MEDICOLEGAL STUDY OF DROWNING DEATHS

Anindya A. Mukherjee¹, Shailendra G. Dhawane², Shashikant V. Doble³

¹Professor and HOD, Department of Forensic Medicine & Toxicology, GMC, Nagpur.
²Professor and HOD, Department of Forensic Medicine & Toxicology, GMC, Chandrapur.
³Assistant Professor, Department of Forensic Medicine & Toxicology, GMC, Chandrapur.

ABSTRACT

BACKGROUND

It is a common occurrence in our country to be drowned, it is not necessary that the whole body should be under water. In a classic case of drowning, full submersion does not occur all at a time. The autopsy diagnosis of drowning represents one of the major problems in forensic medicine.

OBJECTIVE

The purpose of the present study was to study autopsy finding in drowning and conclude manner of death.

METHODOLOGY

It was a 2yr prospective study of drowning cases at the Department of Forensic Medicine IGGMC Nagpur during period from Mar-1997 to Apr-1999.

RESULT

Total 70 cases were brought at IGGMC Nagpur. It is found that higher frequency of age group is present in the 21-30 years which is 27.1 % cases, male predominated and 37.14 % were accidental in nature.

CONCLUSION

This study reveals that majority drowning cases belonged to male, adolescent age group & accidental in manner of death.

KEYWORDS

Drowning, Autopsy, Accidental.


INTRODUCTION

Drowning is defined as the situation in which an individual experiences a deterioration in respiratory function due to submersion in a liquid medium.¹

Drowning is a form of asphyxial death when the respiratory passage is occupied by fluid or water, due to submersion under water and inhalation of water. It is a common occurrence in our country to be drowned, it is not necessary that the whole body should be under water. Submersion of mouth and nasal opening by any means is sufficient for that purpose.²

Death by drowning is due to the inhalation of the liquid medium (usually water) and may occur immediately or after some time. According to data from the Global Burden of Disease, during 2000 around 449,000 individuals died of drowning worldwide, while drowning also cost 1.3 million years of lost life and disability.³

When a person is pulled from the water dead, or is found alive but dies later, it should not be assumed that the death was due to drowning. In fact, the investigation of these cases is one of the most difficult in forensic medicine.⁴

Accidental drowning occurs often in India, nearly 40,000 Indians die annually from drowning. It occurs occasionally among swimmers due to their rashness in swimming, but it occurs mostly in non-swimmers who venture to go beyond their depth in the sea, rivers, canals and lakes. Many lives are lost during floods, which are so frequent. It also occurs among persons at bathing places while bathing in deep water. Females may fall accidentally into a well while drawing water from it. Children may also accidentally fall into ponds or lakes while playing near their banks. They may even fall accidentally into domestic vessels of water, such as water tanks, bathtubs and buckets. Accidental drowning in shallow water is very rare, except when the individual happens to be intoxicated, insane or epileptic.⁵

MATERIAL AND METHODS:

This was a 2yr prospective study of asphyxial deaths from which drowning cases have been sorted out, studied, analyzed and tabulated. Study was performed in department of Forensic Medicine & Toxicology at IGGMC Nagpur during Mar-1997 to Apr-1999.

OBJECTIVES OF STUDY ARE AS FOLLOWS

1. To study the manner of death and categories whether the form of asphyxial deaths were accidental, suicidal or homicidal in nature.
2. To confirm whether the drowning was antemortem in nature
3. To study the specific findings of drowning deaths in postmortem examination.
4. To confirm whether any other associated cause of death was present or not.
5. To study the cases of violent asphyxial deaths keeping in mind the possibility of vagal inhibition as the cause of death in cases of violent asphyxia like drowning.
6. To confirm whether the history and supposed cause of death that is given by investigating authorities are consistent with postmortem findings.

In summation, the present study is directed to study the medico-legal aspects of violent asphyxial deaths special reference to drowning, keeping in mind its practical applicability and the effort we can take to help the investigating authorities.

**OBSERVATION & RESULTS**

The present study has been performed on 165 cases of total asphyxial deaths which were brought to Indira Gandhi Medical College & Hospital, Nagpur for routine medico legal autopsy.

Table No. 1 showing sex-wise distribution of cause and manner of asphyxial deaths, Out of total of 165 cases that were studied, 119 (72.12 %) were males & 46 (27.88%) were females.

Thus it is obvious that the majority of cases reported for postmortem examination were males.

Table showing Drowning accounted for 70 (42.42%) of cases. Out of the total of 70 cases of drowning, 50 (71.43%) were males & 20 (28.57%) were females.

Table showing the distribution various types of violent asphyxial deaths with respect to manner of deaths as per police in total of 70 cases studied.

Out of the total of 70 cases of drowning, it was found that 26 cases (37.14%) were accidental, 19 cases (27.14%) were suicidal and in 25 cases (35.72%) the police could not ascertain the manner of death.

Significantly we did not find any case of homicidal drowning.

