



Effect of nursing knowledge on heat exposure risk in Mecca health centers in 2024

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ABSTRACT

Although classic heat exposure and heat stroke are among the oldest known human diseases, their early clinical manifestations, natural history, and complications remain poorly described. Heat exposure and heat stroke are life-threatening conditions characterized by a rapid increase in core body temperature to above 40°C and neurological changes such as delirium, seizures, or coma following exposure to extreme heat alone or in combination with strenuous physical exertion. Heat-related illnesses (HRIs), such as heat stroke (HS) and heat exhaustion (HE), are common complications of the Hajj. The Saudi Ministry of Health (MOH) has developed guidelines for the management of HRIs to ensure the safety of all pilgrims. Medical staff must follow the latest national guidelines for the management of HRIs before and during hospitalization. Effect of nursing knowledge on heat exposure risk in Mecca health centers in 2024. A descriptive cross-sectional study was conducted among nurses to investigate the risk of heat exposure and prevalence of heat-related illnesses among pilgrims who visited primary health care centers in Makkah from May 1, 2024 to May 30, 2024. The total sample size of participating nurses was (200). Relationship between nurses' knowledge of heat exposure hazards and prevalence of heat-related illnesses among pilgrims The relationship between the knowledge level of most participants was general knowledge (56.0%) followed by high knowledge (26.0%) but weak knowledge (18.0%) and total knowledge(100.0%), with significant relationships at P value <0.001 and X² 48.16. Conclusion: Heat exposure and heat illness are not common problems for Saudi Arabians. However, they are significant for pilgrims from other parts of the world during the Hajj season, which varies according to the lunar year. In recent years, the Hajj timing coincides with the summer months of July and August. The average temperature during the Hajj reaches 54 °C (130 °F).

Keywords: Effect of nursing knowledge on heat exposure risk in Mecca health centers in 2024, Makkah, Saudi Arabia.

INTRODUCTION

The World Health Organization (WHO) has listed climate change as one of the top five environmental causes of death worldwide [1]. Extreme weather has caused a variety of illnesses and deaths worldwide. Heat exposure, in particular, is a natural hazard that can affect human health and is significantly associated with the occurrence of heat-related illnesses [2]. Heat exposure and heat-related illnesses can lead to a variety of health conditions, ranging from mild symptoms to life-threatening manifestations such as heat stroke (HS), heat exhaustion (heat exposure), and heat cramps [3]. Hajj is the fifth pillar of Islam as it requires financially and physically able Muslims to perform the pilgrimage at least once in their lifetime. The pilgrimage is considered one of the major challenges facing Saudi Arabia and the Ministry of Health. [4] Every year, more than 9 million pilgrims perform the rituals during the Hajj, which is considered a peaceful mass gathering of pilgrims. People from 200 countries gather in Mecca, Saudi Arabia. The Hajj pilgrimage involves “arduous prayers, supplications, and rituals performed for spiritual upliftment”². Age, urbanization, obesity, comorbidities, lack of acclimatization measures, duration of exposure to heat, and relative humidity are individual and environmental risk factors that may increase the frequency and intensity of heat exposure [5,6]. Heat-exposed patients can present with a variety of clinical symptoms, such as fatigue, vomiting, syncope, hyperthermia, neurological disorders, circulatory collapse, and multi-organ failure [7]. The diagnosis of heat exposure is usually based on a history of heat exposure, clinical symptoms, and signs of dehydration [8]. In Saudi Arabia’s desert climate, heat exposure and heat-related illness are endemic during the Hajj pilgrimage to Mecca [9]. Due to the strict rituals, pilgrims have clear geographical boundaries outside the desert city, wear similar clothing, eat similar foods, and move together. As a result, pilgrims receive a considerable dose of heat and experience almost experimental conditions of severe heat stress. Furthermore, during the Hajj, all conditions are in place for early detection of heat stress and heat-related illness. This includes that most pilgrims are aware of the risk of heat stress and heat-related illness and know how to recognize their early warning signs and symptoms [10]. In addition, there are public health protocols for detection and immediate cooling treatment in field hospitals within walking distance to minimize heat-related organ damage and maximize the chance of survival. Here we describe the demographics, clinical characteristics, biomarkers, treatments, and outcomes of one of the largest cohorts to date to comprehensively examine [11]. The holy city of Mecca hosts two Islamic rituals, the Hajj and the Umrah. Mecca is located in the western part of the Kingdom of Saudi Arabia (KSA) and is characterized by a desert climate with extremely hot daytime temperatures. As the Hajj season enters the hottest part of the year, heat exposure and heat-related illness are the most common causes of morbidity and mortality [12]. The Saudi Arabian government attaches great importance to providing adequate and free health services to pilgrims during their stay at the Hajj sites (Mekkah Al-Mukarramah, Mina, Muzdalifah, and Arafat). These services are primarily provided and coordinated by the Ministry of Health (MOH). [13] One of the major breakthroughs in heat stroke treatment was the introduction of the Makkah Al- Mukarramah Body Cooling Unit (MMBCU). [14] The MMBCU, which was put into use during the Hajj in 1979, is a specially designed bed that provides rapid cooling and protection of vital organs for heat stroke victims. In recent years, the MMBCU has become the device of choice, and specially designed heat stroke centres have been established at pilgrimage sites. In addition, 64 MMBCUs have been installed in three hospitals in and around Hajj. [15]

