

Critical Study Of Near Drowning Cases At A Pediatric Emergency Department In West Africa

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Abstract

Background: Drowning is a significant cause of morbidity and mortality in childhood

globally. Children in the developed world are thought to be affected most by this event.

However recent figures have shown that drowning contributes significantly to childhood deaths in developing countries. Drowning have been redefined.

Method: To determine the pattern of near drowning in this setting a retrospective review of inpatient records of cases of childhood drowning and near drowning from september1999 to September 2008 was undertaken.

Results. Seven cases were identified .Male children were more likely to drown, The manner of drowning was mostly accidental.

The river was the most common place of these events. There was no pre-morbid psychopathology. Two cases were brought in already dead.

Conclusion.

In this review, the event circumstances were age related in keeping with the recognized descriptive epidemiology. The derived figures could assist hypothesis generation for research direction and multimodal public health interventions.

INTRODUCTION

Drowning is a significant cause of disability and death. Given the shortcomings of previous definitions ,drowning was redefined as a process resulting in primary respiratory impairment from submersion in a liquid . Outcomes were classified as life without morbidity, delayed morbidity or death. Globally, drowning causes half million deaths annually, 60% of these are children .Rates for near

drownings are undetermined due to inadequate reporting. The epidemiology of near drowning in childhood was reviewed elsewhere^(1,2,3,4,5,6,7,8) In developed settings , robust epidemiologic studies directed research , provided guides to policy makers and espoused sustainable preventive measures. ^[9,10,11,12]. This is lacking in developing countries .Descriptive epidemiology intimates that the incidence of common childhood illnesses in this setting are decreasing, but that of near drowning is undetermined. This study aimed

to review the features ,outcome of near drowning cases seen at the Paediatric ED in a developing country's setting, and proffer sustainable preventive measures.

METHODS

The data from the inpatient case records were retrospectively reviewed from september1999 to September 2008 for descriptors, premorbid coincidental self regulating defects, seizure disorders, the circumstances of near drowning and the immersion time. Also information on site and pre-drowning activities, the time of the year and contributing factors such as adverse pre-existing medical conditions, trauma, medications, cardiopulmonary disease, head trauma, hypothermia, fractures, aspiration syndromes, the complications, sequalae, the management strategies applied and outcomes were also determined.

RESULTS

A total of seven cases of drowning and near drowning were admitted to the Paediatric emergency department during this period.5(71.43%) males and 2(28.57%) females.2(28.57%) were aged from 6 months to 1 year,3(42.86%) were aged above 1 year to 6 years,2(28.57%) were aged more than 6 years to 12 years.

Figure 1

Table 1: Type of water where accident happened

Body of water	Number	Percentage
Salty river water	2	28.57%
Well water	1	14.29%
Septic tank	1	14.29%
Hotel swimming pool	1	14.29%
Domestic receptacle	1	14.29%
Sea water	1	14.29%

Figure 2

Table 2: Linked circumstances to event.

Linked circumstances.	Number	Percentage
Playing by the river side	2	28.58%
Fall into a well water	1	14.29%
Fall into a septic tank	1	14.29%
Left Sleeping in parents bed room but was latter found dead in a domestic receptacle	1	14.29%
Found dead in a hotel swimming pool during hotel visit to see mother who just returned from overseas	1	14.29%
Playing by the sea side	1	14.29%

The approximate submersion times were more than 10 minutes 2(28.58%) of cases,10 to 20 minutes 2(28.58%) of cases, more than 20 minutes to 30 minutes 1(14.29%),more than 30 minutes 2(28.58%)

The times that elapsed from the event to presentation to The Emergency Department were undetermined in the 2(28.58%) cases these were the two cases who were brought in already dead. All the 5 (71.43%)cases brought in alive presented less than 6 hours after the incident. They were brought directly from the scene of the event to the Paediatric emergency department.

Figure 3

Table 3: Clinical features on presentation to the Paediatric Emergency Department.

