Profile of Drowning Autopsies at Rajkot Civil Hospital: A Two Year Study

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Abstracts: Background: Gujarat registered 40.7 % of accidental deaths in 2007 and nearly 10% of them are due to drowning. For implementing preventive measures, research related drowning data and its implicating factors are required. So we attempted to carry out this study with objective of generating profile for all drowning autopsies. Methods: The study was conducted at Rajkot from 1st November 2004 to 31st October 2006. Out of total 2934 autopsies, drowning was found in 100 cases. Detailed and complete postmortem examination of corpses was done and a proforma was filled in. Data were entered and analyzed with SPSS 15.0 version software. Results: Out of total 100 drowning cases, 58% were from urban area. 43% deaths were suicidal and 36 % were accidental in nature. Out of 88 identified cases, 60.2 % were unmarried. 67% cases were in 15-30 years of age group and male: female ratio was 2.7:1. Literacy rate was 69.3% with higher education only in 2.2% cases. Most frequent occupations were study (31.8%) and labor work (22.7%) with 59.1% belonged to lower socio-economic class. Factors affecting mental status and behavior like addiction, family problem and mental illness were found in 33%, 35% and 10.2% cases respectively. Injuries and animal or aquatic animal bites over the body were in 5% and 12% victims respectively. Conclusion: The high rates of drowning deaths in Rajkot and their specific circumstantial profiles suggest that drowning deaths could beneficiate from basic prevention programs and legislation. [Patel A et al NJIRM 2012; 3(1) : 125-129]

Key Words: Drowning, Autopsy, Suicide, Socio-economic characteristics

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Introduction: Drowning is a process resulting in primary respiratory impairment from submersion in a liquid medium. This is a new consensus definition for drowning suggested by a group of experts at the 2002 World Congress on Drowning, held in Amsterdam in order to decrease the confusion, to allow more accurate analysis and comparison of studies, allow researchers to draw more meaningful conclusions from pooled data, and improve the ease of surveillance and prevention activities[1]. Globally, injuries accounted for over 9% of total mortality and 8% of them were drowning during 2000. Of these drowning deaths, 97% occurred in low- and middle-income countries[2].

Drowning in India commonly occurs in rivers, ponds, lakes and wells and can be accidental, suicidal or sometimes homicidal in nature. The entire coastal belt of India is a risk-prone area. Owing to easy access to water bodies, the occupation of individuals, occurrence of natural calamities at frequent intervals, the risk-prone nature of young children and adolescents, drowning is common in India. The incidence of drowning increased from 31/100,000 in 1991 to 44/100,000 population by 1997. The Survey of causes of death report (1998b) reveals that 1.1% of total deaths and 18% of total injury deaths were due to drowning. It was one of the top 10 killers among children 5–14 years of age (7.2%)[3].

Gujarat has registered a higher percentage (40.7 %) of accidental deaths in 2007 than the national average of 30 percent and nearly 10 percent accidents in the state are due to drowning. In Gujarat, Rajkot stands third among mega cities across India for accidental death rate where it is more than 73 percent[4]. Prevention is the key for reducing mortality from drowning. For implementing preventive measures, research related drowning data and its implicating factors are required. So we attempted to carry out this study in Rajkot with objective of generating profile for all drowning autopsies.

Material and Methods: The study was conducted at Rajkot civil hospital during the period of two years from1st November 2004 to 31st October 2006. Total 2934 dead bodies brought to the mortuary for post-mortem examination during this period. Out of which, drowning was found in 100 cases. Detailed and complete postmortem examination of corpses

was done, including diatom test and chemical analysis of viscera, which was done at Forensic science laboratory, Junagadh. A proforma was prepared to fill up details like the age, sex, marital status, socio-economic characteristics, personal habits, family problem and other findings of the cases. The information was collected from relatives, eye-witnesses, concerned investigating police officer and police panchanama. Data were entered and analyzed with SPSS 15.0 version software.

Result: Out of total 100 drowning cases, 58% corpses were recovered from urban area while rests 42% were from rural area. 43% deaths were suicidal in nature, while 36 % were accidental and only in 1% case it was homicidal. In rest 20% cases, the manner of death could not be determined. 88 victims were identified, while rest (12) could not be identified by any means, so in those non-identified cases, socio-demographic and other characteristics except age and sex could not be ascertained. Out of these 88 cases, more than half cases (60.2 %) were unmarried, while 37.5 % cases were married and 2.3% were widow/widower.

