

Various Parameters of Drowning Cases

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Abstract: The present study was planned in Forensic Science Laboratory, Madhuban, Karnal, Haryana (India). During the study the various parameters (drowned male and female ratio, water body in which drowning take place, approximate age groups of drowned individuals and various cause of drowning) of fifty drowning cases have been studied. Out from fifty drowning cases, drowned male and female ration (44:6) were observed. Approximate age (mean \pm S.E.) of drowned individual groups have been varied from minimum 0.08 ± 0.01 (approximate age of 31-40 years person) to maximum 0.42 ± 0.07 (approximate age of 21-30 years person). Drowning cases have not been reported from approximate age groups 0-10 years old persons. The drowned cases (reported in water body) may varied from minimum 5 cases (in river) to maximum 20 cases (in water canal) followed by 7 cases (in pond) and 18 cases (in minor). The various causes of drowning such as boating accident, diving accident, inability to swim, succide attempt, pressure on mind, any incident and other causes were also observed.

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1. Introduction:

Drowning can be defined as death due to full or partial submersion in a fluid (Timperman, 1972; Krstic et al., 2002). Drowning suffocation causes a lack of oxygen, resulting in death in only a few minutes. An exception to this rule appears in victims who have been suddenly and rapidly submerged into ice-cold water (<32F, 0C). Some of these people have survived up to an hour underwater without any resultant physical damage. This phenomenon is known as the mammalian dive reflex, which is activated when the face and body plunge into ice-cold water, resulting in the slowing of body metabolism as well as diverting blood only to the heart, lungs, and brain. If water enters the airways of a conscious victim, the victim will try to cough up the water or swallow it, thus inhaling more water involuntarily. Upon water entering the airways, both conscious and unconscious victims experience laryngospasm, that is the larynx or the vocal cords in the throat constrict and seal the air tube. This prevents water from entering the lungs. Because of this laryngospasm, water enters the stomach in the initial phase of drowning and very little water enters the lungs. Unfortunately, this can interfere with air entering the lungs, too. In most victims, the laryngospasm relaxes some time after unconsciousness and water can enter the lungs causing a "wet drowning". However, about 10-15% of victims maintain this seal until cardiac arrest. This is called "dry drowning", as no water enters the lungs. In forensic pathology, water in the lungs indicates that the victim was still alive at the point of

submersion. Absence of water in the lungs may be either a dry drowning or indicates a death before submersion. The fundamental principal of the diatom test in investigation of drowning is based on the postulation that diatoms are present in the fluid where possible drowning took place and the inhalation of the fluid causes penetration of diatoms into the alveolar system and blood stream, and leading to their deposition into brain, kidneys and other organs (Krstic et al., 2002). If the victim was dead before the body was submerged, the transport of diatom cells to various organs is prevented because lack of circulation and water sample. In 2002, over 400,000 people died from drowning worldwide. In the US, drowning claims nearly 3,600 lives annually and is the third leading cause of accidental death in the United States. For children, it is the second leading cause of accidental death for school-age children and the number one cause for preschoolers (Lunetta and Modell, 2005). Due to less and scanty information available on the various aspects on drowning cases in Haryana, particular. So the present study was planned on the various parameters of reported drowning cases in Forensic Science Laboratory, Madhuban (H), Karnal, Haryana (India).

2. Materials and methods:

Study area:

Haryana (27° 39' and 30° 55' N latitude, 74° 27' and 77° 36' E longitude) was separated from the Indian state of Punjab on 1st November 1966. It is situated in the Northern part of India and occupies an area of 44,212 km² with Chandigarh as its

administrative capital. The state is presently divided into 21 districts, 47 sub-divisions, 67 tehsils, 45 sub-tehsils, 116 blocks, 81 cities and 6759 villages. The climate of Haryana is very hot in summer with temperature touching occasionally 50° Celsius and cold in winters with temperature dropping to 1° Celsius.

