect to motive for committing suicide was as follows, 34 for health problem, 30 for economic problems, 26 for family problems, 12 for marital disputes, 11 for failure in exams, 3 for love failure and 2 of them accidentally consumed the poison. The distribution of study group according to the survival period is, 40.7% of the study sample died at the spot or were brought dead to casualty, 30.5% of them lived for one to two days, 16.9% lived 4-5 days, 10.2% survived less than one day and 1.7% survived for 3-4 days. 98.30% of the cases were suicides and 1.69% of them were accidental poisonings. The gross findings in stomach in various poisons are tabulated in Table 1. The spectrum of histopathological changes seen in stomach are tabulated in Table 2.

Table 1 Gross changes in stomach mucosa in various poisons

Name of the poisons/ Gross Findings	Congestion	Haemorrhage	Erosion	Pale	Total Cases
Organophosphorus compounds	75	1	4	0	80
Corrosive Poisons	8	2	2	0	12
Rodenticides	3	0	1	0	4
Alcoholic Poisons	10	0	1	0	11
Herbicides	2	0	1	0	3
Organic Poisons	1	0	1	0	2
Metallic Poisons	1	0	1	0	2
Unknown	3	0	0	1	4
Total Cases	103	3	11	1	118

Table 2- Histopathological changes seen in stomach mucosa of various poisons

Name of Poisons/HPE	Congestion	Gastritis	Necrotic Changes	Sub Mucosal Haemorrhages	Total
Organophosphorus compounds	73	4	1	2	80
Corrosive Poisons	8	0	4	0	12
Rodenticides	3	0	0	1	4
Alcoholic intoxications	8	2	0	1	11
Herbicides	3	0	0	0	3
Organic Poisons	2	0	0	0	2
Metallic Poisons	2	0	0	0	2
Unknown Poisons	3	0	0	1	4
Total Cases	102	6	5	4	118

The distribution of study population according to modified Kuppuswamy scale is as follows, 41.52% lower middle category, 24.57% upper lower category, 16.94% lower category, 8.47 % each belonged to upper middle category and upper class. 81.4% of the study population belonged to Hindu religion, 9.3% were Christian, 8.79% were Muslim and 0.8% unknown.

Discussion

A total of 5% of cases reported at our medico legal centre during the study period were poisonings. This indicates the fact that poisonings are commonplace in our part of the world. The most common poisonings reported were organophosphorus compounds and aluminium phosphide group. This can be easily understood because agrochemical substances are on the top of the list of fatal poisonings in India. Our results in this area are concordant with other studies[3,4,5,6].

The maximum poisoning cases in the study were seen in 20-29 years age group and majority of them were men. It can be explicated because this particular age group is the most active phase of life for men who are exposed to physical, mental and social hazards to a maximum extent. Our results are concordant with other studies[4,7,8,9]. The male preponderance of poisoning cases reported at our institute is in consonance with other studies and is also a matter of common sense that men take risks and lead a carefree life, which can lead to failures and drive them to suicide[10,11,12,13]. 81.4% of the study population were Hindus, which is quite normal considering Indian religious profile and our results were similar to a study conducted by Mugadalimath et al[13].

About 79.66% of study population were married and reasons for suicide sprang out of the institution of marriage. This casts a serious aspersion on the institution of arranged marriage in India. Nevertheless, marriage can neither be avoided and nor prevented in a progressive society. Similar findings were observed by Mugadalimath et al and Nayak GH et al[13,14]. In case of married males, marital disharmony, family issues, unemployment and financial constraints were the main motive for committing suicide. Similarly, in case of married females, adjustment disorder post marriage and dowry harassment by husband and in-laws surfaced to be major motives. In case of unmarried males, frustration due to unemployment and love failures turned to be major motives, whereas failure to adjust to the physical and mental changes after attaining puberty and gender discrimination were identified as major drivers for suicide in unmarried females.