Table 1 shows age and sex wise distribution of drowning cases. Most (91%) of cases were below 45 years of age comprising one fourth (24%) children and most (67%) between 15-30 years of age group. The victims' age were ranged between 1 to 67 years with mean age of 33.5 years. Overall male preponderance was seen with Male: Female ratio of 2.7:1 [Table 1].

Table 1: Distribution of drowning cases According to age and sex

Age group (years)	Male	Female	Total
	No. (%)	No. (%)	No. (%)
<15	14 (47.1)	10(52.9)	24(100.0)
15 – 30	41(77.3)	12 (22.7)	53(100.0)
31 – 44	9 (64.3)	5 (35.7)	14 (100.0)
≥45	9 (100.0)	0 (00.0)	9 (100.0)
Total	**73 (73.0)**	**27 (27.0)**	**100 (100.0)**

Regarding education, literacy rate was 69.3% comprising up to secondary (43.2%) and up to higher secondary education (23.9%). But higher education like graduation was seen only in 2.2% cases. Most frequent occupations were study (31.8%) and labor work (22.7%). They were followed by farmer (15.9%) and government service (7.9%). While 10 (11.4%) and 15 (17.1%) cases were housewives and unemployed males respectively. Socio- economic class was decided on the basis of modified Prasad's classification. 5 Most (59.1%) of the drowning cases belonged to lower socio-economic class (class IV & V), whereas 35 (39.8%) cases were from middle social class (class III). Only 1 case (1.1%) was from the higher social class (class I & II) [Table 2].

Table 2: Distribution of drowning cases according to Socio-economic characteristics (N=88)*

Socio-economic characteristics	No.	%
Educational status		
Illiterate	27	30.7
Up to secondary	38	43.2
Up to higher secondary	21	23.9
Graduate	2	2.2
Occupation		
Student	28	31.8
Laborer	20	22.7
Farmer	14	15.9
Housewife	10	11.4
Government service	1	1.1
Unemployed	15	17.1
Socioeconomic status		
Class I & II	1	1.1
Class III	35	39.8
Class IV & V	52	59.1

*12 cases could not be identified

About addiction, in one third cases (33%) addiction was observed in one or other form. While in 67% cases no history of addiction was found. Most common addiction was tobacco chewing (18.2%), followed by smoking (13.6%). Alcohol addiction was found only in one (1.1%) case. Regarding family problem, no history of family problem was found in 53(60.3%) cases. While more than one third (35%) cases had some family problem comprising domestic problem (14.8%) and love affair (12.5%) as most common family problems. Other family problems were economic (7.9%) and disease/illness (4.5%). History of mental illness was observed in

one tenth (10.2%) cases, while other (89.8%) did not have such history [Table 3].

Table 3: Distribution of drowning cases according to addiction, family problem and mental illness (N=88)*

Characteristic	No.	%
Addiction		
Smoking	12	13.6
Tobacco chewing	16	18.2
Alcohol	1	1.1
No Addiction	59	67.1
Family problem		
Domestic	13	14.8
Love Affair	11	12.5
Economic	7	7.9
Disease/ illness	4	4.5
No family problem	53	60.3
History of Mental illness		
Yes	9	10.2
No	79	89.8

*12 cases could not be identified

We observed that in only 5% cases there were injuries over the body, while in most (95%) of cases there was no injury found over the body. Out of 5 (5%) cases, major type of injury was found only 1 case which is sufficient to cause of death, while rest 4 (4%) cases had minor type of injury. Regarding animal or aquatic animal bites over the body, we found 12% cases having animal bite while most (88%) cases did not have such bites. Dead bodies were found floating in more than half (52%) cases, while other (48%) were in submerged position when recovered from the site. Presence of watery fluid in pleural cavity was found in one third (34%) cases; they all were decomposed bodies. While in rest (66%) cases, there was no fluid in pleural cavity. The time since death was determined by the post-mortem changes of body and also considering environmental and other factors. Around two third (63%) cases were found within one day, while 28 % cases were obtained in 2-7 days. Within one to two weeks, 4% cases were recovered and only 1% case was found after two weeks [Table 4].

