A study on chemical analysis of toxic substances in Autopsy samples

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Abstract

The purpose of a toxicological investigation on postmortem specimens is to detect the presence of alcohol, drugs or other substances that could directly or indirectly be the cause of death. The collection of suitable and representative samples is an essential requirement. The present study is a retrospective study of chemical analysis of viscera collected from the medico-legal autopsies conducted at the Mortuary of Madras medical college, Chennai over a period of one year from 1st of January 2014 to 31st of December 2014. During this period, the number of autopsies done was 2332 and 492 visceral samples were sent for chemical analysis. Out of 492 cases, 398 cases belong to males which account for 80.9%, while female cases were 94 forming 19.1%. Out of 492 cases for which samples were sent for chemical analysis, 66 were tested positive for toxic substances. Of this 66poisoning cases, 46 cases had a history of poisoning, 5 were brought dead cases, 3 were RTA cases, 4 were hanging and 8 had a history of fall from height. Out of 136 suspected poisoning case, only 46 cases were positive constituting only 33.8% which could be attributed partly to the duration of hospitalization, time of sample collection, type of poisoning, the quantity consumed etc. The maximum death occurred in the age group of 20-40 years which needs attention.

Keywords: Visceral analysis, Poisoning, Suicidal, Homicidal and Brought Dead.

Introduction

Analytical toxicology deals with the detection and estimation of a variety of poisons in biological samples. The detection, quantification of toxic substances and their interpretation is influenced by various factors like age and weight of the diseased, sensitivity to the toxic substances and presence of other illness and trauma. A negative finding in the toxicological examination could be due to a wide variety of reasons like the quantity consumed, treatment given to eliminate or counter the toxicity, time between consumption of poison to sample collection and availability of methods to detect the various toxic substances. This study is concerned with the type of distribution of poison and the positivity percentage from the visceral samples collected from the Autopsies conducted at Madras Medical College, Chennai during the study period.

Material and methods

This study was done by retrospective analysis of postmortem records of autopsies done at Madras Medical College Chennai from 1st of January 2014 to 31st of December 2014. The autopsy cases wherein visceral samples sent for toxicological examination were included in this study. Descriptive analysis of the number of cases sent, case history, the toxicology report from Forensic Science Laboratory, Chennai, nature of poisons, positivity in each category of deaths was analyzed. The following visceral samples were collected for the analysis during the autopsy and sent for chemical analysis to The Forensic Science Laboratory, Chennai. Stomach and its Contents, Kidney (half of each kidney), Liver (100gm), Intestine (One foot of proximal part), Blood (50ml) and Brain (half).

Observation and results

The number of autopsies done in the study period was 2332 and the number of visceral samples sent for chemical analysis was 492. The age and sex distribution of cases were given in Table-1. Categorization of cases based on the cause of death and the numbers in each category is given in Table-2. The number of samples tested positive was 66 which contribute 13% of the samples sent. Out of 66 positive cases, 27 cases were positive for Organophosphorus compounds, 22 cases for ethyl alcohol, 9 cases for acid substances and the remaining 10cases were positive for oleander, cyanide, zinc phosphide, paraquat, monocrotophosphate, quinophosphate, dicholorovas and odovan Poisoning each. 2 cases were positive for both OPC and Alcohol. The types of toxic substances detected in the samples according to the age of deceased are given in Table 3.

Table 1: Age and sex wise distribution of cases

S. No.	Age in years	Male	Female
1	0-10	5	6
2	11-20	23	13
3	21-30	106	36
4	31-40	75	16
5	41-50	91	7
6	51-60	56	9
7	61 -70	35	4
8	71 and above	7	3

Table 2: Distribution of visceral samples case wise

S. No	Type of cases	No of cases
1	Poisoning	136
2	Brought dead	119
3	Fall from Height	60
4	Hanging	49
5	Assault	33
6	Road traffic accident	29
7	Snake bite	23
8	Drowning	11
9	Electrocution	11
10	others	21

Table 3: Age wise distribution of various poisons

Age in Years	Alcohol Male	Alcohol Female	OPC Male	OPC Female	Acid Male	Acid Female	OPC with Alcohol Male	OPC with Alcohol Female	Others Male	Others Female
0-10	0	0	0	1	0	0	0	0	0	0
11-20	0	0	2	1	0	0	0	0	1	0
21-30	8	0	7	2	1	1	0	0	3	1
31-40	4	0	1	0	1	2	0	1	0	0
41-50	4	0	6	0	0	0	1	0	2	1
51-60	2	0	2	1	0	0	0	0	0	0
61-70	1	0	2	0	2	1	0	0	2	0
71 and above	1	0	0	0	0	1	0	0	0	0

Discussion

In this study out of 492 cases for which Visceral samples were sent for 136 had a history of poisoning, 119 were brought dead to the hospital with no obvious cause of death, 29 cases were Road traffic accidents, 49 cases history were Hanging cases, 60 had history of fall, 11 were electrocution, 11 were drowning, 33 had history of assault, 23 were snake bite and 21 cases from causes including judicial enquiry. Out of 492 samples sent for analysis, 66 samples came with positive results constituting about 13%. From 136 Samples sent from cases with the history of poisoning, 44 samples yielded positive results constituting about 32.3%. Similarly in the samples with history of fall, 8 came as positive with13%, in road traffic accident case, 3 samples turned out positive out of 29 cases with 10.3% positivity, 119 samples from brought dead cases were 5 were positive with 4.2%, and in cases hanging 4 samples were positive out of 49 cases (8%).

In the 60 samples collected with the history of fall from the height, 52 were of males and 8 belonged to the females. The positive 8 cases in this group constituting about 13% showed positive results for alcohol and all were males. The history showed that the incidents occurred while working. Out of 8 positive cases, 5 were in the age group of 20-40 years.

Similarly, in the samples collected from road traffic accident cases, 3 were positive for alcohol and 2 out of 3 were in the age group of 20-40 years.

In poisoning cases, 54 out of 136 cases (39.8%) were in the age group of 21-30 years. Out of 44 cases which were positive for toxic substances, 26 were positive for organ phosphorus compounds, 7 for acid substances, 2 each for oleander and organophosphorus with ethyl alcohol poisoning and 1 case each for cyanide, zinc phosphide, paraquat, monocrotophosphate, quinophosphate, dicholorovas and odovan poisoning.

As given in table-1, 21-30 years group forms about 28.9%, 31-40 years group forms 18.4% and 41-50 years age group forms 19.9 %. In poisoning cases, the maximum cases were found in 21-30 years. In India majority of death due to fatal poisoning are males in the age group of 10-30 years belonging to low socioeconomic status from a rural area.

A negative finding in the toxicological examination could be due to a wide variety of reasons like the quantity consumed, treatment given to eliminate or counter the toxicity, the time gap between consumption of poison to sample collection and availability of methods to detect the various toxic substances.

Conclusion

1. The toxicological analysis of viscera was carried out in 21% of autopsies done to ascertain the cause/ contributor to death.
2. Positivity for toxic substances was reported in 66 (13%) samples out of 492 samples sent.

3. 48.5% of positive samples were in the 21-40 years age group and a majority of them were males.
4. Organophosphorus and alcohol positivity forms74% of the positive cases.

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