The present study was planned in Forensic Science Laboratory, Madhuban, Karnal (29° 40' 48" N, 76° 58' 48" E), Haryana (fig. 1). Developed nascent state at Rohtak in Haryana (in the year 1973), this laboratory later shifted to Madhuban (Karnal) in 1976. The Forensic Science Laboratory,

Karnal (Haryana) has been making consistent strides in the field of scientific activities. Now a day, it is one of the best known laboratories in India. It comprises of eight divisions namely Chemistry, Physics, Biology, Serology, Ballistics, Documents, Instrumentation and Lie-Detection and three sections namely, Photo, General and information. The Scientists of the Laboratory have been assisting the training institutes like National Institute of Criminology and Forensic Science, Delhi, Central Detective Training School, Chandigarh, C.I.D. Training School, Panchkula and P.T.C. Madhuban.

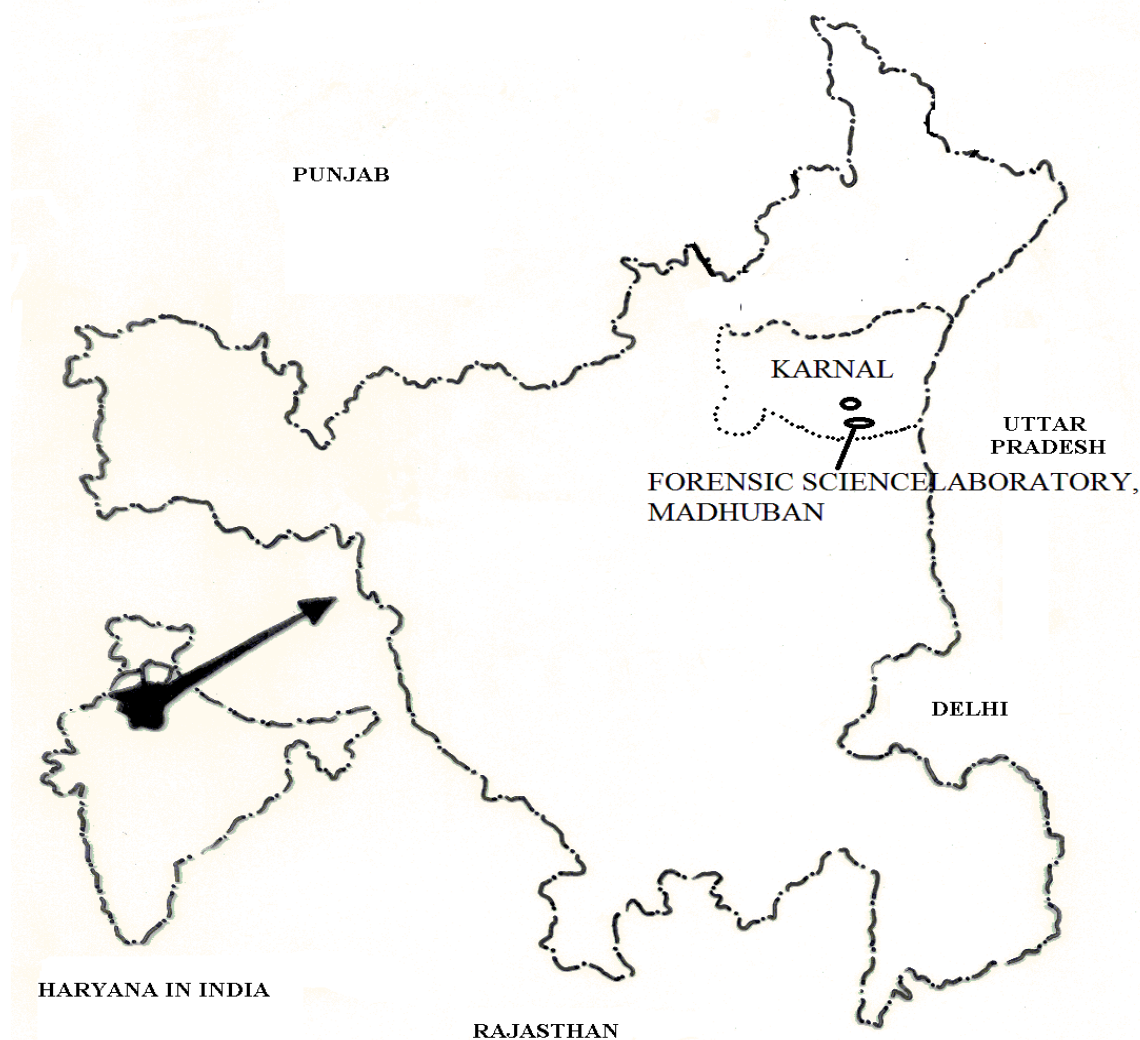


Fig. 1. Forensic Science Laboratory, Madhuban, Karnal (Haryana).

