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Original Research Article

Study of Post Mortem Findings in Deaths Due to Drowning

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Abstract

Background: The autopsy diagnosis of death by drowning is the most difficult problem in forensic pathology due to the delayed approach to medico-legal experts because of delays in transport and rituals of society.

Method: 80 dead bodies aged between 10-75 years death due to drowning (50 male and 30 female) were studied by autopsy. The places of drowning and external and internal post-mortem findings were recorded in both sexes.

Results: 45 (56.2%) drowning in lakes/rivers, 10 (12.5%) in wells, 21 (26.2%) in house tanks, and 4 (5%) in swimming pools. In external post-mortem findings, the highest was injury 40 (50%) followed by 31 (38.7%) froth around the mouth/nostril, and the least finding was 2 (2.5%) mud/sand in nails. In internal post-mortem findings, the highest was 73 (91.2%) voluminous lungs, followed by 58.7% mud/sand/salt in the larynx; 8 (10%) had the least internal injury.

Conclusion: The present study of autopsy will certainly help the medico-legal expert to differentiate homicide and suicide in drowning deaths.

Keywords: Suicide, Asphyxia, Forth, Drowning, Homicide.

Introduction

There are a lot of water resources like lakes, rivers, ponds, and wells in India. In such an awesome environment, it is but natural that deaths due to drowning are a most frequent event [1]. The medico-legal expert has to investigate the cause of death. It is reported that about 40000 Indians die from drowning every year. It may occur occasionally among swimmers due to their rashness in swimming, but it may occur mostly in non-swimmers who venture to go beyond their depth in rivers, canals, lakes, and seas [2].

Many lives are lost during floods, which are also frequent water calamities in India. It may occur casually while bathing in deep water; children and females may fall accidentally into the well ponds or rivers while bathing or filling water in vessels [3]. Accidental drowning in shallow water is very exceptional or rare except when the individual happens to be intoxicated, insane, or epileptic. The autopsy diagnosis of death by drowning is one of the most difficult problems in forensic pathology because the dead bodies are delayed for autopsy due to transport and ritual formalities in Indian societies [4]. Hence, an attempt is made to evaluate the autopsy to rule out the cause of drowning.

Material and Methods

80 (eighty dead bodies, 50 male and 30 female) aged between 10 years and 75 years were brought to the Forensic Medicine and Toxicology department of Sri Manakula Vinayagar Medical College Hospital, Pondicherry-605107, and were studied.

Method

Detailed information pertaining to epidemiological factors and external and internal findings, such as the presence of froth, signs of asphyxia, cadaveric spasm, the presence of mud/sand on the body/nails in the larynx and trachea, and changes in the lungs was observed and noted.

The duration of the study was from September 2023 to October 2025.

Statistical Analysis: Various places of drowning, external post-mortem, and internal post-mortem findings in both sexes were recorded. The statistical analysis was carried out in SPSS software. The ratio of male to female was 2:1.

Observation and Results

Table-1:

Study of places of occurrence of Drowning

- Lakes / rivers: 30 males, 15 females, total 45 (56.2%)
- Wells: 8 males, 2 females, total 10 (12.5)
- House tanks: 12 males, 9 females, total 21 (26.2%)
- Swimming pool: 2 males, 2 females, total 4 (5%)

Table-2: Study of external post-mortem findings

- Froth around mouth and Nostrils: 28 males, 3 females, total 31 (38.7%)
- Mud/Sandy body: 13 males, 2 females, total 15 (18.7%)
- Mud/Sandy nails: 1 male, 1 female, total 2 (2.5%)
- Sign of asphyxia: 25 males, 3 females, total 28 (35%)
- Sign of injury: 38 males, 2 females, total 40 (50%)

Table-3: Study of internal post-mortem findings

- Forth larynx / trachea: 21 males, 3 females, total 24 (30%)
- Mud/sand/salt etc. In the largnx: 43 males, 4 females, total 47 (58.7%)
- Lungs voluminous: 68 males, 5 females, total 73 (91.2%)
- Stomach content water: 10 males, 3 females, total 13 (16.2%)
- Stomach content food: 14 males only (17.2%)
- Injury 8 males only (10%).

