Knowledge, attitude and practice towards heat related illnesses of the general public of Jeddah, Saudi Arabia

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Received: July 2021; Accepted: August 2021; Published: September 1, 2021.
Citation: Fathi El-Gamal, Ahmed Ghandoura, Abdullah Alammari, Bushra Alghamdi, Lama Babhair, Sali alsabhani. Knowledge, attitude and practice towards heat related illnesses of the general public of Jeddah, Saudi Arabia. World Family Medicine. 2021; 19(9): 21-30 DOI: 10.5742/MEWFM.2021.94120

Abstract

Background: Heat related illness can be avoided; it may also be present in a milder form to a life threatening condition.

Objectives: To explore the pattern of KAP towards HRIs among the subjects in Jeddah city.

Method: It was a cross-sectional study of 378 subjects, who gave their responses through an online Google form. Data were analyzed using SPSS software version 23. The level of significance was 0.05%.

Results: 18.2% of the subjects suffered from HRIs, and 49% never received health education about HRIs. Increased KAP score was associated with increased age (b= 0.177, p<0.000), more encountered in the females (b= -2.25, p <0.000), in those who owned air conditioning (b = 5.3, p < 0.024), in the smokers (b= 1.77, p<0.35), and in those who received health education about HRIs (b=2.327, p< 0.000).

Conclusions: The subjects' awareness of the prevention of HRIs needs to be strengthened.

Key words: Heat related illnesses, Determinants, Saudi Arabia

Introduction

Heat related illness (HRIs) are health disorders that range from mild forms to life threatening conditions; but they can be prevented. People with chronic medical conditions such as diabetes mellitus, obesity or cardio-vascular disorders, are more vulnerable to the effects of heat (1). Saudi Arabia is one of the sunniest and hottest countries in the world (2). Heat waves (3 or more days at or above 35°C) were associated with an increase in ambulance transport and significant increases in admissions of all ages in renal and psychiatric hospitals, and a rise in admissions to ischemic heart disease centres in the 65- to 74-year age group (1,3-5). The most common morbidities assessed in these relationships were: cardiovascular and respiratory disorders such as stroke, acute myocardial infarction, acute coronary syndrome, and asthma. Heat stroke is defined as decreased level of consciousness of a person with a temperature more than 40 degrees, which is considered as an absolute emergency case and a life-threatening condition. The patient may suffer also, from inappropriate behavior, ataxia or collapse, tachypnea, and tachycardia. It may cause a multi-organ failure which leads to a poor prognosis (6). Heat stroke consists of two types: exertional heat stroke that affect persons who are doing vigorous physical activities in a hot climate like runners, and classic or non-exertional heat stroke that affects persons in hot indoor area or of old ages(7). Despite treatment, the mortality rate of heat stroke in the United States is still increasing up to 30% (6). Heat exhaustion results from depletion and dehydration of intravascular volume caused by prolonged effort in a hot environment. It is characterized by symptoms of fatigue, intolerance of effort, weakness, headache, nausea, tachycardia and sometimes dyspnea (8). Heat rash can occur in humid or tropical areas when the exocrine sweat glands get clogged during prolonged or profuse sweating. Moreover, it manifests as an erythematous pruritic rash with blisters that is frequently seen on the neck, trunk and limbs, but sparing hands and feet (6). One of HRIs' forms is heat cramps which results from drinking hypotonic fluid to compensate the excessive amount of sweat sodium losses, hich results in extracellular fluid volume contraction and deformation of nerve during muscle contractions (4,6,9). The National Collegiate of Athletic Association (NCAA) reported that the most frequent heat illness that presented among NCAA athletic trainers, were heat cramps, followed by heat exhaustion, and dehydration(10). A previous study reported that most participants had a poor knowledge level and practice towards HRIs, which was improved after education (5). The risk factors for HRIs include two main variables, which are environmental and personal factors; the environmental factors include humiditys and very high temperatures in the country. Personal factors are many and include: ethnicity, health condition, genetics, physical activity levels, type of clothing, and hydration status (11,12). The present study aimed at exploring the KAP of Jeddah city population about HRIs.