Literature Review

Higgins et al. (2022) reported that excessive loss of water, salt, or both may increase the risk of heat stroke. A previous study reported that oral hydration on site is an important step in the patient’s treatment process [17]. However, the lowest compliance scores were observed when oral fluid administration was initiated and the patient was in the supine position with the hips and legs elevated. There may be several reasons for these low compliance scores: Lack of adequate knowledge among caregivers about the importance of adequate hydration during heat exposure and heat-related illness episodes may be an important reason for poor compliance.

Environmental factors, including the presence of other critically ill patients who require more attention [18,19]. Another study by James et al. (2020) reported that the elderly are generally at higher risk. Most of them belonged to the older age group in their country of origin. Increased mortality due to heat exposure and heat-related illnesses has been reported during the Hajj, and these deaths may be caused by heat. Excessive hot weather may also increase mortality from heat illnesses. Saudi Arabia has an excess number of deaths due to heat exposure and heat-related illnesses during heatwave years. [20] In another study, Alqahtani et al. (2019) reported that diarrhea and food poisoning (traveler’s diarrhea) were common during the Hajj, especially among the elderly, although few studies have documented their frequency and causes. A recent study in 2020 showed that heat exposure and heat illness were the third most common cause of hospitalization during the Hajj, including among the elderly. Cholera, heat exposure, and heat illness (an acute bacterial enteric disease caused by *Vibrio cholerae*) have been the cause of several outbreaks after the Hajj. [21] Heat exposure and heat-related illness are frequently reported during the Hajj, resulting in significant morbidity and mortality among pilgrims. [22] Another study (23) found that an important factor that increases the risk of heat stroke among pilgrims is the high prevalence of chronic disabling diseases. Of particular note here is diabetes. 70% of patients had abnormally high blood sugar levels, while only 30% of those with hyperglycemia had sugar in their urine. Most had no history of diabetes. Diabetic patients responded least well to cooling, and all deaths occurred in these patients. The link between heat stress

