Title: Knowledge, Prevention, and Practice of Heat Strokes Among the Public in the United Arab Emirates

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Contributor Role	Role Definition	Authors 1	2	3	4	5	6
Conceptualization	Ideas; formulation or evolution of overarching research goals and aims.	X	X	X			
Data Curation	Management activities to annotate (produce metadata), scrub data and maintain research data (including software code, where it is necessary for interpreting the data itself) for initial use and later reuse.		X	X	X	X	X
Formal Analysis	Application of statistical, mathematical, computational, or other formal techniques to analyze or synthesize study data.	X	X	X			
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Investigation	Conducting a research and investigation process, specifically performing the experiments, or data/evidence collection.	X	X	X	X	X	X
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1. Heat stroke is one of the most distressing conditions that the majority of children and adolescents experience.
2. Heat stroke is very common in summer in the UAE, where the environmental temperature is very hot and humid in comparison to the rest of the world's regions
3. In hot climates like the UAE, where heat strokes are a major concern, it is important to assess the the awareness of the population of the symptoms, management and prevention of heat strokes
4. In this study 50% and 47% of the sample got below-average scores in total and knowledge scores, respectively. It is also significant to note that 7% of the sample have never heard of a heat stroke before.

ABSTRACT.

Background: Heat strokes are predictable and preventable, so sufficient public awareness of the condition and preventative practices are essential in hot and humid countries such as the United Arab Emirates (UAE). This study aims to assess the level of awareness (knowledge, prevention, and management) of heat stroke among UAE residents.

Methods: Survey-based study of a random sample of adults (≥18 years) in four different cities of UAE. The questionnaire included 37 questions on knowledge and practices. Correct answer was equal to one point and total scores were calculated. The average of participants' total scores was taken as cut-off point. Multivariate logistic regression was used to identify associated factors with below-average awareness.

Results: A total of 402 people participated in the study, with age average 33±12 years and 48.5% were female. Only 1 person achieved a perfect score and 0.7%, 10%, and 17.7% achieved above average scores in knowledge, practices, and management, respectively. Seven percent of participants had never heard of a heat stroke before. A third of participants (32%) did not know that severe heat strokes can lead to death. Males are at higher risk of having a poor level of knowledge (Odds ratio [OR]=1.65; 95% confidence interval [95%CI]=1.10-2.47). The older the population the poor was the knowledge about heat stroke (OR=1.39, 95%CI=1.03-1.89).

Conclusion: The results of this study show that a huge proportion of the population in the UAE does not have sufficient knowledge about heat stroke, its prevention, and management. Governmental institutes should increase awareness of heat stroke.

Key Words: Health Knowledge, Attitudes, Practice; Heat stroke; Prevention; Saudi Arabia; Heat wave (Source: MeSH-NLM)

INTRODUCTION

Heat stroke (HS) is a frequent adolescent life-threatening condition that affects individuals across all ethnic groups and has a severe impact on both physical and psychological health.[1] HS is a medical emergency that can result in higher rates of morbidity and fatality, with a mortality rate of 71%.[2] HS is one of the most distressing conditions that the majority of children and adolescents experience.[3] Excessive heat is a significant weather risk related to a higher ratio of mortality and morbidity all over the world.[4] It is a condition that is caused by overheating of the body temperature along with central nervous system (CNS) dysfunction, which can involve combativeness, hallucination, seizures, and coma.[4] Generally, this problem occurs due to prolonged exposure to heat or any physical exertion in high temperatures.

