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Original Research

A Retrospective Study to assess changes in body after death due to drowning

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ABSTRACT:

Introduction: Determining the cause of death in bodies found in water is quite challenging which can be achieved with thorough investigation and complete autopsy after which only the doctor certifies a death based on drowning. The experts in the field of Forensic Medicine are facing difficulties in estimation of time, cause and mode of death. Hence, the present study aimed to analyse the various aspects of drowning deaths whose Post Mortem were conducted in the mortuary. **Material and Methods**: The present study was a retrospective study which was conducted among 90 dead subjects. All the dead bodies recovered from different sources of submersion irrespective of age or sex and either with fresh or decomposed bodies were included in this study. The study was carried in the year 2019 to analyse various aspects of deaths due to drowning. **Results**: The majority of the subjects with drowning were 80% of the males followed by 143% of the females. The place of drowning was found to be in rivers (56.66%), lakes (27.7%), wells, ponds (14.53%) and swimming pools (1.11). **Conclusion:** Drowning has become an undervalued problem. Hence, there is a necessity for prevention among all the ages by the government so that overall burden caused by drowning can be reduced.

Key words: autopsy, drowning, external changes, internal changes.

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INTRODUCTION:

One of the most classical definitions is provided by Roll: ‘‘death by drowning is the result of a hampering of the respiration by obstruction of mouth and nose by a fluid medium (usually water)". Drowning is a form of asphyxiation death. It is a silent killer where people while drowning may not be able to call for help, as they are expending energy to breathe or to keep their head above water.[1]

World Health Organization described, drowning as serious and neglected public health problem. Near about 42 people every hour and 3.7 lakh every year die from drowning in the world. In India out of total cases of unnatural deaths 9.4% were died due to drowning, this was the second most common after road traffic accidents.[2]

It must be appreciated, at the outset, which not all persons whose bodies are recovered from water will have died from its inhalation, although they may show features reflecting immersion in water. Such bodies should therefore be particularly carefully examined, both externally and internally, to catalogue (and subsequently to explain satisfactorily) all injuries present, to determine whether death indeed followed immersion in the water, and to see whether any natural disease, such as ischaemic heart disease, cerebrovascular disease, and hypertension, may have contributed to, precipitated, or even caused death.[3] It is also important to determine whether the deceased was under the influence of alcohol or other drugs at the time of death (although interpretation of laboratory results should be influenced by the knowledge that, as discussed below, classic fresh water drowning may increase the blood volume by as much as 30-35%. Forensic expert has a vital role in determining, from all pathological and circumstantial

evidence available, whether the overall findings are consistent with or even point directly towards accident, suicide, or homicide.[4]

The experts in the field of Forensic Medicine are facing difficulties in estimation of time, cause and mode of death. Hence, the present study aimed to analyse the various aspects of drowning deaths whose Post Mortem were conducted in the mortuary of Hind Institute of Medical Sciences Ataria Sitapur, U.P., India

MATERIALS AND METHODS:

The present study was a retrospective study which was conducted among 90 dead subjects. All the dead bodies recovered from different sources of submersion irrespective of age or sex and either with fresh or decomposed bodies were included in this study. The study was carried out to analyse various aspects of deaths due to drowning.

Detailed history related to place of the incident, type of water body, position of the body and other relevant findings were obtained from the previous records. During post mortem examination, condition of clothing, skin changes, examination of natural orifices, injuries on body and cadaveric spasm were studied. All the three principle cavities were examined. The presence and quantity of fluid in the paranasal sinuses was evaluated. The quantity was expressed in one of three following categories: 1-2 mm fluid, more than 2 mm but less than 50% or filled equal or more than 50% of the volume of the sinus. The thickness of the mucosa was assessed as normal.

Statistical Analysis The statistical analysis was performed by using SPSS software version 21. The descriptive statistics was used as percentages and is presented in the form of tables and graphs.

RESULTS:

The majority of the subjects with drowning were 80% of the males followed by 20% of the females. The place of drowning was found to be in rivers (56.66%), lakes (27.7%), wells, ponds (14.53%) and swimming pools (1.11%). The drowning deaths were commonly seen in age groups of 21-30 years 36(40%) followed by 31- 40 years 33(36.66%) and 41-50 years 21(23.33%).

