جامعة نايف العربية للعلوم الأمنية
Naif Arab University for Security Sciences

Naif Arab University for Security Sciences
Arab Journal of Forensic Sciences & Forensic Medicine
المجلة العربية لعلوم الأدلة الجنائية والطب الشرعي
https://journals.nauss.edu.sa/index.php/AJFSFM

الجمعية العربية لعلوم الأدلة الجنائية والطب الشرعي
Arab Society for Forensic Sciences and Forensic Medicine

Fatal Accidents of Children Falling into Abandoned Borewells: An 11-Year Review of Data and Literature

CrossMark

الحوادث المميتة للأطفال الذين سقطوا في حفر الآبار المهجورة: مراجعة علمية للبيانات والأبحاث والدراسات المتوفرة خلال فترة 11 سنة.

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Received 26 Nov. 2019; Accepted 27 Apr. 2020; Online 15 Jun. 2020.

Abstract

The escalation of child fatalities due to falling into borewell has been in news in recent years. A Borewell which is a digging structure, is created by digging, driving, boring, or drilling the ground to access groundwater from underground aquifers. When these borewells don't fetch enough water they are abandoned without taking proper measures to seal them. Children might get accidentally stuck and trapped in the tubing or the hole of the borewell through which they are unable to extricate themselves. Due to this, if immediate rescue is not done, chances of survival of the little victims get diminished.

Cases of children falling in borewells were studied from year 2006 to 2016. Data were reviewed from available literature, national crime record bureau of India, the news published in press media either as hard print, e- news, television etc. A total of 43 incidents of victims who had fallen in borewells were studied. Most of these cases were of children below 6-years with male preponderance. In most of the cases, victims died due to asphyxiation due to wedging of the body in the narrow space of the borewell. In few cases (rather 2 cases) there was water in the borewell which may have drowned the victims.

Keywords: *Forensic Science, Fatality, Abandoned Borewell, Accidental fall, Children, Prevention.*

المستخلص

أصبح تزايد عدد وفيات الأطفال بسبب سقوطهم في الآبار يتصدر الأخبار في السنوات الأخيرة. يتم إنشاء بئر الارتوازي وهو عبارة عن حفر تجويف عن طريق الحفر أو الثقب أو التنقيب في الأرض للوصول إلى المياه الجوفية من طبقات المياه الجوفية تحت الأرض، وعندما لا تجلب هذه البئر ماءً كافياً يتم التخلي عنها دون اتخاذ التدابير المناسبة لإغلاقها. وقد يتعرّض الأطفال للوقوع أو الانحشار دون قصد في الأنابيب أو ثقب البئر الذي لا يستطيعون من خلاله تخليص أنفسهم. وبسبب هذا إذا لم يتم الإنقاذ الفوري تتضاءل فرص بقاء الأبرياء الصغار على قيد الحياة.

تمت دراسة حالات الأطفال الذين يقعون في فتحات الآبار من عام 2006 إلى عام 2016. وتمت مراجعة البيانات من الدراسات العلمية المتوفرة، والمكتب الوطني لسجلات الجريمة في الهند، والأخبار المنشورة في وسائل الإعلام إما على شكل مطبوع، أو الأخبار الإلكترونية، أو التلفزيون، إلخ. تمت دراسة ما مجموعه 43 حادثة من ضحايا سقطوا في فتحات الآبار وكانت معظم هذه الحالات من الأطفال دون سن 6 سنوات مع غالبية من الأطفال الذكور. توفي معظم الحالات بسبب الاختناق نتيجة انحشار الجسم في مساحة ضيقة في حفر الآبار. وفي حالات قليلة (بالأحرى حالتين) كان هناك ماء في البئر مما قد يكون قد تسبب في غرق الضحايا.

وفيات الأطفال الذين يقعون في حفر الآبار المهجورة في ارتفاع.

الكلمات المفتاحية: علوم الأدلة الجنائية، الوفيات، حفر الآبار المهجورة، السقوط العرضي، الأطفال، الوقاية.

Production and hosting by NAUSS

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doi: 10.26735/NAOX1933

Fatalities of children because of falling in abandoned borewells is rising. Such fatalities need urgent attention in form of understanding of risk, prevention, rescue and other legal sanctions to prevent further such incidents in the coming years.

