

DROWNINGS IN THE METROPOLITAN REGION OF CUIABA

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Abstract: Drowning is the fourth leading cause of accidental death in adults and the third in children and adolescents worldwide. Drowning is usually caused by asphyxia due to aspiration of fluid that obstructs the airways and is responsible for changes in gas exchange, which lead to hypoxemia (insufficient oxygen levels in the blood) and metabolic acidosis. This study aimed to analyze cases of drowning in the metropolitan region of Cuiabá from January to December 2014. The analysis consisted of the observation of 1200 reports from the Instituto Medico Legal de Cuiabá, which presented 25 cases of drowning; all were men (100%), with a predominance of adults (52%), of which there was a predominance of the age group between 31 and 60 years (36%), higher incidence of drowning cases in September (28%) and more than half of the deaths from this fatality (60%) occurred in the freshwater Cuiabá river, on the banks near the capital of the state of Mato Grosso.

Keywords: Drowning, Cuiabá, Fresh Water.

INTRODUCTION

The current concept of drowning adopted by several bodies, including the World Health Organization (WHO) and the International Lifesaving Federation (ILS), is that it is a type of trauma that occurs with the aspiration of non-corporeal liquid, caused by submersion or immersion. In the context of legal medicine, it is classified as a violent death, inserted in the context of mechanical asphyxia². Called “external causes” in the International Classification of Diseases (ICD), deaths linked to accidents and violence represent an important cause of death in Brazil.³

Most drownings occur accidentally, but suicide and homicide cases are not uncommon, but depend on specific circumstances such as objects tied to the body or the force of the aggressor on the victim (homicide). It is also important to point out that drownings

occur in most cases by submersion in water but in unusual circumstances they can occur in small water slides due to a sudden illness or in various liquids such as cesspools or fermentation tanks by workers.

Many recreational and leisure activities in rivers, lakes, sea or in swimming pools are factors that increase the incidence of drowning each year. A significant number of patients survive, US data show that one death is recorded for every eight visits. Statistics show that drowning is the third leading cause of death in Brazil among violent causes, representing an important factor to be considered among the preventive measures and guidelines to be implemented.

The expertise represents a difficult medical-legal diagnosis because it requires the exclusion of other causes of asphyxia, in addition to excluding situations arising from pathological antecedents, simulations of accidents and drownings themselves. Thus, the technical description of autopsies is a challenge and requires careful inspection, both externally and internally.

The World Health Organization estimates that half a million people worldwide die from drowning each year, 260,000 of which are children. A study carried out in Denmark from 1989 to 1993 showed that 39% of men and 27% of women were drunk when they drowned. The W.H.O. indicates that alcohol consumption is responsible for 14% of drowning deaths worldwide^{7,13}.

In the United States, 27% of deaths from external causes are due to drowning, in the 1980s a total of 9,000 drowning deaths/year were recorded. In Mexico, it is the second leading cause of death in children aged 1 to 4 years, and in the period from 1979 to 2005, 107,319 deaths were recorded among all ages, most of them male⁸.

In Portugal, an average of 28 children per year die from drowning, which represents

43% of accidental deaths in children in that country. The highest percentage of occurrences of this fatality is in the South Pacific region with 38% of cases. In Africa, the incidence of this type of fatality occurs at a rate of 13.1/100,000 inhabitants/year.¹². In Bangladesh, drowning leads the list of accidents due to violent causes; by continents, Africa with 14.2/100,000 inhabitants/year leads the ranking of deaths from drowning, followed by Asia with 8.1/100,000 inhabitants/year.

In China, in the year 2000, there were 129,000 deaths from drowning, resulting in a mortality rate of 10.2/100,000 inhabitants and India, with about 86,000 deaths, which translates into a mortality rate of 8.5/100,000 inhabitants. In 2001, unintentional causes were the leading cause of death in individuals aged 1 to 34 years, being also the fifth of deaths in all ages in the USA¹⁴.

In Brazil, data from the Ministry of Health indicate that there are about 1.3 million cases of drowning. Of these, almost eight thousand die in a proportion of 5.2/100,000 inhabitants, 65% of which are children between 5 and 14 years old, thus constituting the second cause of death for external reasons in this age group. Those who survive, for the most part, are left with lasting sequels, which cause the greatest economic impact of all types of accidents. More drowning per year in Brazil than the sum of homicides in Norway, Greece, Ireland, Switzerland, Sweden, Slovenia, Singapore, Austria, Finland, Spain, Canada, Portugal, Estonia, Armenia, Denmark, Israel, Hungary and the Czech Republic¹⁵.

In Brazil, there are studies on drowning in some localities, such as Rio de Janeiro, São Paulo, Florianópolis, Ribeirão Preto and Distrito Federal, and the number of studies developed on this type of fatality is still small, with a visible lack of updated data. in several locations mainly in the non-coastal region¹⁸.