DISCUSSION:

The death mechanism of drowning is quite complicated with the involvement of asphyxia and filling of the airways with fluid along with effects at hydrostatic and osmotic level. It is considered that certain victims may suffer airway obstruction from laryngeal spasm or due to vagal inhibition. The time from immersion to cardiac arrest lasts from seconds to minutes but it is increased in cold environments.[5] The findings in autopsy among drowning cases is usually characteristic and is not diagnostic in many cases. The first observations may be sand, weeds, grass or other vegetation covering the body, wrinkling of the skin of the hands and feet (so-called ‘‘washer-woman’’ changes), and injuries to the dorsum of the feet and to the knees which are seen externally.

Table 1: External features in autopsy among the subjects

External feature in autopsy	Number (%)
Cutis Anserina	5 (5.55%)
Froth at the mouth and nostrils	37 (41.11%)
Soddening	50 (55.55%)
Degloving	2 (2.22%)
Congested conjunctiva	29 (32.22%)
Bluish finger nails and lips	25 (27.77%)

Table 2: Internal features in autopsy among the subjects

Internal features in autopsy	Number (%)
Froth in trachea	19 (21.11%)
Mud in trachea	6 (6.66)
Froth in larynx	15 (16.66%)
Voluminous lungs	62 (68.88%)
Emphysema Aquosum	25 (27.77%)
Rib markings on lungs	43 (47.77%)
Paltauf’s haemorrhages	10 (11.11%)
Aorta staining	2(2.22%)

Table 3: Amount of fluid in pleural cavity

Amount of fluid in pleural cavity	Number (%)
<100ml	7 (7.77%)
100 to <200ml	53 (58.88%)
200 to < 300 ml	15 (16.66%)
300 to < 400ml	11(12.22%)
>400ml	4 (4.44%)

However, these findings merely show that a body has been submerged, instead has been traumatized by dragging across a river or hit against the rock bottom.[6]
In the present study the drowning deaths were predominantly seen in male (86%) with male: female ratio of 4:1. The drowning deaths were commonly seen in age groups of 21-30 years 36(40%) followed by 31- 40 years 33(36.66%) and 41-50 years 21(23.33%). The findings of our study are in concordance with study done by Phad LG and Dhawane SG[2] and Pathak A and Mangal H[7.]
The probable reason behind preponderance of 21-30 years age group in drowning is carelessness and adventurous nature usually seen in youngsters while swimming or doing recreational activities in or around water source leading to accidental deaths. This is followed by the age group of 31-40 years; it may be due to familial and financial problems arising in life and their inability to deal with them.[2]
Failure to locate a body quickly may lead to extensive changes because of decomposition and post mortem predation of animal. Variety of animals such as aquatic fauna and fishes can harm the body significantly leading to change in shape of the body.[8]
Autopsy performance affords external and internal access to much of the anatomy to assess for findings of drowning.[9] Excessive fluid and sedimentous material in the sinuses and cavities of the head and chest, oropharynx, lungs, stomach, and small intestine have been identified in drownings. Identification of density differences as result of hemodilution or hemoconcentration in viscera have been used in the differentiation of fresh versus saltwater drownings.[3]
Study of Diatoms and electrolytes is often quoted as providing evidence for drowning. In practice, both are difficult to perform and to interpret, with many false positive and false negative results.[10]
In bodies without significant decomposition or prolonged resuscitation, the typical findings associated with drowning are more easily identified.[11]
External findings in drowning deaths vary and are both nonspecific and nondiagnostic. Some findings are merely indicative of a period submersion in which there has been contact with water of sufficient time to cause visible changes.[12] In the present study external features present during autopsy were Cutis Anserina (5.55%), Froth at the mouth and nostrils (41.11%), Soddening (55.55%), degloving (2.22%), Congested conjunctiva (32.22%) and Bluish finger nails and lips (27.77%).
Exudation of a column of white or pink froth from the nostrils and/or mouth is often apparent or becomes apparent by simply pressing down on the chest.[11]
Internal features present were froath in trachea (21.11%), Mud in trachea (6.66%), Froth in larynx (16.66%), Voluminous lungs (68.88%), Emphysema Aquosum (27.77%), Rib markings on lungs (47.77%), Paltauf's haemorrhages (11.11%) and Aorta staining (2.22%).
With increased postmortem submersion intervals, inclusive of decompositional changes, decreased lung weights along with increased amounts of pleural fluid have been described.[13]
Death scenes involving submerged bodies warrant the response of medicolegal death scene investigators, forensic experts, and other professionals with varied forensic scientific expertise. The extent of their involvement is dictated by the death circumstances.

CONCLUSION:
Drowning has become an undervalued problem. Hence, there is a necessity for prevention among all the ages by the government so that overall burden caused by drowning can be reduced.

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