During the study of various parameters of drowning cases, direct observation methods (Benwerdo, 2011) was followed. Initially in drowning death cases, first information report launch in police station of present districts and finally post mortem of dead body has been done by doctors in present districts hospitals.

For detection of diatom tests these cases have been brought in biology division of Forensic Science Laboratory, Madhuban, Karnal (H) from various districts of state Haryana. These cases directly observed and data analysed statically.

3. Results and Discussion:

Drowning is death from asphyxia due to suffocation caused by water entering the lungs and preventing the absorption of oxygen leading to cerebral hypoxia (Dueker and Brown, 1999). Two-thirds of drownings happen in the summer months: 40% occur on Saturday and Sunday. Some 90% occur in fresh water even in states with large coastal regions. More than half of these cases occur in home swimming pools. One-quarter to one-third of drowning victims have swimming lessons. Although drowning equally affects both sexes, males have a rate three times higher than females because of increased reckless behavior and use of alcohol. Children less than one year of age tend to drown in bathtubs and buckets because they are not coordinated enough to get out by themselves when they fall in. Older children aged 1-4 drown in swimming pools, while those aged 5-14 years tend to drown in lakes, ponds, rivers, and oceans. Adolescents and adults tend to drown because of impaired swimming ability from alcohol or illicit drug use (Lindholm and Lingren, 2006).

About 3,000 people, many of them children, drown each year in the United States and many more suffer serious, irreversible injury in near-drowning incidents. Drowning is the leading cause of all accidental deaths among small children (one to four years of age) and the second leading cause among all children from one to 14 years of age, following only motor vehicle accidents. Drowning can occur in a number of places, including at public and private swimming pools, open recreational waterways such as lakes and ponds, spas, hot tubs and even in bathtubs. According to the Centers for Disease Control and Prevention (CDC), for every fatal drowning incident involving a child 14 years old or younger, three children require emergency room treatment for submersion injuries and 40 percent of those require hospitalization. Non-fatal incidents can cause brain damage that results in long-term disabilities ranging from memory problems to the victim being left in a vegetative state. Kline & Specter (2009), with some 30 attorneys (several of whom are also highly regarded doctors), has broad expertise and experience in pursuing drowning accidents and swimming pool drowning cases.

Kline & Specter, P.C., attorneys have won a number of major drowning lawsuits. In one celebrated case, Shanin Specter won a \$24 million

verdict for a three-year-old girl who suffered brain damage after she plunged into the deep end of a swimming pool at an Upper Darby, Pa., apartment complex. Specter produced evidence that two lifeguards had been lying down on their backs, one with her eyes closed, when the incident occurred. (See The Weightman Case.) In another case, the Griffin case, the firm negotiated a seven-figure settlement in the death of a 15-year-old boy who drowned in a swimming pool at a hotel in Reading, Pa. The lifeguard in that case had her feet up on a desk and was reading when the tragedy occurred. In a July 2004 trial, Tom Kline won a \$6.6 million Philadelphia jury verdict for the family of Anthony Slaughter, an eight-year-old boy who drowned in an unattended swimming pool at a summer camp. There had been two lifeguards at the pool, but one was on a break and the other had left to use the bathroom at the time of the incident. Anthony's death occurred on the first day of camp. (See The Slaughter Case.). In a settlement announced in October 2009, Kline & Specter won a \$5.12 million settlement for the estate of a 16-year-old boy who drowned after he was taken by a school supervisor on an unauthorized off-campus swimming outing.