Extravagant or extended exposure to heat, which can occur as a result of an amalgamation of extrinsic thermal surroundings, occupational heat provenance, and internal heat creation through excessive muscle effort, can result in a variety of conditions recognized as heat-related illnesses (HRI). Common signs of HS may include fever, rapid breathing, palpitations, dizziness, and an altered mental state.[5] The risk of developing a heat stroke increases when wearing dark-colored clothing during hot weather and being dehydrated by not taking adequate water to top up the loss of fluids through sweating. HS can lead to complications such as vital organ damage and, in severe cases, can cause death.[6]

HS is a preventable death that needs a greater index of clinical suspicion in the right circumstances. Because the mortality and morbidity rates from HS are related to the duration of the temperature, education of the public on heat illnesses, behavioral interchanges, imposed rests and fluid protocols, acclimatization, and organized provisions of cooling facilities in hot areas will help reduce morbidity and mortality from heat stroke.[7] HS patients' prognosis is closely connected to the degree of hyperthermia and how long it lasts. As a result, aside from prevention, quick cooling is the most crucial feature in the management of heat stroke.[8]

Although several studies recommend that patients with heat stroke be treated with ice water or cold-water immersion, fundamental research investigations have demonstrated that evaporative cooling is just as effective.[9] Heat-related illnesses are becoming more common as the world warms, and they are recognized in tropical regions such as most Arab countries.[10] HS is probable and avertable, so sufficient awareness about knowledge and practices regarding heat strokes is essential in an extremely high-temperature country like the UAE.[11]

There is a lack of appropriate knowledge among the public in the UAE. Sufficient awareness regarding HS will assist in identifying and treating these disorders at an early stage. Numerous factors influence the public's key performance parameters (KPP), including the local climate, people's socioeconomic status, and general public behaviors. KPP data can be thought of as resident indicators of heat wave awareness in a specified and limited area. The main objective of the study is to assess the knowledge, prevention, and practices amongst the public in the UAE regarding general awareness of HS.

MATERIALS AND METHODS.

This was a analytical study done in the college of medicine at the University of Sharjah, UAE, from January 2020 to December 2020. The Ethical Review Board of University of Sharjah, UAE approved the study. (Ref# REC-20-01-22-01).

The sample size was calculated according to the Epi-Info, version 3.5.1 by taking the expected prevalence of knowledge 50%. The worst acceptable frequency as 12.3%, and the confidence interval of 95%. After adding 20 % of the non-response rate the minimum sample size was 377; however, 500 participants were invited for the study. Both genders, aged more than 18 years, were included through random sampling of public places. The cities included were Abu Dhabi, Ajman, Dubai, and Sharjah. interview using a structured questionnaire of 37 questions; four domains: demographics (9 questions), knowledge (18 questions), practices, and management of heat strokes (10 questions). The total mean score was 17.06 and we took cut off point of 17, any total score of below 17 would be takes as our below average and any score of 17 and above would be taken as our average and above (**Figure 1**).

A wide spectrum of questions were asked to determine which aspect of knowledge about heat strokes the community lacks, whether it was prevention, signs and symptoms of a heat-related illness, or risk factors. The correct answer was equal to one point, and the point system was used to calculate total scores. The average of the total scores was used to determine good and poor knowledge.

SPSS v26 was the program used for analysis. Each correct answer is equal to one point. Total (all questions), knowledge, and practice scores were calculated. The Chi-Square test was used for comparative analysis of sociodemographic characteristics with average and below scores. The null hypothesis was rejected by a p value of 5%, which was considered statistically significant. The average total score was taken as the cut-off point for good and poor knowledge (KPM). Multivariate logistic regression analysis was run using gender, age, nationality and occupation as covariates. The results were expressed as an odds ratio (OR) and a 95% confidence interval (95%CI). The dependent variable was coded as 0 for above knowledge and 1 for below average knowledge.

RESULTS.

In this study, 500 participants were invited in which 402 participated. The response rate was 80.4%. out of 402, 207 (51.49%) were male and 195 (48.51%) were female. The study participants were divided into three groups based on age. The mean age of the participants was 33.45 ±12.2 years. The majority of the participants, 178 (44.27%), were in the age group of 18–25 years. Half of the participants (204, 50.74%) were Arabs. Regarding occupation, most of the participants 159 (39.58%) were in the categories of business, sales, and engineering. The majority of the participants, 345 (85.82%), were from Abu Dhabi. Table 1 shows the demographic data of the participants. In our study, occupations were divided according to heat exposure; 40% were business, sales, and engineering jobs, which were the most exposed; 32% were governmental and medical jobs, which were moderately exposed; and finally, 29% were students who were considered to be the least exposed. We compared the knowledge, practices, and management scores between the cities tested. Thirty two percent of the sample did not know that severe heat strokes can lead to death.