The preponderance of poison related fatalities in urban group could be because of the location of our medico legal centre in an urban area. When the pattern of family of the study population is taken into consideration, 72.9% of deaths occurred in nuclear families. It can be assumed that people living in nuclear families have less support from their elders, they face stress both at home and work which can often drive them to the extreme step of suicide[4,15,16]. 69.5% of study population consumed poison at home and it is quite natural that one chose one's own home for secrecy. Related results were observed in studies conducted by Sridhar PV et al and Farzaneh E et al[12,17].

Chronic illnesses and financial problems among the study population topped the list of reasons for committing suicide. Interestingly, anatomical stigmata of alleged chronic illness like pulmonary tuberculosis, gynaecological disorders were corroborated at autopsy. Amongst the financial factors, excessive debts and poverty were the apparent reasons, the underlying factors included extravagant lifestyle and attempts towards instant richness.

40.7% of the study group died due to poisoning on the spot or before reaching a health care facility. However, rest of the study group showed variation in survival time. There are umpteen number of poison variables like dose, potency etc. and individual factors like co-morbidities, age, ill health etc which influence the outcome of poisoning cases. 98.3% of poisonings were intentional. Equivalent results were observed in some studies[7,13]. The gross and histopathological findings in stomach were commensurate with the type of poison. Most of the agents cause congestion and inflammation of stomach mucosa/wall (Table

1 and Table 2). Haemorrhages were seen in 12 cases of insecticide poisoning. Combination of corrosion, perforation and softening of wall was seen in 3 cases of acid poisoning. The gross and histopathology findings in gastric mucosa in our study were similar to as described in standard sources[18,19,20].

Kerosene like odour was noted only in 15 out of 22 cases of insecticide poisoning. Smell of alcohol was perceivable only in 9 out of 16 cases of alcohol intoxication. In the remaining cases there was no specific odour to the poison consumed.

Gross and histopathological findings of few peculiar cases were presented as figures 1, 2, 3, 4 for the sake of reference.

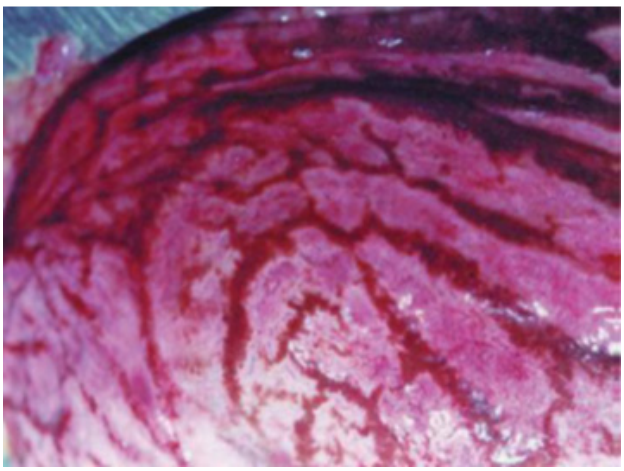

Figure 1: Stomach Gross: Pink, haemorrhagic, eroded gastric mucosa in cyanide poisoning

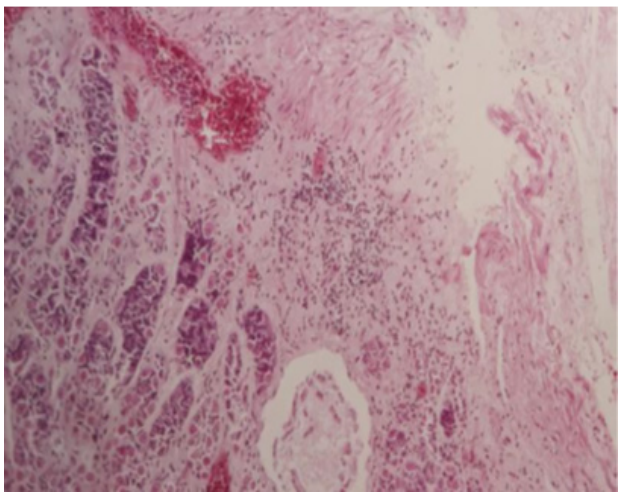

Figure 2: Stomach Histopathology, Haematoxylin & Eosin, Low Power: Vaso-congestion, haemorrhagic necrosis, epithelial desquamation with mucus precipitation in cyanide poisoning.