When the suicidal % accidental manner of death was compared with other manner of deaths in cases of drowning by applying chi square test, it was found to be statistically highly significant ($\chi^2 = 106.12, \text{d.f} = 1, p < 0.00001$) indicating that majority of cases of drowning are accidental or suicidal in nature.

Table No. 2 showed the sex and age wise distribution drowning where the incidence of drowning was found in all age groups. It was seen that 5 cases (7.14%) belonged to 1 – 10 yrs. of age groups, 11 cases (15.71%) belonged to 11 – 20 yrs. age groups, 19 cases (27.14%) belonged to 21 – 30 yrs. age groups, 14 cases (20%) belonged to 31 – 40 yrs. age groups, 9 cases (12.86%) belonged to 41 – 50 yrs. age groups, 7 cases (10%) belonged to 51 – 60 yrs. age groups, 2 cases (2.86%) belonged to 61 – 70 yrs. age groups, 2 cases (2.86%) belonged to 71 – 80 yrs. age groups, 1 cases (1.43%) belonged to 81 – 90 yrs. age groups.

Thus the maximum number of cases studied belonged to the age group of 21 – 30 yrs. and the minimum number of the cases were reported in age group of 81 – 90 yrs.

Table No. 3 Showed The postmortem findings drowning cases, out of the total of 70 cases of drowning, cyanosis was observed in 44 (62.85%). Oozing of whitish to pinkish froth, copious in amount from mouth and nostrils was found in 57 (81.42%) cases.

Postmortem lividity was found typically over face, neck & front of trunk in 14 (20%) cases. Purging of urine or semen or faeces was observed in 29 (41.42%) cases.

Cuts anserine was observed in 25 (35.71%) cases and washer woman's hands & feet were observed in 23 (32.85%) cases. The presence of petechial haemorrhages, externally over conjunctivae was found in 9 (12.85%) cases.

Internal petechial haemorrhages over pleura, pericardium, under scalp and over lungs in the interlobar areas were found in 46 (65.71%) cases.

In all the 70 cases we observed the presence of heavy voluminous, oedematous and congested lungs with weight of either lung above 500 gm with presence of copious amount of whitish, fine, leathery froth oozing out freely on cut section. Significantly, we did not find any case of dry drowning. The presence of water in stomach and first part of small intestine was observed in 51 (72.85%) of cases.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Number of Cases Studied</th>
<th>Male</th>
<th>Percentage</th>
<th>Female</th>
<th>Percentage</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Asphyxial Deaths</td>
<td>119</td>
<td>(72.12 %)</td>
<td>46</td>
<td>(27.88%)</td>
<td>165</td>
</tr>
<tr>
<td>2</td>
<td>Drowning</td>
<td>50</td>
<td>(71.43%)</td>
<td>20</td>
<td>(28.57%)</td>
<td>70</td>
</tr>
</tbody>
</table>

**Table 1: Showing sex-wise distribution of cause and manner of asphyxial deaths**

($\chi^2 = 106.12, \text{d.f} = 1, p < 0.00001$)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Age Groups in Years</th>
<th>Male</th>
<th>Female</th>
<th>Total No. of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>01 – 10</td>
<td>4</td>
<td>1</td>
<td>5 (7.14%)</td>
</tr>
<tr>
<td>2</td>
<td>11 – 20</td>
<td>7</td>
<td>4</td>
<td>11 (15.71%)</td>
</tr>
<tr>
<td>3</td>
<td>21 – 30</td>
<td>13</td>
<td>6</td>
<td>19 (27.1%)</td>
</tr>
<tr>
<td>4</td>
<td>31 – 40</td>
<td>9</td>
<td>5</td>
<td>14 (20%)</td>
</tr>
<tr>
<td>5</td>
<td>41 – 50</td>
<td>7</td>
<td>2</td>
<td>9 (12.86%)</td>
</tr>
</tbody>
</table>

**Table 2: The sex and age wise distribution of 70 cases of drowning**

(* Number showed in parenthesis denote percentage*)
According to Mason JK, Drowning is defined as the impairment of tissue oxygenation consequent to submersion in a fluid medium. According to Mason JK, the precise number of drowning fatalities on a world wide basis is uncertain but is probably around 140,000 people per year. The trend is increasing world wide due to increase in water transport, and adventure water sports.

According to Modi, Accidental drowning occurs often in India, nearly 40, 000 Indians die annually from drowning. It occurs occasionally among swimmers due to rashness in swimming, but it occurs mostly in non-swimmers who venture to go beyond their dept. In sea, rivers, canals, and lakes etc.

Amandee found in India drowning occupies the first position of all models of committing suicide. In his study of 231 cases of suicide, 90 were due to drowning. Indian females, even on the least provocation, commit suicide by jumping into a well or a tank in the neighbourhood.

In our study of total of 70 cases of drowning, 50 (71.43%) were males & 20 (28.57%) were females. In all age groups males predominated.

Similar findings of male predominance were also noted in observations made by Sayed ZAT, Chormunge et al, Amandee Singh et al, Salachin et al, Gross V et al, Momanchand et al, and Srivinasa Reddy.