An epidemiological study that considered age and gender, related to drowning deaths in Florianópolis, capital of the state of Santa Catarina, from January 1991 to December 2005, identified 592 drowning deaths in the reports of the Legal Medical Institute of the state, with a prevalence for the age group from 30 to 39 years old, corresponding to 21.6% of the total number of deaths, followed by the age group from 20 to 29 years old with 19.8% and the group from 0 to 14 years old with 16.5% of the cases. Deaths^{17,20}.

Regarding gender, the prevalence was in males with 85.6% of the total number of deaths, and in females this corresponded to 14.4% of the total. On the beaches of the state of Rio de Janeiro, there are approximately 290 rescues for every fatal case (0.34%) and one death for every ten visits, with the main factor influencing drowning cases being the ingestion of alcohol, corresponding to 37 % of cases¹⁷.

According to Szpilman in absolute numbers in 1997, the states with the highest number of drowning deaths were: São Paulo (1822) cases, followed by Minas Gerais (900), Bahia (507), Rio de Janeiro (502) and Rio Grande do Sul, when it comes to proportional numbers, Roraima (9.8), Acre (8.6), Mato Grosso do Sul (6.8), Amapá and Espírito Santo (6.7) per 100,000 inhabitants stand out⁶.

The uniqueness of this type of fatality and the scientific studies on the subject, which are so scarce, promote a more in-depth study of deaths that occur mainly in regions bathed by freshwater rivers where the highest incidences of drowning mortality are observed.

METHODOLOGY

Mortality data on drowning were recorded in the metropolitan region of Cuiabá and the surrounding municipalities, located in the Center-West region of Brazil and comprising the cities of Várzea Grande, Nossa Senhora do

Livramento and Santo Antônio de Leverger, with the Instituto Médico Legal de Cuiabá responsible for the entire region bathed by the Cuiabá River and its tributaries.

The analysis consisted of the observation of 1200 autopsy reports from the Instituto Médico Legal de Cuiabá, in 2014, with 25 cases of drowned victims being eligible.

In the medical records of the IML, the following variables were cataloged: protocol number, skin color, sex, place of death, time of death, age, conservation status and biotype. And, information regarding the description of external injuries, internal injuries, complementary exams, answer to the official questions that constitute the expert report, made available by accessing the computerized system of the IML of Cuiabá¹.

The selected cases of drowning in the metropolitan region of Cuiabá were typed into the Epi-Info 2000 program version 3.5.1 and later descriptive, bivariate and multiple analyzes were performed using the Epi-InfoTM 7 and Microsoft Excel programs^R.

RESULTS

In 2014, there were 25 deaths from drowning at the Instituto Médico Legal de Cuiabá, which covers the entire metropolitan region. Deaths in male victims were recorded, being 100% men, with no identified cases of women. As for skin color, black (72%) predominated, followed by white (16%) and brown (12%). Regarding the age group of the victims, adults between 31 and 60 years old prevailed (36%), then they were adolescents (20%), young adults between 19 and 30 years old.

(16%), elderly (8%) and children (4%) and four deaths were not identified (16%). Concerning the victims' profession, there was heterogeneity (6 different professions) although, for the most part, we had unidentified ones (28%), followed by students (24%), self-

employed (16%), fishermen (8%), guard (4%), plumber (4%), attendant (4%), general service assistant (4%) and security (4%). The mean age was 31.09 years, the minimum age found was 3 years and the maximum age was 65 years. The places where death occurred were predominantly on the Cuiabá River (56%), Coxipó River (4%), São Lourenço River (4%), Agua Azul Community (4%), Lagoa (4%), in a Caixa d' water (4%) and six cases were not cataloged (24%).

Variables	Occurences	Number %
Gender		
Male	25	100%
Female	-	-
Breed		
White		
Black	4	16%
Brown	18	72%
Yellow	3	12%
Not identified	-	-
Age		
Children (<12)	1	4%
Teenagers (12-18)	5	20%
Young Adults (19-30)	4	16%
Adults (31-60)	9	36%
Elderly (>60)	2	8%
Not identified	4	16%
Profession		
Students	6	24%
Retired	1	4%
Freelancer	4	16%
Others	7	28%
Not identified	7	28%
Biotype		
Short	2	8%
Normoline	17	68%
Longline	2	8%
Not identified	4	16%

Table 1. Distribution of drowned people in the metropolitan region of Cuiabá by sex, race, age, profession and biotype.

Of the expected pathophysiological characteristics, variables of external injuries were analyzed, the ones recorded were: cadaveric rigidity (44%), followed by gigantism (28%), bilateral paralytic mydriasis (24%), hypostasis free (24%), tongue projection (12%) and anserine skin (12%).