Our results showed that only 1 person in the entire sample, achieved a perfect score on knowledge, management, and practices. Moreover, 0.7%, 10%, and 17.7% of the total sample achieved above average in knowledge, practices, and management, respectively. Most of the participants (52%) did not follow sufficient preventative measures to meet the set average practice score. Moreover, 50% and 47% of the sample got below-average scores in total and knowledge scores, respectively. It is also significant to note that 7% of the sample have never heard of a heat stroke before. As expected, there was a strong correlation between the chosen source of knowledge of the participants and how that affected their knowledge and total scores. For the participants who chose "medical" as their source of knowledge, 70.6% of them achieved an above-average score in the knowledge test (p=0.61). Only 47% of those who chose "family and friends" as their source of knowledge achieved an average or above-average total score, compared to 67% of those who chose "medical" as their source of knowledge, who achieved an average or above-average total score. Only 58% of the participants drank water only when thirsty, and even 44% did not know that they should give water to a victim suffering from a heat stroke. Finally, there was a relationship between the place of residence and the average score of the participants (p=0.02); participants from Abu Dhabi got 34.2% above the average total score, while Dubai and Sharjah got 24.8% and 27.2%, respectively.

Results of multivariate logistic regression analysis revealed that male are higher risk of having a poor level of knowledge (OR=1.65; 95%CI=1.10-2.47, p=0.01) as well as the older the population the poor was the knowledge about heat stroke (OR=1.39, 95%CI=1.03-1.89, p=0.03). Nationality and occupation were not associated with a below-average level of HS knowledge (**Table 3**).

DISCUSSION.

This was a cross-sectional study performed in different cities in the UAE to judge the public's awareness of heat stroke among adults. Heat stroke is very common in summer in the UAE, where the environmental temperature is very hot and humid in comparison to the rest of the world's regions. It's a dangerous disorder produced by the body's overheating, and it's linked to a high rate of death and morbidity due to its sequelae, which include crucial organ damage. Participants who cited medical experts as their primary source of information, as well as Arab nationalities, scored higher than the other nationals. In addition, Abu Dhabi outperformed all other cities. In general, the percentage of participants who scored above average on knowledge, prevention, and practices of heat strokes was low, and our findings revealed that a large segment of the community in the UAE lacks adequate understanding of heat strokes, their prevention, and management.

Studies from other regions have recognized that heat stroke has vital adversative effects on the human body that may lead to long-lasting abnormalities.[12,13] People have to perform their routine work in an open environment for their sustenance. In this regard, daily wagers and security guards are significantly at greater risk of heat strokes. A heat wave came upon the metropolitan city of Karachi, Pakistan in 2015, resulting in the deaths of hundreds of residents in this city.[14] The general public in the UAE is aware of this worsening condition but does not have sufficient knowledge regarding its management and control. Worldwide and nationally, inadequate work has been done to learn about the knowledge, prevention, and practices of heat strokes among the public. In our study, just one person achieved a perfect score on knowledge, management, and practices, while 52% of the total participants did not follow sufficient preventative measures to meet the set average practice score. The majority of participants believe that avoiding outdoor activities can prevent heat strokes, which contradicts the findings of a study conducted in the United States.[15] The Arab nationals achieved some good knowledge, practice, and management scores about heat strokes in comparison to other nationals. They consider fever and vomiting to be the major symptoms of heat stroke, which are in good correlation with studies conducted in China.[16,17] Besides, 32% of our study participants were not aware of the worse consequences of heat strokes. During the heat strokes, most of the participants even did not know that victims of heat strokes should be given water and needed to be moved under shade. In hot weather, people should wear an umbrella when heading out, drink water plenteously while going out, limit their outdoor activities, and protect their heads with a damp towel as a preventive measure. While studying the demographic characteristics, Males are higher risk of having a poor level of knowledge (OR=1.65). This finding were in good correlation with study by Li et al.[15] The older the population the poor was the knowledge about the heat stroke (OR=1.39), which is in good correlation with the findings of a study by Wang et al.[16] and in contrast to another study by Li et al.[15]