Methodology

It was a cross sectional study, and the sampling method was a non-probability convenient one where data were collected through online Google forms on residents of Jeddah, Saudi Arabia. Sample size was determined using G*power software, where α = 0.05, Power = 0.95 effect size = 0.3, and degree of freedom= 5(13). The minimal sample size required was 277 subjects; thus, 378 subjects were enrolled in the present study. Data were collected using structured questionnaire which provided information on socio-demographic characteristics, hobbies, habits and clinical aspects of the participants. A questionnaire on the KAP about HRIs was studied and validatedpreviously(12, 14). The Knowledge was assessed by 25 questions; each question was answered by yes or no, and the correct answer was given score of 1, and the wrong answer was given score of 0; the total scores of the Knowledge was the sum of all scores. Attitude was assessed by 8 questions; each question was answered by yes or no, and the correct answer was given 1 and the incorrect one was given a score of 0; the total attitude score was the sum of all scores. The practice was assessed by 12 questions; each question was answered by yes or no, and the correct answer was given a score of 1, and the incorrect one was given a score of 0; the total scores of the practice was the sum of all scores. Reliability study was conducted on the questionnaire responses (Cronbach` alpha for knowledge questions was 0.82, for attitude questions was 0.78, and for practice questions was 0.74). The software SPSS (IBM compatible version 23), was used to analyze the data. Chi square test and multiple linear regression were used to analyze the data. The level of significance for the present study was 0.05%.

Availability of the data: the row data is available at the research center of ISNC and all results of the data are included in the paper.

Results

The total number studied was 378 subjects; 156 females (41%), while the number of males was 222 (58.7%). Table 1 shows the general characteristics of the studied subjects. Among the studied subjects, 18.2% (69) had ever suffered from HRIs. Almost half of the studied subjects (49%) never received health education about health effects of HRIs.

Table 2 reveals the mean scores and correlation matrix for the variables knowledge, attitude and practice. The mean knowledge score was 13.9 (SD=4.3), the mean attitude score was 4.7 (SD=1.5), and the mean practice score was 28.9 (SD=3.4). The knowledge score was significantly correlated with attitude score ($r = 0.210$, $p < 0.000$), while it was not significantly correlated with the practice score ($r = 0.06$, $p < 0.229$). On the other hand, the attitude score was significantly associated with the practice score ($r = 0.357$, $p < 0.000$).

Table 3 displays the correct answers on the knowledge questions about HRIs by gender. About one third of all the respondents got the answers wrong. Knowledge of the males about HRIs was better than that of the females in general. Questions about effects of heat stress on patients with cardiovascular disorders had the lowest correct answer scores. The occurrence of HRIs while asleep (in shaded area) had the lowest correct answer score (23.8%).

Table 4 displays the correct answers on the attitude questions about HRIs by gender. About one third of the respondents answered positively on the attitude questions regarding HRIs. However, questions on use of umbrella (20%), or use of sun screen cream (35.7%) while in an unshaded area outdoors, had the lowest correct answers. Females tend more to use more sun screen cream compared to males (p<0.001).

Table 5 shows the correct answers on the practice questions about HRIs by gender. The majority of the respondents adopted appropriate practice while inside the home; however, a great proportion of the respondents adopted the wrong practice while outdoors exposed to heat in the unshaded environment.

Table 6 shows factors which predict the total KAP score among studied subjects. Increased age was significantly associated with increased KAP score (b= 0.177, p<0.000). Mean KAP score was significantly higher in females compared to males (b= -2.25, p <0.000). Those who owned AC, and similarly those who owned fans, had significantly higher mean KAP score compared to those who had not (b = 5.3, p < 0.024).. Smokers had significantly higher KAP score compared to non-smokers (b= 1.77, p<0.35). Subjects who received health education about HRIs had higher KAP score compared to those who did not (b=2.327, p< 0.000).

Table 1: Characteristics of the study subjects

Variable		Frequency	Percentage (%)
Gender	Female	156	41.3
	Male	222	58.7
Educational level	< University	60	15.9
	≥ University	318	84.1
Occupation	Not Employed	262	69.3
	Employed: indoor work	103	27.2
	Employed: outdoor work	13	3.4
Health care professional	No	223	59.0
	Yes	155	41.0
Smoking	No	310	82.0
	Yes	68	18.0
	Own Air conditioning		
	No	7	1.9
	Yes	371	98.1
Own Air Fan	No	228	60.3
	Yes	150	39.7
Received treatment for Diabetes Mellitus	No	369	97.6
	Yes	9	2.4
Received treatment for Heart disease	No	370	97.9
	Yes	8	2.1
Received treatment for HTN	No	361	95.5
	Yes	17	4.5
Received treatment for other diseases	No	342	90.5
	Yes	36	9.5
Suffered from HRI	No	309	81.8
	Yes: Doctor-diagnosed	22	5.8
	Yes: self-diagnosed	47	12.4
Received HE about HRI:	No	184	48.7
	Yes, media	78	20.6
	Yes, Health care personnel	82	21.7
	Yes, Relatives/ friends	34	9.0