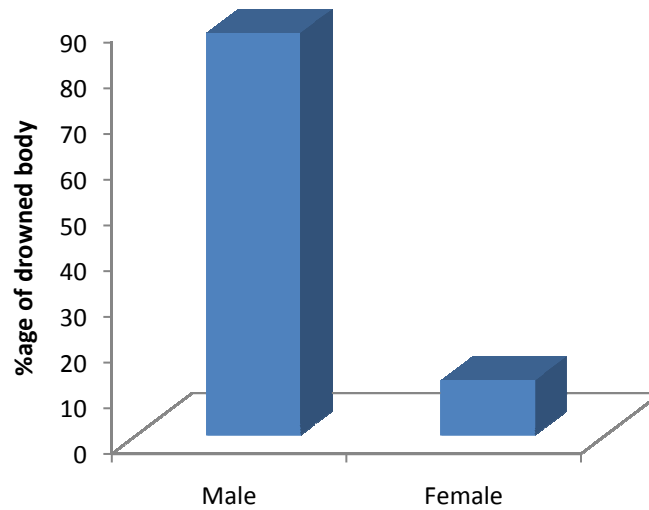
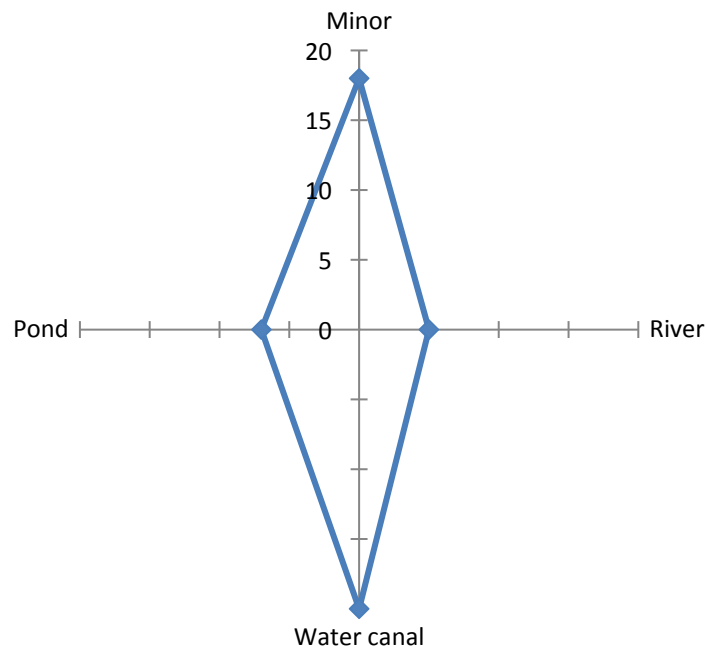
The present study was planned in Forensic Science Laboratory, Madhuban, Karnal, Haryana (India). During the study various parameters (drowned male and female ratio, water body in which drowning take place, approximate age groups of drowned individuals and various cause of drowning) of fifty drowning cases have been studied. The whole parameters of drowning cases have been explained in table 1. Approximate age (mean \pm S.E.) of drowned individuals may varied from minimum 0.08 ± 0.01 (approximate age of 31-40 years person) to maximum 0.42 ± 0.07 (approximate age of 21-30 years person). Drowning cases have not been reported from approximate age groups 0-10 years old persons (table 2). Out from fifty cases, percentages drowning male and female ration (88:12) was observed (fig. 2). The drowned cases (reported in water body) may varied from minimum 5 cases (in river) to maximum 20 cases (in water canal) followed by 7 cases (in pond) and 18 cases (in minor) (fig. 3). The various causes of drowning such as boating accident, diving accident, inability to swim, succide attempt, pressure on mind, any incident and other causes were also studied (fig. 4).