Discussion: Out of 100 cases, 58% were recovered from urban area while 42% cases were from rural area. A study[6] found rural dominance in contrast to our study. This may be because of the selection of different area for study as our study was in an urban setting while the other study was conducted in a rural area. Regarding manner of death, we found maximum cases of suicidal death (43%) followed by accidental deaths (36%). Studies showed mixed findings as our results were comparable with some studies[7-8], but in contrast to other studies[6, 9] as they observed more accidental deaths (52%-84%) compared to suicidal ones. The difference in results may be because of different study settings. Homicidal drowning was noticed only in 1% case, which shows its rare occurrence, as the murder by submersion is difficult when the victim is an adult or unless he was made first weakened by some other means.

Table 4: Distribution of drowning cases according to associated injury, animal bite and other findings (N=100)

Finding	No.	%
Associated body injury		
Major	1	1.0
Minor	4	4.0
No injury	95	95.0
Animal/ Aquatic animal bite		
Yes	12	12.0
No	88	88.0
Body position in water		
Floating	52	52.0
Submerged	48	48.0
Fluid in plural cavity		
Yes	34	34.0
No	66	66.0
Time since death		
0 – 12 hours	28	28.0
12 – 24 hours	35	35.0
1 – 2 days	4	4.0
2 – 7 days	28	28.0
7 – 20 days	5	5.0

Among identified cases, maximum numbers of victims (60.2 %) were unmarried. The reason may be that they do not have sufficient maturity and liabilities of their family which act like an inspiration to live and behave carefully and secondly because of more stressful and ambitious student life. Both together can lead to suicidal tendency and accident prone behavior. More than half (53%) cases

belonged to 15-30 years of age group which is also observed by others[6, 10-11]**.** This is more active period of life having great fluctuations of emotions, violent and arrogant nature and frequent participation in water activities. Also a tendency to be more reckless could explain the high proportion of victims in this age group. Male preponderance (73%) seen in the study was comparable to other studies[6, 10]**.** Studies suggest that males have higher drowning rates than females due to increased exposure to water and riskier behavior, such as swimming alone, drinking alcohol before swimming alone and boating[2]. Literacy rate was 69.3 percent, but higher education like graduation was seen only in 2.2% cases. This was well correlated with higher proportion of lower socio-economic class (59.1%) and occupation wise major proportion of students (31.8%) and laborers (22.7%). Similar findings were reported by others[6, 10-11]. Lower level of literacy and low socioeconomic status are considered major risk factors for drowning all over the world[2].

Factors affecting mental status and behavior like addiction, family problem and mental illness were found in 33%, 35% and 10.2% cases respectively. These are the important factors as they increase the risk of accidental as well as suicidal drowning. Though in our study, alcohol addiction was found only in 1.1% case. But at other places, alcohol continued to be a significant issue in drowning incidents and in the 18 to 34 age group, close to 1 in 2 male drowning deaths was linked to alcohol[12-13]. We observed injuries and animal or aquatic animal bites over the body in 5% and 12% victims respectively. They are helpful in differentiating accidental, suicidal and homicidal drowning. Near two third (63%) corpses were recovered within one day after the death of victim. It could be associated with body position in water as 52% cases found floating and therefore visible to people for reporting such deaths. Fluid in pleural cavity is one of the signs of body decomposition and was found in all decomposed bodies (34%). This can also be related with time period between death and recovery of dead body, as decomposition generally begins after one day and dead bodies found after one day were 37%.

Conclusion: Present study revealed that most common way of drowning was suicidal followed by accidental. Victims were mostly of young active males, students and laborers, though literate but of low scale education and belonged to low socio-economic class. Factors influencing mental state and injury or animal bite were less common in this study. The high rates of drowning deaths in Rajkot and their specific circumstantial profiles suggest that drowning deaths could beneficiate from basic prevention programs and legislation. Preventive measures like removing the hazard by draining unnecessary accumulations of water, creating barriers in proximity to water, protecting those at risk by swimming classes, supervision and water safety education , and countering the damage by training the general community in resuscitation can help to reduce such deaths. This study can stimulate other researchers for further studies in the same area, which can be helpful in preparing a concrete plan of action for prevention of drowning deaths.

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