Clinical Features	Number	Percentage
Severe respiratory difficulty	5	71.43%
Febrile response	2	28.58%
Impaired consciousness	4	57.14%
Coughing	5	71.43%
Vomiting	3	42.86%
Tachypnoea	5	71.43%
Abdominal distension	5	71.43%
Pre-hospital CPR	5	71.43%
Cerebral dysfunction syndrome	1	14.29%
Aspiration syndrome	5	71.43%
Other signs of trauma.	0	0
Previous Premorbid, psycho neuropathology e.g. epilepsy	0	0

2(28.57%) of the cases were hospitalized for at least 24 hours, 1(14.29%) case for at least 48 hours,another1(14.29%)case for at least 48 hours,14.29%,2(28.29%) of the cases for at least one week,another1(14.29%) of the cases for more than one week. This case had the longest inpatient stay of nine days and developed organic cerebral dysfunction

syndrome.

The outcomes of the cases were a spectra ranging from alive and well. 4(57.12%) cases ,cerebral dysfunction syndrome 1(14.29%) to brought in already dead. 2(28.57%)

Figure 4

Table 4:Radiologic Features of cases.

Radiologic Features	Number	Percentage
Bilateral perihilar Infiltrates	5	71.43%
Interstitial oedema	5	71.43%
Bilateral pulmonary infiltrates	5	71.43%
Air Bronchograms	0	0
Sand Bronchograms	0	0
X-ray skeletal survey	Normal features	0

All the cases brought to the Paediatric Emergency Department alive 5(100%) had normal haematological indexes.1(14.29%) of the cases had a hypochloraemic metabolic acidosis.

Figure 5

Table 5:Management Strategies applied to cases.

Management strategies.	Number	Percentage
Intranasal oxygen	7	100%
Oro-nasal Suctioning	7	100%
Antibiotics	7	100%
Aminophylline	3	42.86%
Frusemide	4	57.14%
Crystalloids	7	100%
Antipyretics and analgesics	2	28.57%

DISCUSSION

Drowning is an event of much historical interest .It was employed as a means of execution until the 17th century and the 18th centuries. It was used more often than hanging as a means of capital punishment.

It was thought to be a more humane form of execution, and was used mainly for the

execution of women, although some privileged men were executed in this way as well.

In this study an attempt was made to explore the incidence and some potential risk factors of near drowning and drowning-associated deaths in this setting within this period. A detailed history was undertaken and obtained in all cases. It was indistinct in 28.57% of cases. (Tables 1-5)

The derived figures showed that drowning associated deaths

were significantly higher among children aged 1-4 years compared to other age groups which compares with other series where the peak incidence is usually in the first decade. Male children were more likely to drown or to be nearly drowned. These findings are very close to observations in other settings. [13141516171819202122] Where as the few studies in developing countries showed that many cases of drowning took place in domestic settings such as wells, septic tanks, ditches and receptacles, in the developed countries most cases of near drowning or drowning were related to swimming in a domestic swimming pool. River water was the most common place of these events in this series .Although most deaths occurred in the river, children have drowned in baths, buckets and toilets. These findings are consistent with observations elsewhere [23242526].In this setting, wells, septic tanks and sometimes the rivers and seas are located very close to individual households. Given the proximity of these bodies of water to the household, children can easily roam around them. Whenever they are unsupervised, accidents including near drowning, and drowning occur more Commonly in this age group because they are more curious, can move around independently and usually they have a natural affinity for water. On the average children who survive near drowning generally do well clinically. They were pre-morbidly more intelligent and explorative as a group. All the cases were pre-morbidly physically and neuropsychologically normal children with no epilepsy, psychopathology, or defects of self regulation. In this series, the manner of near drowning was accidental in 71.43%, and was undetermined in 28.57% who were met already dead. None of the cases showed any sign of physical trauma. All cases brought in alive were seen in severe respiratory distress. The consciousness levels were impaired in 57.14%.In none of the cases did family members have any retrieval or cardiopulmonary resuscitation knowledge or training.28.57% of the cases were brought in already dead.