In present study, it was also found that 26 cases (37.14) were accidental and 19 cases (27.14%) were suicidal and in 25 cases (35.72%) police did not ascertain the manner of death.

Thus when the suicidal and accidental manner of death was compared with the others in cases of drowning by applying chi square test, it was found to be statistically significant (P<0.0001) indicating that majority of cases of drowning are accidental or suicidal in nature. Homicidal drowning is rare.

Our observations in this regard are consistent with observations of Singh B et al, Bernard Knight, Mason JK, Modi JP, Mukherjee JB, and Nandy.

In our study, we found most common incidence of drowning in age groups to 21 – 30 yrs i.e. 19 cases (27.14%) followed by age group 31-40 yrs i.e. 14 cases (20%) and least common i.e. 1 case (1.43%) belonged to 81 – 90 yrs. age group. Thus the maximum number of cases studied belonged to the age group of 21 – 30 yrs. and the minimum numbers of the cases were reported in age group of 81-90 yrs. When the above observation was analysed we found that 53 cases (73.71%) belonged to age range of 11 to 50 yrs. Thus incidence of drowning was found to be less in very young age, it increases from adolescence to late middle age and again it drastically falls in old age.

The probable explanation to the above may be that as drowning deaths are mostly suicidal and accidental in nature, the age group 11- 50 yrs. are more vulnerable as this age is more prone to accidents in water during adventure sports, travels and swimming. The challenges and struggle for livelihood in adolescents, frustrations due to failure of high ambitions and in love affairs males them more prone for suicide.

Our observations in this regard is consistent with the observation of Singh B et al. This was similar to findings of the study done by Sayed ZAT et al, Chormunge et al, Dattarwal JK et al, and Srivinasa Reddy.

Study of M H Chowdhary et al found that Highest age group in drowning was the 0-10 years.

In our study, we have examined 70 cases of drowning in detail. The following were the salient features of drowning observed, Cutis Anserina i.e the appearance of ‘gooseflesh’ due to contraction of the erector muscles of hair is well known phenomenon. In our study we observed cutis anserine in 25 (35.71%) cases.

Washer women’s hands and feet-a-change of prolonged immersion leading to whitening and wrinkling of skin, particularly on the palmer surfaces of hands and soles of feet. In our study, we found washerwoman’s hands and feet in 23(32.85%) cases.

Our findings in this regard are consistent with Mason JK, Bernard Knight, Mukherjee JB, Modi JP, and Nandy.

In drowning, because the center of gravity of the body is towards the head, the body of a drowned victim usually floats partly head down in water. Dependent lividity may then develop over face, neck and upper part of trunk if the body is floating in such head down position and the lividity which get fixed in 5 – 6 hrs. But, if the body is recovered and lain in supine position, before the fixation of postmortem lividity then such a typical pattern of lividity may not be found. In our study, we found postmortem lividity over face, neck and front of trunk in 14 (20%) cases.

Another significant finding of antemortem drowning is the presence of white coloured or slightly blood tinged, fine frothy and tenacious foam oozing out. The froth consists of a whipped up mixture of drowning medium, air and secretions from bronchial mucous glands. The amount of foam evident externally may increase in volume for a brief period after
death as rigor mortis compresses the chest. In our study, we had found the same in 57 (81.42%) cases. During the postmortem examination when the chest was compressed, the typical thin, leathery, tenacious froth of drowning came out from mouth and nostrils in remaining 13 cases (18.58%).

On postmortem examination the lungs were found to be heavy, voluminous, oedematous and congested with weight of either lung above 500 gms. On cut section there was copious amount of whitish, fine leathery froth oozing out freely.

Our findings in this regard are consistent with Mason JK, Bernard Knight, Modi JP, Mukherjee JB and Nandy. The presence of water in stomach and small intestine was observed in 51 (72.85%) cases. Purging of either urine, semen and faeces was observed in 29 (41.42%) cases.

Other findings like cyanosis in 44 (62.85%) cases, external petechial haemorrhages over conjunctiva in 9 (12.85%) cases, internal petechial haemorrhages over lungs, pleura, pericardium and under scalp in 46 (65.71%) cases persistent fluidity of blood was observed in all the 70 cases, are consistent with that of death due to asphyxia.

As we have discussed earlier the importance of petechial haemorrhages in asphyxia. A noteworthy point in this regard is that the external petechial haemorrhages were observed over face, forehead and conjunctiva in drowning is observed in 9 (12.85%) cases.

Similar finding like Wet body and cloths, Presence of mud & sand on, Copious fine leathery white froth, Lungs voluminous, edematous. Presence of mud and sand in GIT also found in study of M H Chowdhary et al.

CONCLUSION
This study reveals that out of all asphyxial deaths 42% cases were victims of drowning, majority drowning cases belonged to male 71.43%, in adolescent age group i.e. 21-30 yrs. 27.14% & accidental 37.14% in manner of death.

ACKNOWLEDGMENT
Author would like to thanks my teachers and Professor in Department of Forensic Medicine and Toxicology at Government Medical College, IGGMC Nagpur & GMC Chandrapur.

REFERENCES