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INVESTIGATION OF DROWNING EVENTS IN ANTALYA IN 2014-2015

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ABSTRACT

Drowning is described as obstructing the respiration with liquid flowing into alveoli of lungs and blocking the respiration ways by congesting the mouth and nose. Drowning is an insidious and more or less a short process of respiratory impairment caused by submersion in a liquid environment. In a drowning event, the longer the duration of the submersion, the higher the risk of death, some short-term symptoms or further complications. Although drowning is often preventable, it is one of the top fatal accidents. In Turkey the average of 1000 people die by drowning in a year. Drowning is on the second ranking for the reason of unnatural death safter traffic accident. Drowning occurs more frequently in populated area, which is surrounded with sea, lake or river. Deaths attributed to drowning affecting all age groups are usually seen among young population, especially under the age of 30 years old. In addition, men and children are at the top of the drowning victims from statistics analysing. In cases of drowning, the first cause is usually by accidental, and the second is by suicidal events. Accidental children drowning are usually caused by the fact that children are not under adult supervision. In this study; there are 152 drowning events occurred in Antalya province of Turkey between the year of 2014-2015 have been analyzed retrospectively. When the data is analyzed; It is seen that the most drownings occurred in June with 17,105%, 69,737% of the drowned were men and 58,553% died. In order to analyze numerical data in the research, the data was analyzed with association rules which are one of the data mining methods. Drowning incidents have been analyzed in terms of gender, age, nationality, month, day of the week, drowning environment and suggestions were made to reduce the cases of drowning.

Keywords: Drowning, autopsy, accident, association rule, accident analysis.

INTRODUCTION

Drowning is the process of experiencing respiratory impairment from submersion/immersion in liquid (Beeck et al, 2003). This is an international definition proposed by the World Health Organization (WHO) in 2005, eliminating the previously commonly used terms wet, dry, active, passive, silent, or near-drowning (almost drowning). (Albertini, 2003; Idris et al., 2003). In consideration of the results, drowning can be classified as death, morbidity, and no morbidity (Racz et al., 2015). Accidental drowning can have severe and sometimes fatal consequences in children. A retrospective study was conducted in France of children hospitalized for accidental drowning over a 10-year period. Age, gender, accident history, chest imaging and neurological outcomes of drowning children were examined. In total, the average age of 83 children brought to the hospital is 5 years old and 70% of them are boys. 71% of children who drowned drowned in fresh waters and especially in swimming pools (51.8%) (Forler et al., 2008).

A study by the Health Surveillance Institute (InVS) examined 1207 accidental drownings that occurred in France in the summer of 2006. These drowning cases occurred mostly at sea with 56%. Of the drowned, 33%, that is, 401, died and 15 (1.2%) survived with sequelae. In 15% of cases, that is, in 178 cases of drowning, the victim was a child under 6 years of age and 38 resulted in death (Thélot et al., 2008). This definition allows for both cases of fatal and non-fatal drowning. It has been revealed that the number of drowning in the water is much higher than the "World Injury Report" published by the World Health Organization in 2020 when it is thought that about 320,000 people lose their lives every year due to drowning, which represents seven percent of all injury-related deaths worldwide (WHO, 2022). Accordingly, almost half a million people drown in water every year, most of them in low- and middle-income countries, and most of the victims are children (Krug, 1999; WHO, 2022). Accidents for children often occur in a bathtub or swimming pool located near the victim's home. The drowning of children is mainly due to the lack of supervision of the family. (Ermanel & Thélot, 2003; Ermanel et al., 2004; Hausser & Niquille, 2007). Drowning is the most important cause of accidental death, especially in children under 15 years of age, even is one of the main causes of accidental death in children under the age of 4 (Ermanel & Thélot, 2003; Ermanel, 2003; Ermanel et al., 2004). Other studies have also shown that children around the world are at high risk of drowning (Taneja et al., 2008).