None of the patients admitted to the intensive care unit through the paediatric emergency department died. All the cases were admitted for at least 24 hours in the intensive care unit. Hypochloraemic metabolic acidosis could have contributed to the post encephalopathic organic brain dysfunction syndrome in the case of the child having this as an associated complication to the near drowning, this case had the longest hospital inpatient stay of nine days.

Consent for a limited Computer assisted tomographic virtual or conventional extended autopsies were declined by the relatives of the drowned cases.

Children who survive near drowning accidents are at risk of encountering the event in the future; therefore they will need an enhanced supervision. Overall the difference between salt and fresh water drowning has little clinical relevance, except that hypovolaemia is more common in the former and atelectasis more common in the latter. Administration of dextrose infusions were avoided as much as possible in these cases because if applied they could get converted to adenosine which causes vasodilatation and worsens the hypotension. All the cases revealed radiological features consistent with aspiration pneumonia and interstitial pulmonary oedema, no sand or air bronchograms were seen. There were febrile responses in two cases which could have been attributed to an acute phase inflammatory response secondary to aspiration, hypostatic pneumonia or severe bacterial infections. These two cases received antipyretics. All the cases in this series received broad spectrum antibiotics and crystalloids. Intravenous aminophylline and frusemide were administered to 42.86% and 57.14% of these cases respectively. Living in close proximity to a body of water may be considered a risk factor of drowning. In developed countries, children aged between 1 to 4 years are most likely to drown in swimming pools, particularly those located in private residential areas. (27,28,29,30). The case in this series that drowned in a hotel's swimming pool was aged nine, and was found lying face down in the pool during a visit to a mother who just returned from overseas. Various studies in the developed countries proposed several preventive measures such as pool fencing, installation of pool-alarms, telephones and drowning awareness education and cardiopulmonary resuscitations training programs. In this setting, proper fencing of swimming pools, wells, septic tanks, the fencing of ponds or other open body of water, temporary door fencing to confine children indoors, enhanced age appropriate supervisions, formal training in swimming lessons, use of flotation devices, arranging for parents and guardians to undertake formal cardiopulmonary and retrieval trainings, introduction of formal swimming training lessons in the physical educational sessions of the school pupils, increasing the awareness on the possibility of the occurrence of these events, parental and child's educational campaigns, are cost effective, feasible and sustainable preventive options. [31,32,33,34,35,36,37,38] Results of most studies in developed countries showed that drowning-

associated deaths among children aged 1-4 years occurred in swimming pools [39,40,41,42], which is not comparable to the situation in this setting where the event is related to activities in other bodies of water such as a river, the sea, a septic tank, the well and a domestic water receptacle. The wet season is the most common time for near drowning events because most artificial and natural bodies of water increase in depth and overflows. Indeed, occasionally pools of water after a rain is enough to cause near drowning or drowning in young children.

Lack of maternal formal education and overcrowded living conditions could influence unintentional drowning associated deaths among these high-risk age groups. In this setting female literacy was estimated at 24.9%. In developed countries, different preventive strategies were proposed to policy makers and health authorities, and then implemented thereafter based on results of different investigations appeared to be effective in decreasing the mortality related to this event [43,44,45,46,[[[47]]]] However the situation appears to be different for developing countries where the policy makers and health care professionals may lack adequate figures to direct their decisions on this public health problem. The figures derived from this review highlight the spectra of the features associated with drowning and near drowning, its management implications and outcome in this setting. This reiterates the relevance of undertaking observational epidemiological studies on the societal knowledge, attitude and practice of issues related to near drowning and drowning in this setting. The figures derived from this could assist the generation of hypothesis for future research direction and implementation of appropriate interventions in this setting. Even small sample sized studies could be useful initially in achieving these goals.