Table 1: Study of places of occurrence (Total No. of cases 80)

Sl No	Places of occurrence	Male (50)	Female (30)	Total No of cases	Percentage %
1	Lakes / Rivers	30	15	45	56.2
2	Wells	8	2	10	12.5
3	House Tanks	12	9	21	26.2
4	Swimming pools	2	2	4	5

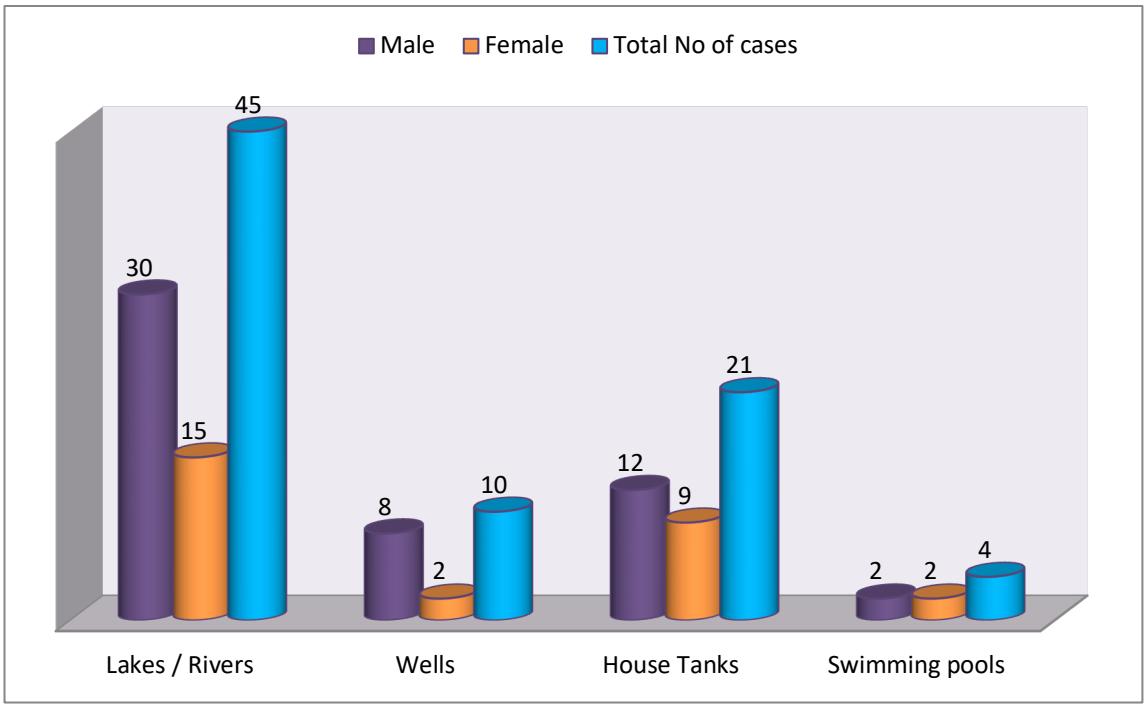

Figure 1:

Table – 2: Study of external post-mortem Findings

Sl. No	External Findings	Male (50)	Female (30)	Total (80)	Percentage %
1	Froth around mouth/Nostrils	28	3	31	38.7%
2	Mud/Sandy Body	13	2	15	18.7%
3	Mud/sandy Nails	1	1	2	2.5%
4	Sign of asphyxia	25	3	28	35%
5	Sign of injury	38	2	40	50%