In this study; there are 152 drowning events occurred in Antalya province of Turkey between the years of 2014-2015 have been analyzed retrospectively. Drowning incidents have been analyzed in terms of gender, age, nationality, month, day of the week, drowning environment and suggestions were made to reduce the cases of drowning. It is seen that the number of studies that reveal the subject in detail about drowning events that cause serious loss of life every year is low. The analysis of the accident data obtained by examining each single drowning file in the gendarmerie records will also provide the opportunity for comparison to future researches. It is considered that this research, in which such detailed data is analyzed, will contribute to the field and be a basis for other researchers and policy makers on the solution. The research, which deals with a problem of the society that is under-studied and cannot be solved, is important in this respect.

METHOD**Data Mining**

Data mining method, a technique used in many scientific investigations, can help identify practical and useful examples by analyzing large databases. Therefore, this method can be applied in order to analyze the drowning incidents that occurred in the province of Antalya in Turkey between 2014 and 2015 (Zhang & Zhang, 2002).

Association Rule

One of the data mining models is used to find cohesion behaviors between large datasets and to reveal unknown associations within datasets. Association rules try to determine the relation between the successive movements when they come to a precursor movement. It is shown in the format $A \Rightarrow B$. The rule support of the association rules is the ratio of the number of movements involving $A \cup B$ to the number of total movement and its formula (Agrawal & Srikant, 1994; Song-bai et al., 2008; Bothorel et al., 2022);

$$\text{Rule Support (s)} = \frac{n(A \cup B)}{n(N)}$$

Confidence (α) is the ratio of the number of movements involving $A \cup B$ to the number of movements involving A . The formula is (Guillet & Hamilton, 2007);

$$\text{Confidence } (\alpha) = \frac{n(A \cup B)}{n(A)}$$

Apriori Algorithm

The Apriori algorithm, which is an algorithm that extracts association rules from data sets, was developed by Agrawal and Srikant and has been the most applied algorithm for extracting association rules in the history of data mining (Witten & Frank, 2005; Agrawal & Srikant, 1994). It has a repetitive nature and scans the database multiple times to find datasets that occur frequently in databases (Sever & Oğuz, 2002; Gülce, 2010).

Data Collection

In this study; the data in the reports prepared by the law enforcement officers regarding the 152 drowning in water in Antalya province of Turkey between 2014- 2015 have been analyzed retrospectively. Drowning incidents have been analyzed in terms of gender, age, nationality, month, day of the week, drowning environment and the status of the drowning person.

FINDINGS

The support value in the charts showing the Apriori Algorithm used in the analysis indicates the percentage of the premise/antecedent factor, confidence value shows how many of the records containing the antecedent factor also contain the successor factor, the rule support value indicates the percentage of coexistence of the two factors. The findings obtained according to the analysis results are as follows (Table 1):

Table 1. Statistics of Drowning Events in the Months and Districts

Antecedent	Consequent	Support %	Confidence %	Rule Support %
June	Alanya	17,105	46,154	7,895
Alanya	September	35,526	22,222	7,895
August	Alanya	15,789	41,667	6,579
Manavgat	September	30,921	14,894	4,605
October	Manavgat	9,211	42,857	3,947
Kemer	July	19,079	13,793	2,632
May	Manavgat	10,526	37,5	3,947
July	Alanya	12,5	31,579	3,947

When Table 1, which shows the month and district situations in which drowning incidents occurred in Antalya in 2014-2015, is examined, it shows that the incidents occurred mostly in June with 17,105 %, this was followed by AUGUST with 15,789 %, September 14,474% and JULY with 12,5 %, when examined in terms of districts, it is seen that the incidents occurred mostly in district Alanya with 35,526 %, district Manavgat with 30,921 %.

According to bilateral associations, rule support, that is, the association with the highest rate among all accidents, is JUNE=>ALANYA and ALANYA=>SEPTEMBER associations with 7.895%. That is, 7.895% of all drowning incidents occurred in June and in District Alanya, and 7.895% in September and again in District Alanya. Other associations are shown in the table 1.