and hyperglycemia requires further study. [23] While the primary treatment for heat exposure and heat-related illness is simple and consists primarily of adequate cooling and hydration, inadequate treatment of heat exposure and heat-related illness can result in devastating consequences such as heat exposure and heat-related illness, multi-organ failure, and death [23]. In the case of heat exposure and heat-related illness, the first step in treating the patient is to move the patient to a cool environment, such as the shade or an air-conditioned car, while lightening the patient's clothing [24]. Quandt et al. (2020) reported that for most patients, moving the patient to a cooler location was the only treatment step for which medical staff compliance was above average, as it was the simplest and quickest step. Compliance with whitening clothing was average, as the type of clothing worn by male pilgrims (ordained men) is two loose-fitting garments worn during the ceremony. [25] On the other hand, previous studies have highlighted the importance of initiating external cooling at the scene and continuing cooling during transport to the medical facility. Continuous cooling significantly improves the treatment of heat exposure and heat-related illness in the prehospital setting [26]. Other studies have shown average compliance throughout the prehospital cooling process. Compliance with both immediate and sustained cooling was below average; however, healthcare professionals adhered to the immediate transfer and cooling methods. These differences in prehospital cooling compliance may reflect the need for more healthcare education on the importance of cooling. Factors such as distance from heat exposure and heat-related illness units, availability of transportation, access to cooling equipment, and crowded environments may affect proper adherence to cooling procedures [27].

Rationale:

A review of the literature suggests that our understanding of the epidemiology of heat stress and the prevalence of heat-related illnesses at global and regional levels remains inadequate. The onset of the Hajj heat cycle, which will continue for the next 15-16 years, is significant and unique for heat illness research.

Approximately 2 million people will be exposed to extreme heat between May and September, with the majority being at high risk. Thousands of cases of heat stroke are expected. This article describes the prevailing conditions during the annual Hajj pilgrimage and outlines the epidemiological and clinical findings observed by the authors during the 2022/2023 Hajj, when many cases of heat stroke were observed or treated. The impact of nursing knowledge on the risk of heat stress and the prevalence of heat-related illnesses among pilgrims is important for the Saudi Ministry of Health to develop further recommendations and interventions.

Aim of the study:

Evaluating the impact of nursing knowledge on heat exposure hazards and prevalence of heat-related illnesses among pilgrims visiting hospitals and health centers, Makkah, Saudi Arabia, 2024.

Objectives:

Evaluation of the effect of nursing knowledge on heat exposure hazards and prevalence of heat-related illness among pilgrims attending the Al-Mokarrama Primary Health Center in Makkah, Saudi Arabia, 2024

Methodology:

Study design:

This study is a cross-sectional study design was used in carrying out of this study.

Study Area

The study was conducted in the city of Mecca, the holiest city in Islam. Mecca is the birthplace of the Prophet Muhammad and the main destination for pilgrims to perform the Umrah and Hajj rituals. The holy city, located in the western region of Saudi Arabia, has a population of approximately 2.58 million. The study focused on pilgrims living in Mecca during the Hajj period in June-July 2023. During this period, the Saudi government will provide free health care through hospitals and primary health centers (PHCs), including temporary health facilities.

The health workers involved in the study were male and female, ranging in age from under 30 to over 50 years old. Throughout the study period, they cared for pilgrims diagnosed with heat stress and heat illness in health centers and hospitals.

Data were collected from 200 people who sought treatment in hospitals and health centers. A team of two researchers stationed at these facilities collected information using a standardized checklist questionnaire. The study excluded individuals under the age of 18, health care workers who did not directly treat patients with heat-related illnesses, and patients who did not diagnose heat exposure or heat illness.

The study used a sample of 200 healthcare workers who met the inclusion criteria and were residing in Makkah during the study period.

Selection criteria:

These range from biological, socio-economic and lifestyle differences.

Inclusion criteria:

Medical staff willing to participate in the study Working during the Hajj in Mecca.

Able and willing to participate in the study. Participate in the diagnosis of heat stress and heat illness.

3.3.3 Exclusion criteria:

Medical staff outside Mecca. Medical staff refused to participate

The sample size

The sample size was calculated using Raosoft Sample Size Calculator (Error rate: 5%, Confidence level: 95%, assuming a 20% response distribution) based on the required sample size (200) of pilgrims (male and female) and

10 more were added to reduce the margin of error. After adding 5% oversampling, the minimum sample size calculated was 200. A computer-generated simple random sampling technique was used to select the study participants.

The researchers conducted data collection in 2024.

