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Knowledge, attitudes, practices, and preparedness regarding heat-related illness prevention among non-Saudi outdoor workers attending care outpatient clinics in Saudi Arabia: a cross-sectional study

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ABSTRACT

Background: Exposure to high temperatures for long periods, combined with strenuous physical activity, can cause the body to overheat. Outdoor workers are more prone to heat-related illness (HRI); consequently, they are more prone to morbidity and mortality if they do not adopt protective measures. Effective preventive measures involve preventing HRI and improving the knowledge, attitude, and practice (KAP) of the workers to reduce their vulnerability to HRI. This study was conducted to assess the knowledge, attitude, practice, and preparedness of outdoor workers regarding HRI prevention.

Methods: This was a cross-sectional study that was conducted at the outpatient clinics of National Medical Care between the period from June to July on outdoor workers. The study was conducted using a questionnaire to collect data from the participants. The survey investigated knowledge, attitude, practice, preparedness, and barriers.

Results: A total of 170 workers were recruited; the mean±SD score of knowledge, attitude, and preparedness were 6.1 ± 3.2, 12.9 ± 2.8, and 16 ± 2.5, respectively, whereas 61.2% had good practice. There were 52.4% and 27.6% diagnosed with heat stroke and exhaustion, respectively. There was a significant negative correlation between practice and attitude ($r = -0.6$, $p < 0.001$) and a positive correlation between knowledge and attitude ($r = 0.284$, $p < 0.001$).

Conclusion: There was acceptable knowledge, low attitude, good practice, and preparedness of outdoor workers regarding HRI prevention. Additionally, there were a few barriers that can be overcome through good preparedness of the working environment.

Keywords: Knowledge, outdoor workers, prevention, heat-related illness.

Introduction

High temperature presents a serious risk to the well-being and safety of workers, resulting in elevated morbidity and mortality during hot weather [1]. Saudi Arabia is known for challenging desert climates marked by high coastal humidity and intense heat; therefore,

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exposure to high temperatures for prolonged periods carries potential health risks [2, 3]. The maintenance of a core body temperature of 37°C is vital; therefore, the failure to cool down through rest or sweat can lead to heat-related illnesses [4].

Heat-related illness (HRI) encompasses a wide range of diseases arising from the inability of the body to maintain optimal core temperature under extreme thermal stress. The presentation of HRI ranges from mild forms such as heat exhaustion and heat cramps to severe, life-threatening heat stroke, which in certain populations causes mortality exceeding 20% [5]. Untreated heat exhaustion can develop into heatstroke, which in turn can lead to complications such as intestinal ischemia, acute respiratory distress syndrome, encephalopathy, and electrolyte imbalances [6].

Outdoor workers are vulnerable to HRI [7] due to exposure to high temperatures for long periods, combined with strenuous physical activity that can cause the body to overheat [4]. It was stated that effective preventive interventions aim to prevent HRI and contribute to improving the knowledge, attitude, and practice (KAP) of the workers, where the gap in KAP of outdoor workers considerably increases their vulnerability to HRI [8]. The risk factors of occupational HRI include lack of preventive measures, inadequate health care, and low levels of knowledge and education [9].

One previous Saudi study investigated KAP of the general population in Jeddah regarding HRI. A total of 378 individuals were enrolled, and it was found that 18.2% of the population experienced HRI. The findings revealed a high level of knowledge; however, the population needs to strengthen their awareness [10]. Additionally, the study did not report the KAP of subjects regarding HRI prevention, and it focused on the general population. Another Saudi study investigated KAP regarding HRI among 168 military personnel and found good KAP of HRI. Nonetheless, there are areas in need of improvement, including enhancing awareness and practical implementation of preventive measures [6]. There was no previous Saudi study focused on outdoor workers; therefore, this study was conducted to assess the knowledge, attitude, practice, and preparedness of outdoor workers regarding HRI prevention.