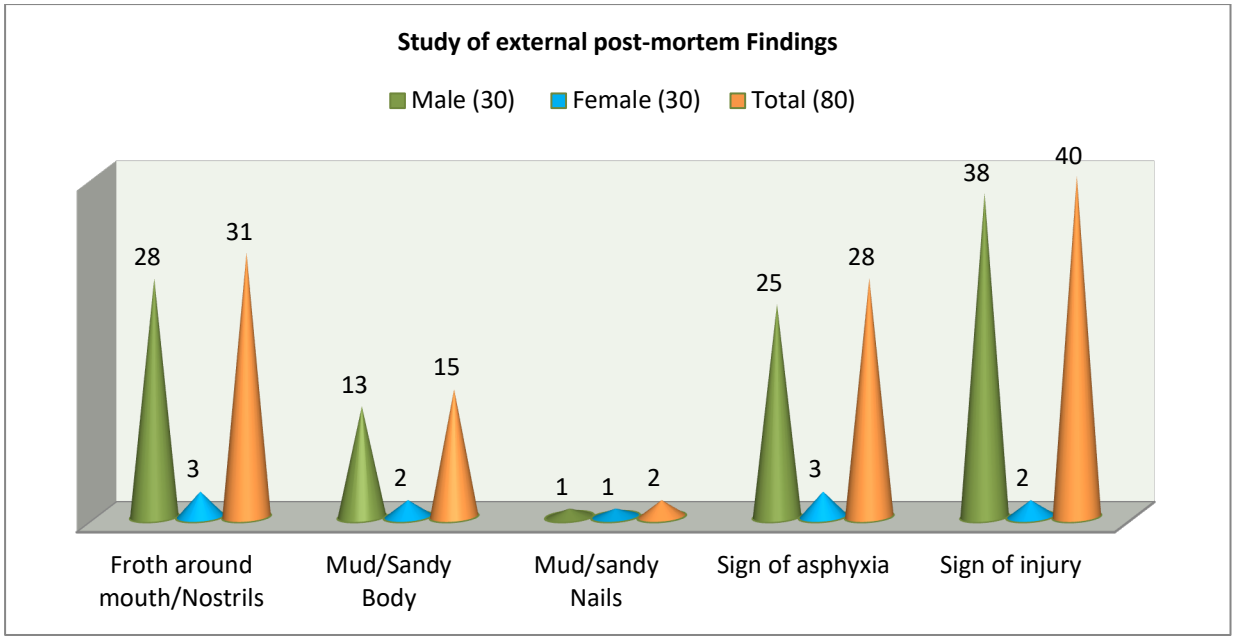

Figure 2: Study of external post-mortem Findings

Table 3: Study of internal post-mortem findings

Sl. No	Internal Findings	Male (50)	Female (30)	Total (80)	Percentage %
1	Forth larynx / trachea	21	3	24	30%
2	Mud / sand / salt etc in larynx	43	4	47	58.7%
3	Lungs voluminous	68	5	73	91.2%
4	Stomach content water	10	3	13	16.2%
5	Stomach content Food	14	--	14	17.2%
6	Injury	8	--	8	10%