Data collection tools of the study:

A structured questionnaire was used to collect data. It was developed by the researchers after reviewing the current national and international literature. It consists of questions. It includes the following sections:

Section 1: Bio-socio-demographic characteristics: name, number of pilgrims, age, sex, phone number, name of leader, frequency of pilgrimage, years of education, place of residence, and presence of chronic diseases such as diabetes.

Section 2: This section includes questions to assess the caregivers' knowledge about the hazards of heat exposure and the prevalence and treatment of heat-related diseases among pilgrims.

After a brief introduction to the study, informed consent will be obtained from each participant who agrees to participate in the survey. Ethical approval will be obtained from the hospital research center and primary health center. The research tools were developed by the researchers and tested for validity and reliability using Cronbach's alpha ($r=0.76$). A pilot study was conducted on 10 health care workers during the Hajj to test and ensure the clarity, applicability, and feasibility of the tools. The health care workers completed the survey on their own; however, the research team members assisted those who were unable to complete the questionnaire on their own.

Data entry and analysis:

Data entry and analysis were performed using Statistical Package for Social Sciences (SPSS) version 24.0 software. Descriptive statistics (e.g., counts, percentages) and chi-square test (χ^2) analysis statistics were applied to test the association and difference between two categorical variables. A p value ≤ 0.05 was considered statistically significant.

Pilot study

A pilot study has been conducted from Nursing hospitals and primary health centers in the same sector due to the similarity to the target group using the same questionnaire to test the methodology of Research. Feedback will be that the questionnaire was clear and no methodological flaws were found.

8. Budget: Self-funded Results: Ethical Considerations

Verbal consents were obtained from all survey participants, all information was kept confidential, and the result was submitted to the department as feedback.

Table 1: distribution of participants according to socio demographic characteristics (Age, Gender, Nationality, qualification, Job title, and experience)

	N	%
Age		
<30	44	22
30-40.	56	28
40-50.	64	32
>50	36	18
Gender		
Male	136	68
Female	64	32
Nationality		
Saudi	154	77
Non-Saudi	46	23
Your qualification is		
Diploma	60	30
Bachelor	125	62
Master	15	8
Job title		
Nurse	200	100
Years of experience		
<5	42	21
5-10.	76	38
10-15.	50	25
>15.	32	16

Regarding the socio-demographic characteristics, this table shows that the highest percentage of participants were between the ages of 40-50 years (32.0%) and 30-40 years (28.0%), while <30 years (22.0%), and regarding gender, the majority of participants were males (68.0%), but females (32.0%), and regarding nationality, the

majority of participants were Saudis (77.0%) but non-Saudis (23.0%), and regarding qualification, the majority of participants were bachelor's degree (62%) while diploma (30%), and regarding job title, the participants were nurses (100%), and regarding years of experience, the majority of participants were 5-10 (38.0%), while 10-15 were (25.0%) but <5 were (21.0%).

Table 2: distribution of the participants' knowledge about the heat exposure and heat stroke cases.

	N	%
Heat exposure and heat stroke cases Management		
Advanced Case Management	22	11
Do not know	22	11
Basic Case Management	30	15
All of them	126	63
How heat exposure and heat stroke cases Management		
Patient clothes lightened up	10	5
Patient moved to a cooler place	22	11
Patient moved to a cooler place	12	6
Patient placed in supine position and elevate legs and hips	24	12
Patient started oral hydration	18	9
All of them	110	55
Do not know	4	2
If advanced how case management		
Cooling and transferring the patient to health facility	22	11
If no improvement of signs and symptoms, other diagnosis considered	30	15
Intravenous fluid given when patient nauseated	32	16
All of them	110	55
Do not know	6	3
Heat stroke pre-primary health care management guidelines compliance scores		
Any medication given pre-primary health care	36	18
BSI * considered	24	12
Full pre-primary health care report taken	26	13
All of them	110	55
Do not know	4	2
To recognition of heat exposure and heat stroke / Case management		
All of them	96	48
All vital signs documented	44	22
Do not know	8	4
Responsiveness assessed	52	26
Stabilize ABC		
Airway stabilized	18	9
All of them	120	60
Breathing stabilized	30	15
Circulation stabilized	16	8
Do not know	16	8
Cooling		
All of them	106	53
Cooling continued on the way to the heatstroke unit	16	8
Do not know	10	5
Ice packs/chemical ice packs, fanning, wet sheets to the skin were applied	38	19
Patient transferred immediately to the heatstroke unit	18	9
Started immediately on the scene	12	6