Subjects and Methods

Design, settings, and subjects

This was a cross-sectional study that was conducted at the outpatient clinics of National Medical Care between the period from June to July. The study was conducted on outdoor workers admitted to the outpatient clinics of National Medical Care. The inclusion criteria for the participants were outdoor workers of both genders, workers admitted to the outpatient clinics regardless of their nationalities, workers who agreed to participate, and workers who provided informed consent. The exclusion criteria were indoor workers, those admitted to other clinics, and those who refused to participate or refused to provide informed consent. Ethical approval was obtained from June before the initiation of the study.

Data collection

The data were collected through a questionnaire distributed to the outdoor workers visiting the outpatient clinics who fulfilled the inclusion criteria. The questionnaire was designed after reviewing previous related literature and included six parts; the first investigated demographics and included two questions about permission to participate in the study. The second section included questions on knowledge of HRI, the third section investigated attitude toward HRI prevention, the fourth section investigated preventive practice, and the fifth and sixth sections investigated previous experience with HRI and barriers to HRI prevention, respectively. Previous experience with heat-related illness was assessed by self-reported responses to questions asking whether participants had previously experienced specific heat-related symptoms or had been diagnosed with heat exhaustion or heat stroke by a healthcare provider. These items reflected participants' reports of previous healthcare-provider diagnoses and were not independently verified through medical records."

Pilot study

The questionnaire was developed by the research team after reviewing the relevant literature on heat-related illnesses and their prevention among outdoor workers. The questionnaire was structured to assess participants' demographic and occupational characteristics, knowledge, attitudes, preventive practices, previous experience with heat-related illnesses, preparedness, and barriers to heat-related illness prevention. Before the main study, a pilot study was conducted among 25 outdoor workers who fulfilled the same eligibility criteria as the study participants. The pilot study was performed to assess the clarity, comprehensibility, and applicability of the questionnaire and to evaluate its reliability. The questionnaire demonstrated good internal consistency, with an overall Cronbach's alpha coefficient of 0.81. The pilot participants were not included in the final study sample. The questionnaire used for data collection is provided as supplementary material.

Statistical analysis

The data were collected from the retrieved questionnaire and saved in an Excel sheet, then transferred to SPSS program version 26 for analysis.

Questionnaire Scoring

The questionnaire assessed participants' knowledge, attitude, and preventive practices regarding heat-related illnesses. The knowledge section consisted of

12 questions with three response options: true, false, and "do not know." Each correct answer was assigned one point, whereas incorrect answers and "do not know" responses were assigned zero points. The total knowledge score was calculated by summing the scores of all knowledge items, with higher scores indicating better knowledge. Participants who provided the correct answer to the knowledge questions were considered to have acceptable knowledge.

Attitude was assessed using a five-point Likert scale, with responses scored according to the degree of agreement with statements related to heat-related illness prevention. Higher scores indicated a more favorable attitude. The total attitude score was calculated by summing the scores of all attitude items. The two lowest response categories, "disagree" and "strongly disagree," were considered indicative of a low attitude toward heat-related illness prevention.

Preventive practices were assessed using a five-point Likert scale, with responses scored according to the frequency of adopting recommended heat-related illness preventive measures. Higher scores indicated better preventive practices. The total practice score was calculated by summing the scores of all practice items. The two lowest response categories were considered indicative of poor preventive practice, whereas higher response categories indicated more favorable preventive practices. No reverse-coded items were used in the knowledge, attitude, or practice domains.

The categorical and numerical data were represented using number (%) and mean ± standard deviation (SD), respectively. The correlations were established using a *T*-test or chi-square test based on the data type. Spearman's correlation was used to assess the correlation between numerical variables. A *p* value <0.05 was considered significant.

Results

A total of 170 non-Saudi participants were included. The largest proportions of the workers reported having secondary education 57 (33.5%), working in delivery 64 (37.6%), having experience of 1-5 years 71 (41.8%), and having an average daily working hours outdoors of more than eight hours 87 (51.2%). The mean ± SD of the workers' age was 33 ± 8 years (Table 1).