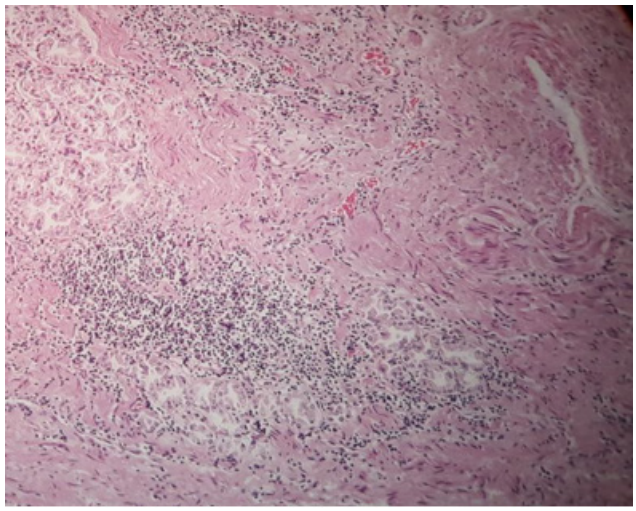

Figure 3: Stomach Histopathology, Haematoxylin & Eosin, Low Power: Submucosal haemorrhages and necrosis in rodenticide poisoning

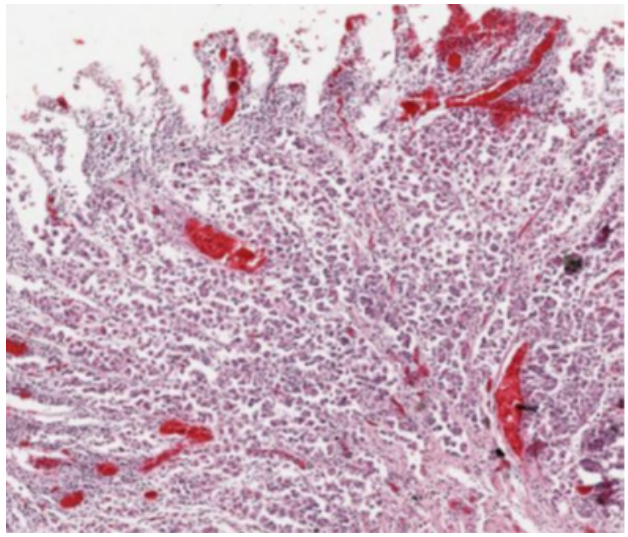

Figure 4: Stomach Histopathology, Haematoxylin & Eosin, Low Power: Sloughed off mucosa in corrosive poisoning.

Conclusion

It can be concluded that gross and histopathological findings alone cannot be used as a basis for diagnosing a particular type of poisoning. The combination of history, clinical findings, inquest, complete autopsy findings, gross and histopathological examination of stomach along with chemical analysis of viscera confirms the diagnosis of poisonings. However, the histopathological findings of stomach can guide us to corroborate period of survival post poisoning. The development of gastric

mucosa specific immunohistochemistry techniques in future can help us in on spot diagnosis of poisoning reducing the burden of transporting viscera samples for chemical analysis.

Limitations:

The study did not consider studying histopathology of major visceral organs *vis a vis* stomach in cases of poisoning which is idea worth pursuing. There are no other major limitations for the study as the aims were very precise and delineated.

Competing interests: None to declare

Financial Support: Nil

Ethics Committee Approval: Taken

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