Table 2: Correlation matrix and descriptive statistics of the scores of Knowledge, Attitude, and Practice about HRI among studied subjects

Variables	Statistics	Knowledge score	Attitude score
Knowledge score	Pearson Correlation	1	-
	Significance (2-tailed)	-	-
	Mean	13.8677	-
	Standard deviation	4.32665	-
Attitude score	Pearson Correlation	.210**	-
	Significance (2-tailed)	.000	-
	Mean	4.7302	-
	Standard deviation	1.50197	-
Practice score	Pearson Correlation	.062	.357**
	Significance (2-tailed)	.229	.000
	Mean	28.9101	-
	Standard deviation	3.40656	-

Table 3: Distribution of studied subjects according to correct answers about knowledge on HRI by gender

Variable	Gender		Total [N=378]	X^2 (p-value)
	Females (N=156)	Males (N=222)		
Usage of cooling devices prevents heat stroke [Yes]	27.2%	32.8%	60.1%	3.98 (<0.04)
Wearing thick clothes prevents heat stroke [No]	29.4%	39.9%	69.3%	0.42 (<0.51)
Staying at cool spots prevents heat stroke [Yes]	33.3%	44.4%	77.8%	1.37 (<0.24)
Cooling body down prevents heat stroke [Yes]	29.9%	39.4%	69.3%	1.22 (<0.27)
Dehydration is one of the symptoms of heat stroke [Yes]	24.3%	43.1%	67.5%	8.71 (<0.003)
Tiredness is one of the symptoms of heat stroke [Yes]	37.3%	48.1%	85.4%	5.20 (<0.023)
Dizziness and light-headedness are symptoms of heat stroke [Yes]	37.6%	52.4%	89.9%	0.34 (<0.56)
Headache is one of the symptoms of heat stroke [Yes]	32.0%	41.0%	73.0%	2.79 (<0.09)
Feeling nauseous is one of the symptoms of heat stroke [Yes]	31.2%	37.0%	68.3%	6.69 (<0.000)
Reduction in appetite is one of the symptoms of heat [No]	29.6%	37.8%	67.5%	2.27 (<0.13)
Sweating is a symptom of heat related disorders [Yes]	34.1%	40.7%	74.9%	8.64 (<0.003)
Muscle cramp is a symptom of heat related disorders [Yes]	20.9%	28.0%	48.9%	0.20 (<0.657)
Sweating reduces body temperature [yes]	27.8%	42.6%	70.4%	0.96 (<0.33)
Sweating negatively affects people with hypertension or cardiac diseases [Yes]	11.1%	16.9%	28.0%	0.84 (<0.722)
People sweat when not really feeling the heat [Yes]	26.5%	39.4%	65.9%	0.25 (<0.62)
Sweating a lot makes people exhausted [Yes]	25.1%	42.1%	67.2%	4.31 (<0.038)
Heat stroke makes people thirsty [Yes]	29.1%	41.3%	70.4%	0.001 (<1.00)
Heat stroke getting worse [Yes]	26.5%	36.0%	62.4%	0.21 (<0.65)
Hypertensives or cardiac patients are more likely to get heat stroke [Yes]	12.7%	16.7%	29.4%	0.15 (<0.69)
Heat stroke occurs during sleep [Yes]	7.7%	16.1%	23.8%	3.5 (<0.06)

Table 4: Distribution of studied subjects according to Correct answers about Attitude on HRIs by gender