The knowledge of the participants regarding HRI was investigated through 12 questions with three

Table 1. *Sociodemographic and occupational characteristics of the study participants (N = 170).*

Variable	Category	*n*	%
Nationality	Non-Saudi	170	100.0
Educational level	Primary education	42	24.7
	Secondary education	57	33.5
	Intermediate education	27	15.9
	University education	1	0.6
	Diploma	43	25.3
Occupation	Construction worker	27	15.9
	Delivery worker	64	37.6
	Road worker	36	21.2
	Cleaner	42	24.7
	Engineer	1	0.6
Years of work experience	Less than 1 year	19	11.2
	1-5 years	71	41.8
	6-10 years	28	16.5
	>10 years	41	24.1
Average daily working hours outdoors	<4 hours	1	0.6
	4-6 hours	16	9.4
	7-8 hours	66	38.8
	>8 hours	87	51.2
Age (years)	Mean ± SD	33 ± 8	

answer options: false, true, or do not know. The range of knowledge scores was 1 to 10, and the mean ± SD score of knowledge was 6.1±3.2, indicating a moderate score. The correlations between the mean knowledge score and other demographics revealed significant correlations with all investigated demographics (Table 2). The highest mean score of knowledge was associated with diploma and university education ($p < 0.001$), working in construction ($p < 0.001$), having long experience of more than 10 years ($p = 0.003$), and working for 7-8 hours daily ($p < 0.001$).

The attitude of the workers regarding HRI was investigated through seven questions with three choices included: agree, strongly agree, and neutral. The range of attitude scores was 11 to 21, and the mean ± SD of the scores was 12.9 ± 2.8. The mean attitude score was significantly related to occupation, with the highest mean score reported by delivery workers (p <0.001);

Table. 2. *Knowledge score according to characteristics.*

Variable	Category	Mean ± SD	Median	Range	*p* value
Educational level	Primary education	6.45 ± 0.50	6.00	6-7	<0.001
	Secondary education	3.25 ± 3.72	0.00	0-10	
	Intermediate education	6.67 ± 2.40	5.00	5-10	
	Diploma and university	8.77 ± 0.99	8.00	8-10	
Occupation	Construction worker	8.00 ± 0.00	8.00	8-8	<0.001
	Delivery worker	3.98 ± 4.10	5.00	0-10	
	Road worker	7.50 ± 2.54	7.50	5-10	
	Cleaner	6.45 ± 0.50	6.00	6-7	
Years of experience	<5 years	5.98 ± 3.35	7.00	0-10	0.003
	6-10 years	5.36 ± 0.49	5.00	5-6	
	>10 years	6.54 ± 3.92	6.00	0-10	
Average daily outdoor working hours	<6 hours	7.69 ± 1.43	8.00	6-10	<0.001
	7-8 hours	10.00 ± 0.00	10.00	10-10	
	>8 hours	2.80 ± 2.50	5.00	0-5	

Table 3. *Attitude score according to characteristics.*

Variable	Category	Mean ± SD	Median	Range	*p* value
Educational level	Primary education	12.36 ± 1.51	11.00	11-14	0.248
	Secondary education	12.16 ± 0.37	12.00	12-13	
	Intermediate education	12.33 ± 0.48	12.00	12-13	
	Diploma and university	14.86 ± 4.93	11.00	11-21	
Occupation	Construction worker	11.00 ± 0.00	11.00	11-11	<0.001
	Delivery worker	14.25 ± 3.93	12.00	12-21	
	Road worker	12.50 ± 0.51	12.50	12-13	
	Cleaner	12.36 ± 1.51	11.00	11-14	
Years of experience	<5 years	13.53 ± 3.41	12.00	11-21	0.015
	6-10 years	11.64 ± 0.49	12.00	11-12	
	>10 years	12.34 ± 1.64	12.00	11-21	
Average daily outdoor working hours	<6 hours	12.17 ± 1.60	11.00	11-21	<0.001
	7-8 hours	21.00 ± 0.00	21.00	21-21	
	>8 hours	12.00 ± 0.00	12.00	12-12	

years of experience, with the highest mean score reported by those with less than 5 years of experience (p = 0.01); and average daily outdoor working hours of 7-8 hours (p < 0.001) (Table 3).