هذه الوفيات تحتاج إلى عناية عاجلة،مع فهم لتلك المخاطر والوقاية منها وعمليات الإنقاذ والعقوبات القانونية الأخرى لمنع وقوع المزيد من هذه الحوادث في السنوات المقبلة.

1. Introduction

The escalation of child fatalities due to falling into borewells has been in the news in recent years. A borewell is a digging structure created by digging, driving, boring, or drilling the ground to access groundwater from underground aquifers [1,2]. As there is an increasing dearth of surface water not only for drinking but also for irrigation, there has been a rise in construction of borewells. However, it is not always that a borewell digged will fetch water. Sometimes, the borewells dug several hundred feet deep will remain dry. Such borewell not fetching adequate water or no water are usually abandoned. These wells can thus become a potential death pit for those small kids who being unaware of their depth, play near these wells. In countries like India which has such diverse geographical topography, the source of water is declining in comparison to the population needs. This is particularly true not only for surface water sources like lakes, rivers etc. but also for below ground level sources like wells. To cater for the rising population, facing scarcity of water, sources like borewells are constructed. For this, more and more underground water resources are explored. As conventional wells cannot be dug beyond certain depths, there is an increase in digging of borewells to fetch water.

In India, ever since the first reported case of a 6-year-old child named Prince. who was entrapped and rescued from a borewell, came to light, numerous other cases have also started to be reported [2, 3]. Such cases have tragic ends and the authorities and the victim find themselves in a helpless situation which is a matter to be seriously considered. Very little data is available on fatalities caused by such incidents in literature. This paper tries to study various issues related to the fatalities caused by victims falling into borewells and aims to highlight preventive and rescue steps. The present study discusses issues which are rarely discussed in medical literature to the best of the author's knowledge.

2. Materials and Methods

The present study was carried out in the department of forensic medicine and toxicology, Indira Gandhi government Medical College, Nagpur. Data was reviewed from various agencies like the national crime record bureau of India, the news published in press media either as hard print, e-news, television etc. from 2006 to 2016. In hard print, the local newspaper, news channels and online news websites were used for collecting data [3-5]. Similarly, all the data in the available literature was also reviewed and studied. Cases which met the criteria for human - borewell accidents were reviewed. The geographical area for the study was from the entire length and breadth of the country rather than a small specified area.

Inclusion criteria:

All the cases of falls in borewell with availability of all the other relevant information were studied.

Exclusion criteria:

Cases having an inadequate history and ambiguous informations were excluded

3. Results

A total of 43 cases of children falling accidentally into borewells were observed between 2006 to 2016. Table-1 shows the age and sex distribution of victims falling into borewells. Most of the victims were aged below 4 years. The highest number of cases were in the age group of 2-4 years followed by 0 – 2 and 4 – 6 years in both sexes. Of the total 43 cases, 27 were male while 16 were female. The male:female ratio was 1.68:1.

Since 2006, there has been a rise in incidents of cases falling into borewells. Barring the years 2015 and 2016, all the years showed more or less a similar picture (Table-2).

On studying different depths of borewell associated with such incidents, it was found that most borewells cases of accidental falls were within 50 feet (n=17) in depth followed by 50-100 feet (n=9). However, there were fair number of cases in which depths were below 150 feet (Table-3).

It was observed that most of the cases were pulled out within 72 hours. Of the total cases, the maximum were pulled out within the first 6 hours followed by a period between 48-72 hours (Table-4). Cases were present in which the victims were pulled out after 4-5 days of res-

Table 1- *Age and sex distribution of cases of fall in borewells (n=43).*

Age (years)	Sex	
	Male (%)	Female (%)
0 – 2	08 (29.6)	04 (25)
2 – 4	07 (25.9)	08 (50)
4 – 6	06 (22.2)	03 (18.8)
6 – 8	02 (7.4)	01 (6.2)
8 – 10	02 (7.4)	00
10 – 12	02 (7.4)	00
>12	01(3.7)	00
Total	**27 (100)**	**16 (100)**

Table 2- *Year wise distribution of cases of borewell deaths.*

Years	Male	Female	Total
2006	01	00	01
2007	06	03	09
2008	01	02	03
2009	03	01	04
2010	03	02	05
2011	04	01	05
2012	04	02	06
2013	01	03	04
2014	01	03	04
2015	01	00	01
2016	01	00	01

cue operations.