Variables	Gender		Total (N=378)	X^2 (p-value)
	Females (N=156)	Males (N=222)		
Drink more water during a hot day even if you are not thirsty (yes)	25.4%	42.3%	67.7%	4.651 (<0.031)
Use an umbrella in unshaded areas while outdoor (yes)	7.4%	12.7%	20.1%	0.769 (<0.38)
While outdoor, if it became extremely hot, you would postpone your business until it becomes cooler (yes)	26.2%	34.9%	61.1%	0.617 (<0.432)
If possible, preform outdoor business at night (yes)	31.5%	42.6%	74.1%	0.674 (< 0.412)
Even if it is crowded I will perform the outdoor business in the afternoon (No)	32.5%	41.0%	73.5%	3.837 (<0.050)
Willing to buy an umbrella (Yes)	31.7%	27.8%	59.5%	33.376 (<0.001)
Use a sunscreen while going outdoors during the day (Yes)	24.9%	10.8%	35.7%	69.684 (<0.001)
Drink soft drinks or coffee when I feel thirsty (No)	34.4%	46.8%	81.2%	0.780 (<0.377)

Table 5: Distribution of studied subjects according to Correct answers about practice on HRI by gender

Variable	Gender		Total (N=378)	X2 (p-value)
	Females (N=156)	Males (N=222)		
Hours of use AC in daytime (until sunset) {more than 5 hours}	34.1%	44.2%	78.3%	8.714 (<0.12)
Hours of use AC in nighttime (until sunrise) {More than 5 hours}	33.3%	42.9%	76.2%	7.086 (< 0.02)
Temperature you start using AC {Less than 26 C}	31.7%	52.1%	83.9%	9.649 (< 0.02)
Room temperature setting {Less than 26°C}	23.3%	40.5%	63.8%	6.606 (< 0.08)
Hours you use an electric fan a day {Rarely}	31.7%	45.5%	77.2%	0.669 (<0.88)
Use a fan {Do not use a fan when using AC}	23.8%	31.2%	55.0%	3.991 (<0.262)
Drink fluid (excluding liquids induded in meals) {drink sometimes even if did not feel thirsty}	18.5%	24.3%	42.9%	3.84 (< 0.27)
Kinds of clothes did you wear {short-sleeved clothing and short pants}	33.3%	43.7%	77.0%	2.47 (< 0.29)
Take a rest when you were active (doing agriculture, fishery and walking) {tried to take a rest regularly}	15.6%	18.0%	33.6%	8.79 (< 0.03)
Active (doing agriculture, fishery and walking) during the hottest period of days (10 am to 4 pm) {sometimes refrained from being active}	14.8%	22.2%	37.0%	9.84 (< 0.02)
Active (doing agriculture, fishery and walking) during the hottest period of days (10 am to 4 pm) {tried to refrain from being active}	13.8%	16.4%	30.2%	9.84 (< 0.02)
Use a hat or parasol when going outside {never}	23.8%	30.7%	54.5%	1.115 (< 0.77)

Table 6: Linear Multiple regression analysis of some continuous independent variables and dependent KAP score variable

Independent variables	Unstandardized Coefficients		Standardized Coefficients	t-test	Sig. *P-value*
	B	Std. Error	Beta		
(Constant)	36.345	2.535		14.336	.000
Age	.177	.034	.314	5.178	.000
Gender	-2.252	.641	-.174	-3.513	.000
Education level	.231	.868	.013	.266	.790
Employment	-.681	.642	-.058	-1.060	.290
Health care profession:	.866	.690	.067	1.255	.210
Own AC	5.329	2.345	.113	2.273	.024
Own a fan	1.271	.634	.097	2.004	.046
Smoking	1.770	.836	.107	2.118	.035
Treatment for DM	-.559	2.048	-.013	-.273	.785
Treatment for Heart disease	-4.115	2.736	-.093	-1.504	.133
Treatment for hypertension	2.109	1.973	.069	1.069	.286
Treatment for any other chronic disease	-.141	1.111	-.007	-.127	.899
Received health education before	2.327	.644	.182	3.611	.000
Affected by heat before	-.898	.865	-.054	-1.038	.300

Discussion

Extreme hot environment can be dangerous to human health; several studies reported that it was associated with increased hospital admissions due to HRIs, as well as cardiovascular and respiratory disorders. Extreme heat events can trigger a variety of heat stress conditions, such as heat stroke(1,3-5). Awareness of the people about the risks, knowledge, and protective practices about HRIs are essential factors for preventing the harmful effects of an extremely hot environment(15). However, to our knowledge this is the first study to explore the people's KAP with regard to HRIs in Jeddah, KSA. Such a study may be of great significance as the majority of the subjects are widely exposed to risk factors of HRIs. Therefore, the findings of this study may provide essential references for the health authority to implement health education programs to the general public.