Table 2. Gender, Age, Reason of Drowning and Outcome Status of Drowning in Water

Antecedent	Consequent	Support %	Confidence %	Rule Support %
Male	Swimming	69,737	75,472	52,632
Swimming	Male	77,632	67,797	52,632
Dead	Male	58,553	75,281	44,079
Swimming	Dead	77,632	53,39	41,447
Alive	Swimming	41,447	87,302	36,184
Dead and Male	Swimming	44,079	68,657	30,263
Alive, Male	Swimming	25,658	87,179	22,368
Female	Dead	30,263	47,826	14,474
Female, Swimming	Alive	25,0	55,263	13,816
71-80	Dead	21,053	65,625	13,816
Accident	Dead	16,447	76,0	12,5
0-10	Male	17,763	70,37	12,5
71-80 and Dead	Swimming	13,816	85,714	11,842
Accident and Male	Dead	13,816	80,952	11,184
11-20	Swimming	11,842	94,444	11,184
71-80, Dead and Male	Swimming	9,868	86,667	8,553
61-70	Male	13,158	65,0	8,553

From Table 2, which shows the gender, age, cause and result of drowning, it illustrates that among all the victims from drowning, 69,737% of the proportion are male, 30,263% are female. Depends on the status of drowning, it demonstrated that approximately 58,553% are dead, while 41,447% are alive. The most risky age for drowning is around 71-80 years old taking up 21,053% of the proportion. This is followed by the 17,763% to 0-10 age group. According to the data from the reason of drowning, it shows that 77,632% of the victims are related with swimming, while it's around 16,447% of the victims getting drowned with accidents.

The bilateral associations in Table 2; DEAD => MALE rule support is 44.079%. In other words, 44.079% of those who drowned were male and died. While the incident of accidental drowning was 16,447%, the rate of death by drowning as a result of accident, that is, the rule support of the association ACCIDENT => DEAD is 12.5%; the rule support of SWIMMING => DEAD association is 41,447%.

It is seen that the triple association for the rule support; {DEAD and MALE} => SWIMMING is %30.263; {ALIVE and MALE } => SWIMMING %22.368; {71-80, DEATH } => SWIMMING is %11.842.

In quartet associations; {(71-80), DEAD and MALE} => SWIMMING, there is %8.553 of the rule support of the quartet combination. The person who drowned in 8.553 % of the cases of drowning was male and within the age range (71-80).

Table 3. Liquid Circumstances in Which Drowning Events Occur, Whether or Not in the Hotel, and the Nationalities of the Drowned People

Antecedent	Consequent	Support %	Confidence%	Rule Support %
Hotel	Sea	73,026	75,676	55,263
Sea	Hotel	69,737	79,245	55,263
Russian	Hotel	29,605	88,889	26,316
Turkish	Sea	38,816	61,017	23,684
Outside the hotel	Turkish	26,974	75,61	20,395
Russian and Sea	Hotel	21,711	84,848	18,421
Pool	Hotel	19,079	93,103	17,763
Sea	Outside the hotel	69,737	20,755	14,474
Turkish and Hotel	Sea	18,421	71,429	13,158
German	Hotel	11,842	94,444	11,184
Pool and Russian	Hotel	7,895	100,0	7,895
Turkish	Pool	38,816	15,254	5,921

When Table 3 is examined, it is seen that, 73.026 % of the events are in touristic hotels, 26.974 % are outside the hotel; 69.737 % are in the sea and 19.079 % in the pool; 38.816 % of the drowned people are Turkish, 29.605 % Russian and 11.842 % are German. In double associations; it is seen that, the rule support of HOTEL =>SEA association is 55.263 %, RUSSIAN => HOTEL association is 26.316 %, also in triple associations the rule support of; {RUSSIAN, SEA} =>HOTEL association is 18.421 %.

CONCLUSION and DISCUSSION

Considering the data obtained from the research, it is seen that approximately 69,737% of drowning victims are men. Referring to all investigations in the literature, it is seen that 60-80 % of the drowned people are male (Racz et al., 2015; Tıraşçı & Gören, 2000; Thélot et al., 2008; Forler et al., 2010; Karbeyaz et al., 2011; Başol et al., 2012; Ahlm et al., 2013; Türkoğlu et al., 2014; Lakadamyalı, 2008). In this respect, this finding of the study is compatible with the literature.