From Table-5 it can be ascertained that about 85.5% male and 87.5% female didn't survive after falling into the borewell. It was found that cases of victims below 6 years only survived while others could not.

Most of the victims who survived were pulled out within 6 hours of falling into the borewell. Barring one case who was pulled out between 24-48 hours, all the other victims died (Table-6). Most of the children were already dead within the borewell itself before being actually pulled out from it. In one case which was noticed by the author the child's body was found to be in an early stage of decomposition.

On correlating the depth of the borewell with survival, it was observed that most of the victims who survived were pulled out from borewells of depth under 50 feet. As the depth of borewell increased the chances of survival was found to be decreased (Table-7). Though, it was thought that the child may have got to the bottom of the borewell after falling, some cases were found to be stuck at various depths of the borewell. However, no data could be found that determined the level of depth at which the victims got stuck in the borewell.

We were interested to know the autopsy- related findings in such cases. But, as the cases are widely distributed throughout the length and breadth of such a alarge country, we were unable to procure any relevant information. However, as per information from the available literature, most of the cases died due to asphyxiation due to wedging of the body in the narrow space of the borewell. In a few cases (rather 2 cases) there was water in the borewell which may have drowned the victims.

Table 3- *Depth of borewells in cases of fall in borewells.*

Depth (feet)	Total (%)
0-50	17 (39.5)
50-100	09 (21)
100-150	02 (4.6)
150-200	07 (16.3)
200-250	02 (4.6)
>250	06 (14)
Total	**43 (100)**

Table 4- *Time period of fall and pulling out from borewells.*

Period (hours)	Sex (*n* = 43)		
	Male (%)	Female (%)	Total
0-6	10 (37%)	07 (43.8%)	17 (39.5%)
6-12	04 (14.8%)	01 (6.3%)	05 (11.6%)
12-18	01 (3.7%)	00 (0%)	01 (2.3%)
18-24	03 (11.1%)	00 (0%)	03 (6.9%)
24-48	01 (3.7%)	02 (12.5%)	03 (6.9%)
48-72	05 (18.5%)	05 (31.2%)	10 (23.2%)
>72	03 (11.1%)	01 (6.3%)	4 (9.3%)
Total	**27 (100%)**	**16 (100%)**	**43 (100%)**

Table 5- *Relationship between the age of victim and victims's survival.*

Age (years)	Male (*n*=27) (%)		Female (*n*=16) (%)	
	Survived	Dead	Survived	Dead
0 – 2	01 (3.7%)	06 (22.2%)	00 (0%)	04(25%)
2 – 4	01 (3.7%)	06 (22.2%)	02 (12.5%)	06 (37.5%)
4 – 6	02 (7.4%)	04 (14.8%)	00 (0%)	03 (18.8%)
6 – 8	00 (0%)	02 (7.4%)	00 (0%)	01 (6.2%)
8 – 10	00 (0%)	02(7.4%)	00 (0%)	00 (0%)
10 – 12	00 (0%)	02 (7.4%)	00 (0%)	00 (0%)
>12	00 (0%)	01 (3.7%)	00 (0%)	00 (0%)
Total	**04 (14.8%)**	**23 (85.2%)**	**02 (12.5%)**	**14 (87.5%)**

Table 6- *Relationship between time period of pulling out and Survival of victim.*

Period (hours)	Male (*n*=27) (%)		Female (*n*=16) (%)	
	Survived	Dead	Survived	Dead
0-6	03 (11.1%)	07 (25.9%)	02 (12.5%)	05 (31.3%)
6-12	00 (0%)	04 (14.8%)	00 (0%)	01 (6.2%)
12-18	00 (0%)	01 (3.7%)	00 (0%)	00 (0%)
18-24	00 (0%)	03 (11.1%)	00 (0%)	00 (0%)
24-48	01 (3.7%)	00 (0%)	00 (0%)	02 (12.5%)
48-72	00 (0%)	05 (18.5%)	00 (0%)	05 (31.3%)
>72	00 (0%)	03 (11.1%)	00 (0%)	01 6.2%)