In this survey, a large proportion of the respondents had low scores on most K-questions and had defective information about awareness and protective practice towards HRIs. The defect was related to gender, age, practice of the subjects and previous education on HRIs. Heat stroke results from excessive exposure to a hot environment, which lead to progressive increase in the core temperature of the body. Cooling devices, including neck-cooling collars, cooling bandanas, cooling vests, neck-cooling devices, and clothing containing cooling micro-gels, have been effectively used to reduce core temperature(16). In the present study 40% of the subjects did not know that using cooling devices could prevent heat stroke. The type of clothing will affect how well air can circulate over the skin, as well as allowing heat and moisture (sweat) to evaporate. If sweat cannot evaporate from the skin, then both skin temperature and discomfort increase (17). However, in the present study around 70 % of the subjects did not know that heavy clothes could worsen the effects of high heat on the body. According to the center for diseases control and prevention (CDC) advised, those living in a hot environment, to Stay in Cool Indoors by Staying in an air-conditioned place as much as possible and drink plenty of fluids(18). In this study around 32% of participants did not realize that they can prevent heat stroke by staying in cool spots. Furthermore, CDC mentions warning signs and symptoms of HRIs(19). A sizable proportion of the subjects in the present study, did not know that dehydration, tiredness, dizziness and light-headiness, headache, nausea, reduction in appetite and sweating are symptoms of HRIs; and almost half of the subjects did not know that heat exposure could produce cramps. Several studies reported that exposure to extreme heat was associated with worsening of chronic diseases including diabetes, cardiovascular, respiratory, renal, and mental illnesses (14,20–24). However, in the present

study a large proportion of the respondents didn't know that excessive sweating and extreme heat exposure could affect the conditions of patients with chronic diseases for example hypertension and cardiac diseases.

In response to the question about attitude and practice, in China 1.9% of the participants were aware that proper heat-related illness preventive measures are needed(25). In the present study the majority of the respondents had a good attitude about HRIs prevention except for a minor subgroup.

Since most skin cancers are preventable by reducing natural and artificial ultraviolet (UV) radiation exposure, public education on and advocacy for sun protection are essential. Two key messages regarding sun safety education are the regular use of sunscreen and physical protective agents, such as clothing, hats, sunglasses, and shade(26). In the present study, the majority of the respondents didn't use an umbrella, or put on sunscreen when they were in a hot un-shaded outdoor environment. Soft drinks including carbonated drinks, still and juice drinks, fruit juices, bottled waters, sports and energy drinks should be avoided (27). Intake of sugary beverages, and especially soft drinks, increases the risk of obesity and diabetes. But they are now emerging as a major risk factor for kidney disease (28). Tea and coffee, which were most frequently chosen by the workers, contain caffeine, but a recent literature review does not support caffeine as it may cause diuretic effect and harmful dehydration(29). In the present study the attitude of the respondents toward not drinking soft drinks or coffee when feeling thirsty in a hot environment was right in 81.0%. Factors associated with decreased risk of morbidity and mortality from exposure to waves of hot climate included the use of home air-conditioning and spending more time in air- conditioned places(30). In the present study the majority of the respondents used AC during day and night. Drinking water and plenty of fluids, in hot environment, are important protective measures against dehydration due to sweating(29). In the present study almost half of the respondents did not drink fluids when they are not thirsty in a hot environment. This is consistent with findings from previous study (31) In the present study the majority of the subjects didn't avoid working outdoors during the sunniest period of the day, and didn't take rest periods, and almost half of the subjects did not wear a hat when they were outdoors. This is contrary to studies conducted elsewhere (25, 31). The majority of the respondents (77%) used short sleeved clothing and short pants when they went outdoors in the hot environment. This is consistent with another study (32).

Conclusions

The KAP study results show that participants' knowledge level about heat waves was relatively high in Jeddah city. However, some participants did not consider themselves to be potentially vulnerable, and had low knowledge on the subject. Certain aspects of the attitude and practice about HRIs of the majority of the subjects need to be improved. The government should focus on health education through mass media campaigns to improve awareness regarding the negative effects of heat waves among the entire population.

Acknowledgement:
All the authors are grateful to ISNC for medical Sciences for approving the study and giving it consent and, we would like to thank all subjects who spent time to fill in this questionnaire and participate in this survey.

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