References

1. Van Beeck E.F, Branche C.M, Spilma D et al. A new definition of drowning, towards documentation and prevention of a global public health problem, Bulletin of the World Health Organization, 2005, 83(11):853-856
2. Wintemute, G.J. Childhood drowning and near drowning in the United States. American Journal of Disease in Childhood, 1990, 144(663-9)
3. Spyker D.A. Submersion injury. epidemiology, prevention and management. Pediatr Clin North Am. 1985, 32.113-125
4. Geddis D.C. The exposure of preschool children to water hazards and the incidence of potential drowning accidents. NZ Med J. 1984, 97.223-226.
5. Somers, G.R, Chaisson D A, Smith C.R. Paediatric Drowning. A 29 year Review of Autopsied cases. Demographic features. American Journal of Forensic Medicine and Pathology. 2005;26 (4).316-319.
6. Kyriacou D.N, Arciniegua E.L, Peek C, Kraus J.F. Effect of

- immediate resuscitation on children with submersion injury. *Pediatrics* 1994, 94:137-142.)
7. Pless IB. The challenge of drowning prevention. *Inj Prev* 1997, 3:237-238.
8. Peden. M.M, McGee K, The epidemiology of drowning worldwide, *International Journal of Injury Control and Safety Promotion*, 2003, 10, 4:195-199.
9. Harris AH, Warchivker, I, de Clerk, NJ. Isolation fencing and the prevention of toddler drowning in backyard pools. an economic analysis. *Economic Programme, Murdoch University* 1992.)
10. Nixon, JW, Pearn JH, Petrie ,GM. Childproof safety barriers. *Australian Paediatric Journal*, 1979, 15(4)
11. Quan L, Gomez A. Swimming pool safety. an effective submersion prevention. *J Environ Health*, 1990, 52(6):334-336)
12. Choo S, Teo WC, and Nixon J. Publicly expressed attitudes to pool fencing in letters to the editor in Brisbane newspapers. In: Nixon J, Pearn J, Oldenburg B, Pitt WR, editor(s). *Review of countermeasures to reduce drowning, near drowning and spinal injuries from diving into shallow water* commonwealth Department of Human Services and Health Canberra ACT, 1995. Monograph series no 2, 69-71 .
13. Silva DT, Ruben AR, Wronski I, Stronach P, Woods M. Excessive rates of childhood mortality in the northern territory, 1985-94. *J Paediatr Child Health* 1998, 34:63-68.
14. Calder RA, Clay CY. Drowning in Florida 1977-1986. *J Flo Med Assoc* 1990, 77:679-82.
15. Ellis AA, Trent RB. Hospitalisations for near drowning in California. Incidence and costs. *Am J Public Health* 1995, 85:1115-8.
16. Bose A, George K, Joseph A. Drowning in childhood: a population based study. *Indian Pediatr* 2000; 37:80-3
17. Hedberg K, Gunderson PD, Varga C, Osterholm MT, MacDonald KL. Drownings in Minnesota, 1980-85. a population based study. *Am J Public Health* 1990, 80:1070-4.
18. Brenner RA, Smith GS, Overpeck MD. Divergent trends in childhood drowning rates, 1971 through 1988. *JAMA* 1994; 271:1606-08.
19. Lunetta P, Penttila A, Sajantila A. Circumstances and macropathologic findings in 1590 consecutive cases of bodies found in water. *Am J Forensic Med Pathol* 2002; 23:371-76.
20. Jenson LR, Williams SD, Thurman DJ, Keller PA. Submersion injuries in children younger than 5 years in urban Utah. *West J Med* 1992, 157:641-4.
21. Kioeck WG. Infant drowning in nappy buckets. *S Afr Med J* 1993, 83:131.
22. American Academy of Paediatrics Committee on Injury and Poison Prevention. Drowning in infants, children, and adolescents. *Pediatrics* 1993; 92:292-294.