4. Discussion

In certain parts of the world there is a growing scarcity of fresh water reservoirs for the purpose of drinking, irrigation, and day-to-day use for washing and toiletries. Most of the parts are still dependent on rain water or the ground water for their daily affairs. India has a varied geography, having snow mountains in the north to deserts in the west. While in east it has big broad rivers like the Ganges and Brahmaputra while the south faces heavy rainfall. Still more or less all this region faces the scarcity of potable water over the ground surface. To overcome this difficulty ground water is taken out by constructing more open and borewells. In drought areas, open wells don't satisfy the need of water for various irrigation and drinking purposes. For this, borewells are a good alternative. The diameter of such borewells are between 4.5 inches to 12 inches (114 millimetres to 305 millimetres) in diameter. For domestic purpose, borewells are between 4.5 inches and 6.5 inches (114 millimetres to 165 millimetres) in diameter, while for commercial or agriculture purpose borewells are above 6.5 inches (165 millimetres) in diameter. These borewells are dug from 50 feet up to 1000 feet (15 metres to 30 metres) in depth for taking out water [1,2]. Most of the times the borewells are successfully dug, however sometimes the borewell doesn't fetch enough water. Such borewells are then abandoned by its owners without taking proper measures to seal it.

In recent years, the news of tragic incidents like falling into borewells have been frequently reported. Such incidents are most tragic and the victim and the rescuers find themselves in a helpless situation. Such accidents occur while the victims are unaware of the fact that they are working or playing around such abandoned structures which might be waiting for them in the form

Table 7- *Relationship of depth of borewells with survival.*

Depth (feet)	Male (*n*=27) (%)		Female (*n*=16) (%)	
	Survived	Dead	Survived	Dead
0-50	03 (11.1%)	07 (25.9%)	02 (12.5%)	05 (31.3%)
50-100	00 (0%)	05 (18.5%)	00 (0%)	04 (14.8%)
100-150	00 (0%)	02 (7.4%)	00 (0%)	00 (0%)
150-200	00 (0%)	04 (14.8%)	00 (0%)	03 (18.8%)
200-250	00 (0%)	02 (7.4%)	00 (0%)	00 (0%)
>250	01 (3.7%)	03 (11.1%)	00 (0%)	02 (12.5%)
Total	**04 (14.8%)**	**23 (85.2%)**	**02 (12.5%)**	**14 (87.5%)**

of a death trap. After falling into the abandoned borewell they are unable to extricate themselves due to the small size of the well and are helplessly waiting for help to come. But the deficiency of oxygen, fright, and harrowing atmosphere can take their life slowly before the rescue team can reach them.

The incident of losing lives after being trapped in borewells was highlighted in 2006 when a 5-year-old child named Prince [3] was rescued by Indian Army experts after a tough combat which lasted 49 hours. The boy showed tremendous survival instinct by remaining calm and being co-operative with survivors. Due to the small diameter of these borewells it is not a real threat to a normal adult human being but small children are particularly at risk of accidently falling in.

In the present study, most of the victims were toddlers under the age of 6 years (Table-1). This can be due to the fact that small children are usually unaware of their surroundings and are more dependable on their parents or guardians for their safety. Similarly, these children have very curious natures to explore things which can become dangerous if not done under supervision. Again while playing they might be totally unaware about the danger of such abandoned borewells, as from surface they seems to be quite harmless.

Yearly comparison of such incidents depict that in every year there are one or more incidents of falls in borewells (Table- 2).

In most of the cases (39.5%), the depth of the borewell was under 50 feet. Whereas, in more than 50% cases of the victim falling into borewell, having depth of up to 100 feet. However, cases have been seen where the depth of borewell was more than 250 feet also. The reason for having such depths of borewells was due to the fact of ever increasing depletion of ground water reservoirs, therefore making the fetcher dig more deep borewells.

The event of rescuing the victim as early as possible is of paramount importance. In the present study we found that most of the victims were rescued within 6 to 12 hours after the fall (Table-4). However, there were cases where the victim was not able to be rescued for a period as long as 72 hours or more. Rescuing the victim from such borewells is a cumbersome and tedious job. The rescuer not only has to think of rescuing, but also the safety and wellbeing of the victim during such operations. The pattern of borewell, its ground soil structure and its internal environment has to be taken into account while doing the rescue operation. Similarly, the method of rescue apparatus used, had to be carefully planned. Planning such an operation is very important before commencing it. Such incidences are mostly not foreseen, so it requires sufficient time to prepare for rescue operations.