Regarding the knowledge of heat exposure and heat stroke cases, the table shows that regarding the management of heat exposure and heat stroke cases, most participants gave all answers (63.0%), but all were basic case management (15.0%), while advanced case management and "don't know" each (11.0%).

Regarding the management of heat exposure and heat stroke cases, most participants gave all answers (55.0%), but all were supine position of the patient with legs and hips elevated (12.0%), while the patient was moved to a cooler location (11.0%). In terms of advanced case management, most participants gave all answers (55.0%), except that intravenous fluids were given for nausea (16.0%), which did not improve. In terms of signs and symptoms, other diagnoses were considered (15.0%), In terms of adherence scores for heat stroke prior to primary health care, most participants gave all answers (55.0%), except that any medications were taken prior to primary health care

(18.0%), Although a complete preventive health report was completed (13.0%), Regarding heat exposure detection and heat stroke/case management, most participants answered all questions (48.0%) except assessing reactivity (26.0%), while all vital signs were recorded (22.0%). %, regarding ABC of stabilization, most participants answered all (60.0%), but stable breathing (15.0%), and stable respiratory system (9.0%), but stable circulation (8.0%), regarding cooling, most participants answered all (53.0%), but applying ice packs/chemical ice packs, fanning, wet cloths to the skin (19.0%), and immediately transferring the patient to the heat stroke ward (9.0%), but continued cooling on the way to the heat stroke ward (8.0%).

Table 3: distribution of the participants' general knowledge about heat exposure and heat stroke pre- primary health care management guidelines compliance scores.

Heat exposure and heat stroke in-primary health care management guidelines compliance	N	%
In-primary Considerations		
Did not give antipyretics	4	2
Do not know	12	6
Full pre-primary report taken	26	13
Adhered to appropriate PPEs	34	17
All of them	124	62
Diagnosis confirmation with rectal thermometer/ Case Management		
A. Cooling		
All of them	102	51
Cooling continued	22	11
Cooling stopped when rectal temperature is 39 C	18	9
Do not know	16	8
Skin and rectal temperature continuously monitored	26	13
Skin temperature maintained > 30 C	16	8
B. Stabilize ABC		
Airway stabilized	18	9
All of them	152	76
Breathing stabilized : administer oxygen to keep oxygen saturation (SaO ₂) > 94	14	7
Do not know	16	8
Special considerations		
All of them	66	33
Do not know	24	12
Intravenous furosemide, mannitol, and sodium bicarbonate were given	64	32
Rhabdomyolysis diagnosed	22	11
Volume expanded by giving more fluids	24	12
Potassium and calcium were monitored		
Do not know	20	10
No	24	12
Yes	156	78
If hyperkalaemia, the patient was treated		
Do not know	32	16
No	24	12
Yes	144	72
In case of seizure/shivering, benzodiazepines given		
Do not know	6	3
No	44	22
Yes	150	75
In case of multiple organ system dysfunction, supportive therapy given		
Do not know	16	8
No	22	11
Yes	162	81

Regarding Heat exposure and heat stroke in- primary health care management guidelines compliance, the table shows regarding In-primary Considerations the majority of participant answer all of them were (62.0%),