The preventive practice of workers regarding HRI was investigated through ten questions with three answer options, including sometimes, often, and always. The overall level of practice was good among 104 (61.2%), whereas 66 (38.8%) had poor practice. The overall practice levels were found to be varied with the demographics of the workers (Table 4). The largest frequencies of those with good practice had diploma and university education (p < 0.001), were delivery workers (p = 0.004), had less than 5 years of experience, and worked for less than six hours daily (p < 0.001).

"Regarding previous experience with heat-related illness, 89 participants (52.4%) reported having previously received a diagnosis of heat stroke from a healthcare provider, while 47 (27.6%) reported a previous healthcare-provider diagnosis of heat exhaustion. These findings were based on participants' self-reports and were not independently verified through medical records (Table 5)."

The preparedness of the workers for the prevention of HRI was investigated through eight questions. The most reported actions for prevention included modification of working hours and activities during periods of extreme heat, 170 (100%), and receiving training on heat-stress prevention, 169 (99.4%). The least reported action was the availability of emergency procedures for dealing with heat-related cases, 99 (58.2%) (Table 6).

Regarding the barriers to applying HRI prevention measures, they are displayed in Table 7. The largest

Table 4. *Preventive practice level according to characteristics.*

Variable	Category	Poor practice, *n* (%)	Good practice, *n* (%)	*p* value
Educational level	Primary education	19 (45.2)	23 (54.8)	**<0.001**
	Secondary education	38 (66.7)	19 (33.3)	
	Intermediate education	9 (33.3)	18 (66.7)	
	Diploma and university	0 (0.0)	44 (100.0)	
Occupation	Construction worker	0 (0.0)	27 (100.0)	**0.004**
	Delivery worker	29 (45.3)	35 (54.7)	
	Road worker	18 (50.0)	18 (50.0)	
	Cleaner	19 (45.2)	23 (54.8)	
Years of experience	<5 years	39 (38.6)	62 (61.4)	**<0.001**
	6-10 years	0 (0.0)	28 (100.0)	
	>10 years	27 (65.9)	14 (34.1)	
Average daily outdoor working hours	<6 hours	37 (42.0)	51 (58.0)	**<0.001**
	7-8 hours	0 (0.0)	16 (100.0)	
	>8 hours	29 (43.9)	37 (56.1)	

Table 5. *Previous experience with heat-related illnesses.*

Previous experience	No, *n* (%)	Yes, *n* (%)
Severe thirst	128 (75.3)	42 (24.7)
Muscle cramps	152 (89.4)	18 (10.6)
Dizziness or lightheadedness	128 (75.3)	42 (24.7)
Fainting	129 (75.9)	41 (24.1)
Self-reported previous diagnosis of heat stroke by a healthcare provider	123 (72.4)	47 (27.6)
Diagnosed with heat stroke by a healthcare provider	81 (47.6)	89 (52.4)

Table 6. *Workplace preparedness for the prevention of heat-related illnesses.*

Workplace preparedness item	No, *n* (%)	Yes, *n* (%)
Drinking water is available at the workplace.	60 (35.3)	110 (64.7)
Shaded areas are available for rest.	66 (38.8)	104 (61.2)
I have received training on heat-stress prevention.	1 (0.6)	169 (99.4)
Emergency procedures are available for dealing with heat-related cases.	71 (41.8)	99 (58.2)
The employer monitors weather conditions or high-temperature warnings.	36 (21.2)	134 (78.8)
First-aid services are available at the workplace.	29 (17.1)	141 (82.9)
Workers are encouraged to report symptoms of heat stress.	38 (22.4)	132 (77.6)
Working hours or work activities are modified during periods of extreme heat.	0 (0.0)	170 (100.0)
Preparedness score	16±2.5 13-20	