According to the results of the research conducted by Tıraşçı and Gören, the most deaths are come from the 0-10 age group with %37 (2000). According to the research results by Thélot et al., 15% of accidental drownings are in the 0-6 age group (Thélot et al, 2008). In our research; The 0-10 age group was identified as the second age group most exposed to drowning. In order to protect children, who are one of the most risky age groups, from drowning, swimming pools should be isolated and kept under surveillance, children should be kept under surveillance and control, playground facilities should be improved, and safety strategies such as safety training for families should be implemented (Thompson & Rivara, 1998; Fragar et al., 2003; Petrass et al., 2011).

However, in Turkey, Tıraşçı and Gören's Diyarbakır; Ankara by Cantürk et al.; according to the researches of Türkoğlu et al. in Elazığ and Karbeyaz, and others in non-coastal cities such as Eskişehir; The majority of drowning is in fresh water. In our research, the majority of the drowning events have occurred in the sea. This result is in parallel with many studies in the field (Thélot et al, 2008; Başol et al, 2012; Lakadamyalı, 2008). However, according to the researches in non-coastal areas done by Tıraşçı and Gören (2000) in Turkey, like Diyarbakır; Cantürk et al, (2009) like Ankara; Türkoğlu et al. (2014), like Elazığ, Karbeyaz et al (2011), like Eskişehir; the majority of the drowning incidents have occurred in freshwater. This difference is due to the geographical location of the studied cities.

The majority of drowning incidents in our study occurred while swimming. While In many studies conducted in this regard, it is seen that rate of accidental drowning is higher (Tıraşçı & Gören, 2000; Karbeyaz et al., 2011; Başol et al., 2012; Türkoğlu et al., 2014). This is because the category of accidental drowning includes all drownings, except for drownings by suicide. In our research, as accidental drowning, it is meant that drowning occurs as a result of accidental falling into a liquid environment. Evaluating the drowning events as an accident, it means that the category of drowning cannot be assessed accidentally by falling into the water and the details of research are ignored. Getting different results in the literature is due to the fact of sensitivity which is not shown in other studies, while it showed in our research.

Most of the accidents can be prevented by using basic safety rules (Darçın & Darçın, 2007, 2016; Darçın, 2013). Overexertion, performing repetitive tasks and unsafe working conditions can lead to serious injuries (Darçın & Darçın, 2017). Potential risk controlling measures include improving the availability and using of safety equipment, increasing situational awareness and risk perception, and developing safety culture (Darçın & Darçın, 2016). It is a fact that there is a significant relationship between the development levels and accidents (Darçın & Darçın, 2017). A primary objective of policies around the world is to protect human health (Darçın,

2017). In addition to education and training programs, health policies should emphasize on creating safer environments.

The World Health Organization's Global report on drowning: preventing a leading killer, published in 2014, highlighted drowning as a serious public health threat. The vast majority of drowning can be prevented and prevention (rather than rescue or resuscitation) is the most important method by which to reduce the number of drowning. The circumstances and events in drowning differ across many varieties of situations and countries form worldwide. Considerable differences lie in the locations of drowning and different cultures. Therefore, all agencies concerned with drowning prevention – legislative bodies, consumer groups, research institutions, local authorities and designers, manufacturers and retailers - must collaborate to set up national and local prevention initiatives. These will depend on good intelligence and insightful research, and must include environmental design and equipment designs as a first route, in conjunction with education, training programs and policies which address specific groups at risk, such as children. The programs must be evaluated and the results of the evaluations must be published.

RECOMMENDATIONS

In the studies conducted in the literature, the causes of drowning are divided into categories such as accident and suicide. This means that drowning as a result of accidentally falling into the sea, canal, lake or stream and drowning in the water for swimming purposes are considered in the same category. This causes the research data to be more superficial. It is considered that it would be appropriate to pay attention to this distinction in future studies.

ETHICAL TEXT

In this article, the journal writing rules, publication principles, research and publication ethics, and journal ethical rules were followed. The responsibility belongs to the authors for any violations that may arise regarding the article.

Author(s) Contribution Rate: First autor's contribution rate %50, second autor's contribution rate %50.

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