23. Brenner RA, Trumble AC, Smith GS, Kessler EP, Overpeck MD. Where children drown, United States, 1995. *Pediatrics* 2001, 108:85-9.
24. Celis A. Drowning in Jalsisco. 1983-1989. *Salud Publica Mex* 1991, 33:585-9.
25. Kibel SM, Negel FO, Myers J, Cywes S. Childhood near drowning .a 12 year retrospective review. *S Afr Med J* 1990, 78:418-21.
26. Mackie IJ. Patterns of drowning in Australia, 1992-1997. *Med J Aust* 1999, 171:587-90.
27. Jose A, George K, Joseph A. Drowning in childhood .a population based study. *Indian Pediatr* 2000, 37:80-3.
28. Quan L, Cummings P. Characteristics of drowning by different age groups. *Inj Prev* 2003, 9:163-68.
29. Mahablesh. S. Profile OF Drowning Deaths in Mangalore Coastal City of Karnakata. *Indmedica-Medico-Legal update* Vol.5, No.2 (2005-04-2005-06).
30. Pitt WR, Balanda KP. Childhood drowning and near drowning in Brisbane. the contribution of domestic pools. *Med J Aust* 1991, 1143-6.
31. Kemp A, Sibert JR. Drowning and near drowning in children in the United Kingdom. lessons for prevention .*BMJ* 1992, 304:1143-6.
32. Fergusson DM, Horwood LJ. Risks of drowning in fenced and unfenced domestic swimming pools *N Z Med J* 1984, 97:777-9.
33. Zhao Z, Svanstrom L. Injury status and perspectives on developing community safety promotion in china. *Health Promot Int* 2003, 18:247-53.
34. Thompson DC, Rivara FP. Pool fencing for preventing drowning in children *Cochrane Database Syst Rev* 2000,(2)CD001047.
35. Brenner RA. Childhood drowning is a global concern. prevention needs a multifaceted approach (editorial). *BMJ* 2002. 324:1049-50.
36. Norris B, Wilson JR. Preventing drowning through design -the contribution of human factor. *Injury Contr Safety Prom* 2003, 10:217-26.
37. Browne ML. Priorities in epidemiological studies of drowning prevention. *Int. J. Epidemiol.*, 2004; 33(5):1063-1064.
38. US-CPSC 1991. U.S Consumer Product Safety Commission. CPSC staff recommendations for barriers for residential swimming pools, spas and hot tubs. Washington D.C.
39. Bull MJ, Agran P, Dowd MD, Garcia V, Gardner HG ,Smith GA et al. (Committee on injury, violence and poison prevention). Prevention of drowning in infants, children, and adolescents. *Pediatrics* 2003, 112:437-9.
40. Stevenson MR, Rimajova M, Edgecombe D, et al .Childhood barriers surrounding private swimming pools. *Pediatrics*. 2003 Feb, 111(2):E115-9.
41. Brenner RA and the committee on injury, violence, and poison prevention. Preventing of drowning in infants and children, adolescents .*Pediatrics* 2003, 112:440-5.
42. Blum C, Shield J. Toddler drowning in domestic swimming pools. *Inj Prev* 2000, 6:288-90.
43. Brenner RA, Saluja G, Smith GS. Swimming lessons, ability, and the risk of drowning. *Inj Control Saf Promot* 2003, 10:211-6.
44. Coffman SP. Parent educations for drowning prevention. *J Pediatr Health Care* 1991, 5:141-6
45. Smith GS, Howland J. Declines in drowning. exploring the epidemiology of favorable trends. *JAMA* 1999, 281:2245-2247.
46. Sibert JR, Lyons RA, Smith BA, Cornall P, Summer V, Craven MA, et al. Preventing deaths by drowning in children in the United Kingdom. have we made progress in 10 years: Population based study. *BMJ* 2002; 324:1070-1071.
47. Quan L, Gore EJ, Wentz KR, Allen J, Novack AH. Ten-year study of paediatric drowning and near drowning in King county, WA Lessons in injury prevention. *Paediatrics* 1989; 83:1035-40.

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