Nowadays, social media is a source of information for many people across the globe and access to it is too easy, especially for those in high-income areas. This could be a reason why people in high-income countries are more conscious of the current state of the global environment than people in low- and middle-income ones.[12,13,15] Individuals, local governments, and national institutions must all work more to improve the KAP about heatwaves by using mass and social media such as radio, television, newspapers, and the internet, as highlighted in other studies.

The limitations of the study include those adherents to the cross-sectional design as well as that a high percentage of participants were young, not all seven Emirates were covered, and the questionnaire was conducted in only two languages (English, Arabic). However, this is the first approach to the topic in the region and the country official language is Arabic allowing us to cover most of the aimed population.

CONCLUSION.

Our results showed that a huge proportion of the population in the UAE did not have sufficient knowledge about heat strokes, prevention, and management. The data showed that people with medical sources of knowledge had the highest scores in terms of knowledge and practices. Unfortunately, those with information from medical sources were one of the minorities, which explains why many people did not have optimal knowledge about heat strokes. Based on these findings, we are requesting our healthcare sectors and governmental institutes to increase awareness of heat stroke among the residents of the UAE by using media outlets, medical staff, and even medical students to help achieve the goal of eradicating heat strokes from the UAE.

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FIGURES AND TABLES.

Table 1. **Demographic Data of the Participants. n=402**

Variable	Frequency	Percentage
Gender		
Male	207	51.49%
Female	195	48.51%
Age group		
18-25 years	178	44.27%
26-35 years	143	35.57%
>36 years	81	20.14%
Nationality		
Local	62	15.46%
Arabs	204	50.74%
Non- Arabs	136	33.83%
Occupation		
Business, sale, and engineers	159	39.58%
Students	115	28.60%
Medical, govt, education etc	128	31.84%
Place of residence		
Abu-Dhabi	345	85.82%
Dubai	13	3.23%
Sharjah	34	8.5%
Ras Al Khaimah	9	2.23%
Umm AL Qaiwain	1	0.24%

Table 2. **Cross Tabulation of the Demographic Data with the Average Score of Knowledge, Practice, and Management.**

Characteristic	Heat stroke knowledge, treatment, management score		p-value
	Below average	Above average	
Age, mean (SD)	32.39(10.5)	34.51(11.9)	0.01 **
Sex, n (%)			
Female	86(44.1)	109(55.9)	0.07 ᵸ
Male	116(56.0)	91(43.9)	
Nationality, n (%)			
Local	54(87.0)	8(12.9)	0.12*
Arabs	104(51.0)	100(49.0)	
Non-Arabs	84(61.7)	52(38.1)	
Occupation			
Business, sale, and engineers	95(59.7)	64(40.6)	
Students	90(78.2)	25(21.8)	0.00*
Medical, govt, education etc	79(61.7)	49(37.6)	

Legend: * chi-square test; ᵸFischer Exact test; **Student` t` test

Table 3. Predictors of Below-Average Heat Stroke Knowledge Among the Participants: Multivariate Logistic Regression Analysis

Variable	Odds Ratio	95% Confidence Interval	p-value
Gender	**1.65**	**1.10 - 2.47**	**0.01**
Age	**1.39**	**1.03 - 1.89**	**0.03**
Nationality	1.08	0.79 - 1.46	0.62
Occupation	1.09	0.83 - 1.43	0.52

Legend: Intercept: -1.5, p=0.02.

Figure 1: Mean total score of participants in our study.