It was found that most of the victims were less than 6 years of age. Similarly, all the victims who survived were also from the same age group of below 6 years (Table-5). However, there were no cases of victims above 6 years old who survived the incident. Firstly, the reason for getting high number of cases at less than 6 years of age, might be due to the small size and structure of children belonging to this age group. Also, in this age group the children have started to explore different places of curiosity and are unaware of the dangers approaching them.

In the present study, when the period of rescue was correlated with survival, it was observed that most of the cases who survived were rescued within 6 hours or less after the fall. Thus, as the time of rescue increases, the chances of survival decreases. This makes it imperative for the rescue agencies to plan and act fast so as to save the life of the entrapped victim.

Again, on observing the relationship of survival or fatality with the depth of the borewell, it was observed that there was no survival of victims beyond 50 feet depth of borewell. Thus, victims falling in deeper borewells are very difficult to rescue and also they have to face a more holistic environment for survival.

It becomes very important for the authorities and the personnel involved in digging the borewell to adopt various preventive measures during and after the successful or unsuccessful digging of the borewell. Prevention is the best method to avoid such incidents rather than to counter various rescue measures afterwards.

Several methods had been adopted till now for rescuing the ill fated victims [3, 4]. Digging a parallel bore hole, catching the victim from above the bore well, etc. New methods have been proposed like bore well rescue robots with advanced equipment and devices, robotic modules with arms and camera systems etc.[3] Thus, the objective is to construct and design a borewell rescue system which not only rescues a trapped victim from borewell but also offers safe handling. However, any method used should not only be fast and easy but also safeguard the wellbeing of little victims who are already in an endangered state. Rapid action and swift recovery of the trapped child must be done by any of the above mentioned rescue methods. However, methods must be used which are best suited to that particular geography. Proper ventilation measures in form of oxygen cylinders and removal of harmful gases or water must be simultaneously carried out during the rescue operations. Whether or not the victim is still alive within a borewell can be ascertained by using the help of fibre optic cable cameras. Personnel must be trained in such particular rescue operations along with medical and paramedical facilities. Proper cordoning-off the

surroundings from bystanders and strangers must be done to prevent chaos during rescue operations. Rescue operations must be supplemented by police and other law and order restoring agencies.

Similarly, strict laws or legislations must be adopted to curb such untoward incidences where the children get fatally trapped. Preventive measures are better than the actual exercise of the rescue. The Supreme Court of India has intervened in such borewell related fatalities matters in 2010, and issued guidelines to prevent such incidents. These guidelines require that the landowners should take written permission from authorities for digging bore wells, there must be compulsory registration of all drilling agencies, erection of signboards and barriers around the drilling site, construction of cement platforms around well casing, capping of wells by welding steel plates and filling up of unused borewells [8, 9].

But despite this, there is no dearth of casualties. The national crime record bureau of India until 2014, did not have any data of falls in borewells. It was noticed that they had also started to take note of incidents and these are reflected in their data of accidents and suicide in the years 2014 and 2015. [7,8] Data of such fatalities and incidents from the year 2016 onwards have not yet been declared. Though there seems to be no national register of children getting trapped in borewells, the numbers with the Home ministry of India, shows that children up to 14 years of age, falling into pits and manholes have gone up from 175 in 2010 to 192 in 2011 and to a further 194 in 2012. The largest number of casualties which occured in 2012 was in Madhyapradesh (67 cases), Maharashtra (39 cases), Uttarpradesh (19 cases), Gujarat (18 cases), and Tamilnadu (13 cases) [10].

5. Conclusion

From this study we may conclude that fatalities of victims falling in borewells occur. It is particularly true for children who are below 6 years of age. Abandoned borewells are usually the culprits. Such incidences can be easily prevented from happening, with due and proper precautions, while abandoning such borewells. These accidents can occur anywhere in the world irrespective of its status. Digging of borewells is well rampant in regions where there is a dearth of water supply for drinking as well as irrigation. Rapid rescue methods and on-site medical attention can be very handy for prevention of losing precious lives. Thus, it is the need of the hour to study such incidences according to its manner and mode of causation and to plan, in advance, future preventive and rescue plans which will help to save the little souls.

Conflicts of Interest
Nill

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