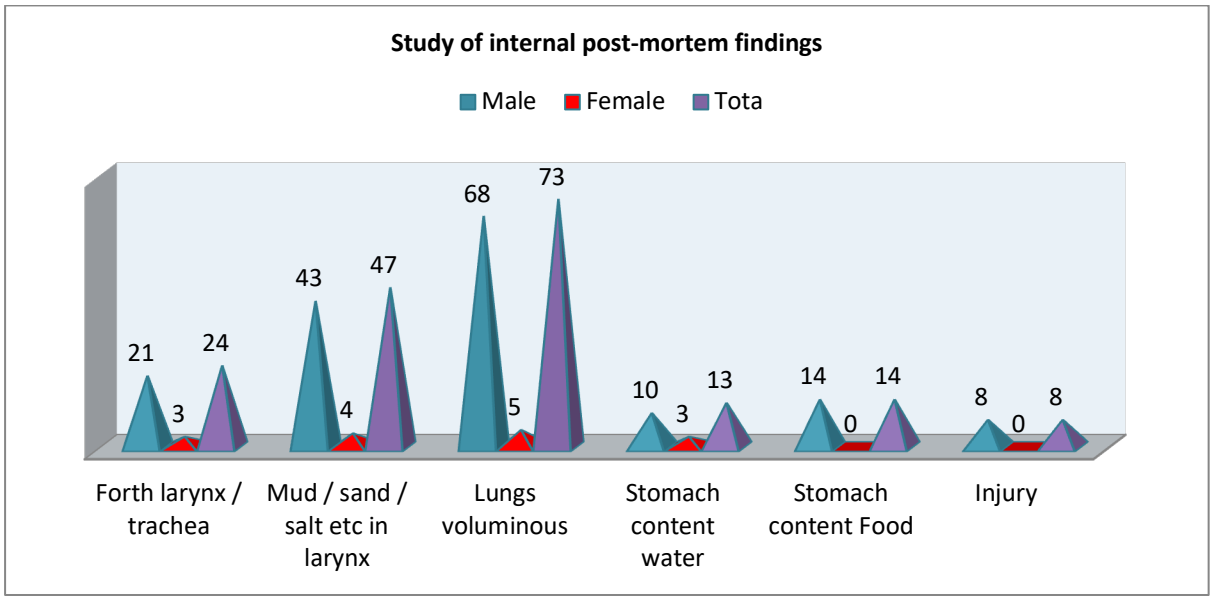

Figure 3: Study of internal post-mortem findings

Discussion

The present study of post-mortem findings in deaths due to drowning in Pondicherry.

The places of drowning were 45 in lakes/rivers, 10 in wells, 21 in house tanks, and 4 in swimming pools (Table 1). The highest finding postmortem was 40 (50%) external injuries, followed by 31 (38.7%) cases of froth around the mouth/nostril (Table 2). The highest finding in the internal post-mortem was 73 (91.2%) lung volumes, followed by 47 (58.7%) mud/sand/salt in the larynx (Table 3). These findings were more or less in agreement with previous studies [6,7,8].

Drowning is mainly an asphyxia process with effects on multiple organ systems. Nevertheless, physiological mechanisms of deaths by drowning are complex and not well understood [9]. It is also reported that the effects of the resulting hypoxia on tissues, other possible mechanisms responsible for cardio-vascular alterations have been proposed, such as electrolyte changes with possible different effects between hypotonic fresh water and hypotonic salt water immersion. It is also noted that the role of cold water is related to hypothermic cardiovascular effects [10]. A small percentage of cases of drowning deaths without apparent inhalation of water was reported [11].

Male deaths were predominantly reported as compared to females, as males committed a greater number of suicide cases. Suicide and homicidal drowning represent a significant segment of drowning deaths; suicidal drowning's are uncommon, and the percentage of suicides depends upon the geographic location and access to locations with water, like lakes, rivers, and wells, which are common locations. A history of psychiatric illness and post-mortem detection of variable levels of psychiatric medications and ethanol have been reported [12].

Moreover, homicidal asphyxia deaths such as strangulation were also a major cause of drowning deaths. Drowning deaths are largely asphyxia processes that affect multiple organ systems, including the respiratory system and lungs. Respiration is an involuntary process of the central nervous system in response to changes in blood and tissue oxygen and carbon dioxide levels and blood PH.

The extent of putrefaction in any death is largely driven by time and temperature. Water, compared to the air, tends to slow the decomposition process. The time factor depends upon how quickly the body recovers. Because most of the bodies will sink, there may be a delay in recovery. If a person is not witnessed to submerge or if the submerged body is not visible, the body may only be found many days after putrefaction results in gas formation in the body by the proliferating microorganism. The gas will increase the body's buoyancy and it will float to the surface. It is then more likely to be discovered.

Summary and Conclusion

Drowning is more frequently observed in men than women except for suicide, where there is only a slight difference among sexes. The weight of the brain and lungs is higher in salt water, although these organs weights are mostly dependent on other variables such as BMI and decomposition.

There are some drowning deaths with normal organ weight and heavy lungs; cerebral edema, however, continues to be identified in numerous drowning deaths.

Therefore, these anatomical findings must still be interpreted in the context of the entire case investigation. This study may help the medico-legal expert to diagnose drowning and also help to identify risk factors to prevent drowning deaths.

This research work was approved by Ethical committee of Manakula Vinayagar Medical College & Hospital, Pondicherry-605107.

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