Among the internal injuries identified, the predominant aspect was the presence of armed and congested lungs (76%), followed by the presence of liquids in the airways (32%), foam mushroom (16%), visceral ecchymosis (16%), bruising Paltauf (12%), posthumous circulation of Brouardel (8%) and foreign bodies under the nail (8%).

Pathophysiological features	Occurrences	Number %
External injuries		
Bilateral paralytic mydriasis	6	24%
Gigantism	7	28%
Books of hypostasis	6	24%
Cadaverous stiffness	11	44%
Tongue projection	3	12%
Anserine skin	3	12%
Internal injuries		
Armed lungs and congestion	19	76%
Presence of fluid in the airways	8	32%
Foam mushroom	4	16%
Strange bodies under the nails	2	8%
Paltauf stains	3	12%
Posthumous circulation of Brouardel	2	8%
Visceral ecchymosis	4	16%

Table 2. Relation of the pathophysiological aspects of drowned people with internal and external injuries.

The incidence of drowning varied according to the month of the year, being predominant in warm seasons. The month with the highest number of cases was September (28%), then

October (16%), August (12%), March (8%), April (8%), May (8%), June (8%), July (8%), with no records in the months of January, February, November and December.

Months of 2014	Occurrences	%
January	-	-
February	-	-
March	2	8%
April	2	8%
May	2	8%
June	2	8%
July	2	8%
August	3	12%
September	7	28%
October	4	16%
November	-	-
December	-	-

Table 3. Incidence of deaths from drowning in the metropolitan region of Cuiabá in the months of 2014.

DISCUSSION

Among the drowned in the IML of Cuiabá in 2014, men, blacks, adults, students and people with normal biotypes predominate. The occurrences were mainly concentrated in the Cuiabá River, due to the proximity of the community to the basin.

In relation to the unanimous male deaths, it is in agreement with the current literature with strong acquiescence in addition to several publications in Brazil and worldwide. Man is attributed a more aggressive and adventurous personality, overestimating his swimming ability, in addition to consuming more alcoholic beverages.²¹

The hydrographic basins of the regions were significant factors in understanding the regional differences in the number of cases that occurred. The region of Cuiabá, bathed by the rivers Cuiabá and Coxipó, had a relevant

incidence of drowning in areas of riverside population that border the rivers, in contrast to the regions of the country, which do not have a freshwater hydrographic basin with large watercourses, and had a lower incidence of drowning. The riverside population is predominantly black and adult, which justifies the higher incidence of deaths for this race and age group.

The predominant pathophysiological characteristic was armed and congested lungs (76%), due to aspiration of liquids and the attempt to restore the oxygenation necessary to maintain vital signs, being an internal sign and with fluid outflow at the cut.²² Cadaveric stiffness (44%) was the second dominant sign, due to how long ago the individual died, it is a post-mortem phenomenon, which appears between 1 and 2 hours after death, and begins to disappear between 18 and 24 hours, in which muscles stop receiving oxygen and start producing lactic acid.²³

The third aspect with the highest incidence was gigantism (28%), which is characteristic of the gas phase, in which bacteria that feed on the fat layer begin to degrade, causing the release of gas which causes the organs to rise.²³ Subsequently, the fourth most comprehensive sign was bilateral paralytic mydriasis (24%) being indicative of cerebral hypoxia, intracranial edema and cessation of brain activity.²⁴

Another common feature found was the hypostasis free (24%) that are formed with the stoppage of blood circulation, thus, they begin to collect in the regions of greater slope, therefore, red spots are formed in the place. Visceral ecchymoses, also known as Tardieu spots, were observed with a frequency of 16%, predominantly punctate between the sulci of the lungs and at the apex of the heart.³

Tongue projection was present in three cases (12%), being common findings in mechanical asphyxia, however, cadavers from

other causes of asphyxia may also present. With the same incidence, anserine-type skin was found (12%), which is caused by the contraction of the arrector pili muscles, making the follicles of these hairs protruding, due to cadaveric rigidity.

Still from internal lesions, Paltauf's spots were identified (12%), which are subpleural ecchymosis, and originate in the lung parenchyma, due to sudden penetration of the liquid.²

A higher number of deaths was observed in the warmer months, such as September (28%), followed by October (16%) and August (12%).²⁶ The Cuiabá River Valley region has constant temperatures during the seasons, with a humid tropical climate. This one is still close to the Chapadas dos Guimarães mountains, blocking the air masses and making the climate warmer.

CONCLUSION

The epidemiological profile of drowning cases in the Cuiabá region, recorded by the metropolitan IML, made it possible to identify that mortality in men from drowning is predominant, black individuals and professional fishermen being the most frequent records. As for the biotype, there was no characterization for this type of death.