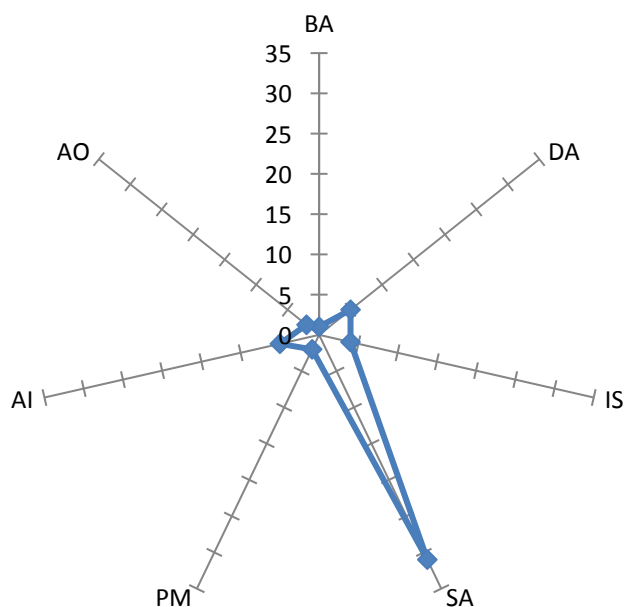
Table 1: Various parameters of studied fifty drowning cases.

S.N.	Sex	Water body	Approximate Age group					
			0-10	11-20	21-30	31-40	41-50	50 Above
1	F	Minor	-	-	√	-	-	-
2	M	River	-	-	-	-	√	-
3	F	Minor	-	-	√	-	-	-
4	F	Minor	-	√	-	-	-	-
5	M	River	-	-	-	-	√	-
6	M	Minor	-	√	-	-	-	-
7	M	Water canal	-	-	√	-	-	-
8	M	Water canal	-	-	-	-	√	-
9	M	Water canal	-	-	-	√	-	-
10	M	Water canal	-	-	√	-	-	-
11	M	Minor	-	-	-	-	√	-
12	M	Minor	-	√	-	-	-	-
13	M	Minor	-	-	-	-	-	√
14	M	Pond	-	-	-	-	√	-
15	M	River	-	-	-	-	√	-
16	M	Water canal	-	-	√	-	-	-
17	M	Minor	-	√	-	-	-	-
18	M	Minor	-	-	√	-	-	-
19	M	Minor	-	-	-	-	√	-
20	M	Pond	-	-	√	-	-	-
21	M	Water canal	-	-	√	-	-	-
22	M	Water canal	-	-	-	-	√	-
23	M	Water canal	-	-	-	√	-	-
24	M	Water canal	-	-	-	-	√	-
25	M	Minor	-	-	√	-	-	-
26	M	Minor	-	-	-	-	√	-
27	M	Minor	-	√	-	-	-	-
28	M	Pond	-	-	-	√	-	-
29	M	River	-	√	-	-	-	-
30	M	Water canal	-	-	-	-	-	√
31	F	Minor	-	-	√	-	-	-
32	M	Minor	-	-	√	-	-	-
33	M	Pond	-	√	-	-	-	-
34	M	Water canal	-	-	√	-	-	-
35	M	Water canal	-	-	-	√	-	-
36	M	Water canal	-	-	-	-	-	√
37	M	Water canal	-	-	√	-	-	-
38	M	Minor	-	-	√	-	-	-
39	M	Minor	-	-	-	-	-	√
40	F	Minor	-	-	√	-	-	-
41	M	Pond	-	-	√	-	-	-
42	M	River	-	-	√	-	-	-
43	M	Water canal	-	√	-	-	-	-
44	M	Pond	-	-	-	-	-	√
45	M	Pond	-	-	√	-	-	-
46	M	Water canal	-	-	√	-	-	-
47	F	Water canal	-	√	-	-	-	-
48	M	Water canal	-	-	√	-	-	-
49	M	Water canal	-	√	-	-	-	-
50	M	Water canal	-	-	√	-	-	-

Table 2: Approximate age (mean \pm S.E.) of drowned body of studied drowning cases.

Approximate age of drowned body	Numbers of case studied	Mean \pm S.E.
0-10	-	0.00 \pm 0.00
11-20	10	0.20 \pm 0.03
21-30	21	0.42 \pm 0.07
31-40	4	0.08 \pm 0.01
41-50	10	0.20 \pm 0.03
50 above	5	0.10 \pm 0.01
Total drowning case	50	

**Fig. 2.** Total %age in drowned male and female ratio of studied drownined cases.**Fig. 3.** Water body in which drowning takes places.



BA-boating accident, DA-diving accident, IS-inability to swim, SA-Suicide attempt, PM-pressure on mind, AI-any incident, AO-any other

Fig. 4. Variation in numbers of cause of studied drowned cases.

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