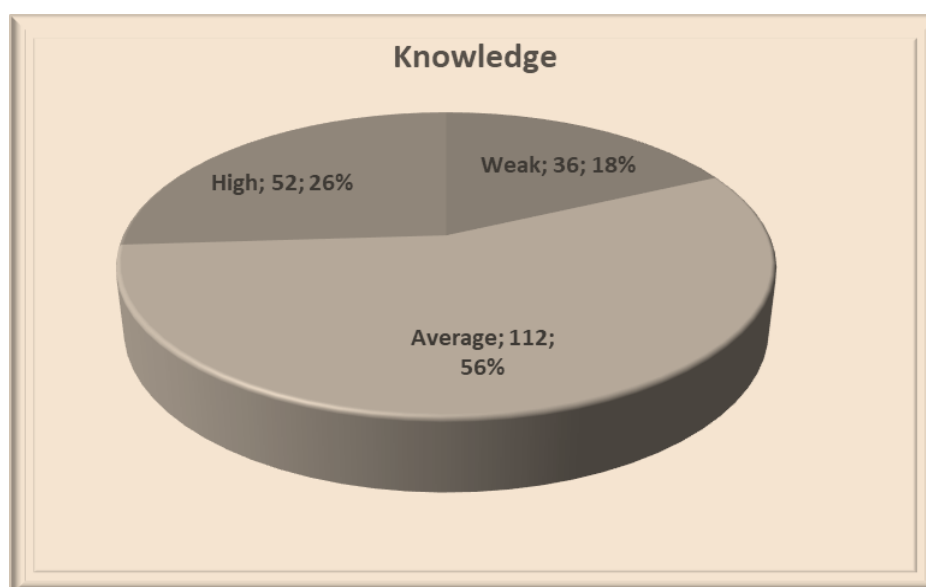
but adhered to appropriate PPEs were (17.0%), while full pre- primary report taken were (13.0%), regarding Diagnosis confirmation with rectal thermometer/ Case Management regarding the A. cooling the majority of participant answer all of them were (51.0%), but Skin and rectal temperature continuously monitored were (13.0%), while Cooling stopped when rectal temperature is 39 C were (9.0%), followed by Skin temperature maintained > 30 C and do not know respectively were (8.0%), regarding B. Stabilize ABC the majority of participant answer all of them were (76.0%), but Airway stabilized were (9.0%), while do not know were (8.0%), followed by breathing stabilized : administer oxygen to keep oxygen saturation (SaO₂) > 94 were(7.0%), regarding Special considerations the majority of participant answer all of them were (33.0%), but intravenous furosemide, mannitol, and sodium bicarbonate were given were (32.0%), while volume expanded by giving more fluids were (12.0%), followed by do not know were (12.0%) while Rhabdomyolysis diagnosed were (11.0%), regarding the Potassium and calcium were monitored the majority of participant answer Yes were (78.0%), but No were(12.0%) followed by do not know were (10.0%), regarding the hyperkalemia, the patient was treated the majority of participant answer Yes were (72.0%), but do not know were (16.0%), while No were (12.0%), regarding case of seizure/shivering, benzodiazepines given the majority of participant answer Yes were (75.0%), but No were (22.0%), while do not know were (3.0%), regarding case of multiple organ system dysfunction, supportive therapy given the majority of participant answer Yes were(81.0%) but No were (11.0%) while do not know were (8.0%),

Table 4 Distribution of the relation of Knowledge of the Nursing about hazards of heat exposure and Prevalence of heat-related illnesses among pilgrims

	Knowledge	
	N	%
Average	112	56
High	52	26
Weak	36	18
Total	200	100
Chi-square X ²	48.16	
P-value	<0.001*	

Table 4 show Distribution of the relation of Knowledge of the Nursing about hazards of heat exposure and Prevalence of heat-related illnesses among pilgrims regarding the knowledge the most of participants average knowledge were (56.0%) followed by high were (26.0%) but weak were (18.0%) and total were (100.0%) while have a significant relation were P-value <0.001 and X² 48.16.