The thanatoscopic aspects predominated in cadavers with armed lungs and the body in the gaseous phase, such as gigantism. The presence of liquids and sands inside the pulmonary cavity demonstrates that in the region this type of fatality occurs in freshwater rivers, different from other regions of the country where they occurred in beach locations.²⁰

It is known that Cuiabá is in a region with a hot-humid climate, with four to five dry months. The high temperature in spring-summer ranges from 30°C to 36°C between the months of September and October. In

the analysis, it was observed that these were the months with the highest occurrence of death by drowning, with a predominance of September (28%), followed by October (16%), August (12%). Therefore, when the region has an increase in temperature, the incidence of drowning deaths increases proportionally, being an important data in prevention actions.²⁶

This work portrays the need for discussion on the subject because knowing the epidemiological profile of victims of drowning makes it possible to prevent mortality from this type of disease.

REFERENCES

1. FRANÇA, G.V. Medicina Legal. Guanabara Koogan. Rio de Janeiro, v.6, p.112- 118, 2001.
2. SZPILMAN, D. Afogamento. Rev Bras Med Esporte, v.6, n.4, p.43-131, 2000.
3. CROCE, J. Manual de Medicina Legal. 8º edição. São Paulo. Editora Saraiva. 2012.
4. VANRELL, J.P. Manual de Medicina Legal Tanatologia. 4º edição. editora JH Mizuno, 2011.
5. SZPILMAN D; Amoedo, A.R. Afogamento. Jama - Clinica pediatria, v.5, n.19, p.5-20, 1995.
6. APARECIDA, S.L. O Álcool como causa associada de mortes por causas externas. Cad. Bras. Saúde Mental, v.1, n.1, 2009.
7. DIETZ PE, Baker S.P. Drowning: Epidemiology and prevention. American Journal of Public Health, v.4, n.64, p.303-312, 1984.
8. MODELL, J.H; MOYA F; NEWBY E.J; RUIZ B.C; SHOWERS A.V. The effects of fluid volume in seawater drowning. Ann Intern Med, v.67, p.68-80, 1967.
9. HERCULES H.C. Medicina Legal - Texto e Atlas - 2ª Ed.; Editora Atheneu, 2014.
10. ORLOWSKI, J.P; SZPILMAN D. Drowning: rescue, resuscitation, and reanimation. Pediatr Clin North Am, v.48; p.627-46, 2001.
11. GUAIANO, O.P. Teoria de controle do afogamento. Congresso de Ciências do Desporto e da Educação Física dos Países de Língua Portuguesa. Revista Portuguesa de Ciências do Desporto. v.2, n.4, 2004.
12. LINDHOLM, P; STEENSBERG, J. Epidemiology of unintentional drowning and near-drowning in Denmark in 1995. Inj Prev, v.6, p.29-31, 2000.
13. SMITH G.S; BRENNER R.A. The changing risks of drowning for adolescents in the U.S. and effective control strategies. Adolesc Med, v.6, p.153-70, 1995.
14. VAN BEECK E.F; BRANCHE C.M; SZPLIMAN D; MODELL J.H; BIERENS J.J. A new definition of drowning: towards documentation and prevention of a global public health problem. Bull World Health Organ, v.11, n.83, p.853-856, 2005.
15. AZMAK, D. Asphyxial deaths: a retrospective study and review of the literature. American Journal of Forensic Medicine & Pathology. v.2, n.27, p.134-144, 2006.
16. SOMMARIVA D.T.M. Estudo Epidemiológico de Óbitos por Afogamento na Região da Grande Florianópolis de 1991 a 2005. Trabalho Apresentado a UFSC. Florianópolis, 2006.

17. ARAÚJO R.T; MARTIN C.C.S; MARTINIS B.S; EIVISON M.P; GUIMARÃES M.A. Afogamentos na região de Ribeirão Preto. Revista USP. v.41 n.1 p.50-7,2008.
18. SZPILMAN D. Afogamento na infância: epidemiologia, tratamento e prevenção. Rev Paul Pediatría. V.23, n.3, p.142-53, 2005.
19. PEDEN M.M, MCGEE K. The epidemiology of drowning worldwide. Inj Control Saf Promot. v.10, n.4, p. 195-9.
20. SANTOS A. Faculdade de Medicina da Universidade do Porto. Tanatologia Forense, 2004.
21. LOPES C. Guia de Perícias Médico-Legais v.6, Porto, 1977
22. ALMEIDA J.P. COSTA J.R.. Lições de Medicina Legal. Editora Nacional, São Paulo, 1978.
23. CROCE D. Manual de Medicina Legal. n.6, São Paulo, 2009.
24. ALMEIDA J, LEMES N. Estudo de clima urbano: uma proposta metodológica. Dissertação apresentado a UFMT. Cuiabá,2005.