Figure 1 Distribution of the relation of Knowledge of the Nursing about hazards of heat exposure and Prevalence of heat-related illnesses among pilgrims



Discussion:

Heat exposure and heat-related illness are frequently reported during the Hajj, resulting in significant morbidity and mortality among pilgrims[21]. Adequate primary healthcare and pre-hospital and in-hospital management are the cornerstones for ensuring optimal outcomes for patients with heat exposure and heat-related illness. [23] The Saudi Ministry of Health has developed guidelines for the care of pilgrims visiting hospitals and primary care centers to educate them about the risks of heat exposure and heat-related illness. health centers during Hajj[22]. Nevertheless, it is still challenging for health workers to comply with all instructions, especially during large events such as Hajj rituals. Health workers must adhere to this

knowledge and make necessary changes to improve the quality of health services and protect pilgrims. [19] The aim of this study was to investigate nurses' knowledge of the hazards of heat exposure and the impact on the prevalence of heat-related illness among pilgrims visiting a primary health center in Mecca, Saudi Arabia, in 2023. The study showed that the most common socio-demographic characteristics of participants were age 40–50 years (32.0%), sex (68.0%), nationality (77.0%), seniority (28.0%), job title (47.0%), nursing (32.0%), and professional experience (38.0%) of 5–10 years (see Table 1).

On the other hand, in terms of knowledge about heat exposure and heat stroke, it was found that excessive loss of water, salt, or both increased the risk of heat stroke. A previous study reported that oral hydration on site was an important step in the patient treatment process [28]. The results were similar to our study. Patients who were started on oral fluids and placed in the supine position with hips and legs elevated had the lowest adherence scores. There are several possible reasons for these low adherence scores: Lack of adequate knowledge among caregivers about the importance of adequate hydration during heat exposure and heat-related illness episodes may be an important reason for poor adherence. Environmental factors, including the presence of other critically ill patients who require more attention, [29] cultural diversity, and different languages, may make it difficult for caregivers to accurately grasp all knowledge. Other patient-specific factors include the fact that the general condition of most patients was stable or improved after the first treatment steps. These factors may also account for poor adherence to intensive case management of heat-related illness, including transferring patients to a healthcare facility and considering alternative diagnoses if their condition does not improve. We also noted that data on adherence to intravenous (IV) fluids in patients with nausea were incompletely recorded. [30] (See Table 2) In contrast, other studies have found that [18] higher adherence values were recorded in prehospital and inpatient care for heat exposure and heat-related illness. Increased awareness among healthcare providers of the serious risks and rapid complications of heat exposure may account for the differences in adherence.

[22] The average compliance with pre-hospital considerations reflects the nurses' good knowledge of the appropriate preparation and relevant medical history of patients with heat exposure and heat-related illness. One of the positive outcomes of this study was the high level of recognition and compliance with adjudication of heat exposure and heat-related illness cases. All healthcare professionals should make every effort to stabilize the patient's airway, breathing, and circulation (ABC) before proceeding with more specific cooling therapies [18]. When assessing the medical staff's compliance with the ABC stabilization guidelines, nurses demonstrated high adherence to the guidelines, with a high percentage of eligible cases being properly stabilized. Even after admission, staff also demonstrated good compliance in stabilizing the airway and maintaining oxygen saturation above 40°C [31]. This relatively high level of compliance may be due to the medical staff's adequate training and preparation for emergencies related to heat exposure and heat-related illness. (See Table 3)

In this study, most participants under the age of 30 had a weak knowledge score (52.78%) compared to the overall mean score (22.0%), but the correlation was significant (P value = 0.001 and X² (48,925). In terms of qualification (bachelor's degree), most participants scored weakly in knowledge (41.67%), while the significant relationship was P value = 0.001 and X² (46,366). For job title (nurse), most participants had an average knowledge score of (67.86%), P value = 0.001 and X² (114.183) (see Table 5, Figures 3, 4, 5).

Conclusion

Although Saudi Arabian government authorities are conducting research and forming multidisciplinary teams to prevent health problems during the Hajj, the mortality rate due to heat exposure is high, with most patients suffering from heat exposure and heat illness. Programs need to be developed to pay more attention to educating pilgrims to prevent heat stroke before they arrive in the Kingdom. It is also hoped that with the improvement of services and immediate availability of first aid in the Haj sites will witness better and safer Haj seasons in the future.

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