Table 7. *Barriers to applying heat-related illness prevention measures.*

Barrier to preventive practices	***n***	**%**
No reported barriers	63	37.1
High workload and fear of wage loss or penalties	23	13.5
High workload, inadequate training, and lack of shaded areas	29	17.1
Lack of drinking water, high workload, and fear of wage loss or penalties	19	11.2
Lack of drinking water, high workload, and lack of shaded areas	18	10.6
Lack of adequate rest breaks	18	10.6
Total	170	100.0

Table 8. *Spearman's correlations between age, knowledge, practice, and attitude scores.*

Pair	Correlation (*r*)	*p* value
Age ↔ Knowledge	−0.305	**< 0.001**
Age ↔ Practice	−0.632	**< 0.001**
Age ↔ Attitude	0.410	**< 0.001**
Knowledge ↔ Practice	0.147	0.056
Knowledge ↔ Attitude	0.284	**< 0.001**
Practice ↔ Attitude	−0.600	**< 0.001**

proportion revealed no barriers 63 (37.1%), whereas the most reported barriers were high workload, inadequate training, and lack of shaded areas.

The correlations between numerical variables revealed significant negative correlations between age and knowledge (r = −0.305), age and practice (r = −0.632), and practice and attitude (r = −0.6). There were two significant positive correlations found between age and attitude (r = 0.41) and knowledge and attitude (r = 0.284) (Table 8).

Discussion

This study was conducted to assess the knowledge, attitude, practice, and preparedness of outdoor workers regarding HRI prevention, as there was no previous Saudi study investigating this subject. The symptoms of heat exhaustion include weakness, headache, irritability, diarrhea, dizziness, vomiting, and nausea. The manifestations of heatstroke include delirium, seizures, tachycardia, confusion, dizziness, hallucinations, hypotension, and multi-organ dysfunction, which can be fatal [6]. In the current study, 89 participants (52.4%) reported a previous healthcare-provider diagnosis of heat stroke, while 47 (27.6%) reported a previous healthcare-provider diagnosis of heat exhaustion. These figures represent self-reported previous diagnoses and should not be interpreted as independently confirmed clinical diagnoses or as the prevalence of heat stroke in the broader population of outdoor workers.

, followed by heat exhaustion diagnosed by healthcare providers. A previous study from India enrolled 123 adult brick kiln workers and reported a high prevalence of HRIs of 80.49%, but with no specification of certain illnesses or symptoms [4].

A previous review discovered a high prevalence of HRI, including heat exhaustion, dehydration, kidney disorders, and productivity loss among outdoor workers across different sectors such as agriculture, construction, and informal labor [11]. Our findings were higher compared to those reported in a previous Saudi study from Jeddah conducted on the general population, which reported that 18.2% of the individuals suffered from HRIs [10]. However, the variations in such prevalence findings can be related to the fact that we focused on outdoor workers who are more prone to experience HRIs in comparison to the general population, which may include indoor workers and people who do not spend long periods in the heat outside.

A study that recruited 88 outdoor workers found that most workers reported at least one mild HRI symptom (96.6%), with fatigue, dizziness, and muscle cramps being the most reported complaints [12]. Similarly, we found that the most reported symptoms included dizziness, whereas muscle cramps were the least reported symptom.

Regarding KAP, in this study the workers displayed acceptable knowledge, low attitude, and more than one-half had good practice; however, the preparedness of the workers was good. One Saudi study focused on military personnel reported good KAP of HRI [6]. However, the study focused on a different population and did not report the preparedness of the personnel. A study from India included 405 community individuals and found that only 26.1% had good knowledge about the prevention of heatstroke, and more than one-half (61.08%) showed a favorable attitude toward the preventive measures, whereas 9.38% only had good practice during peak heatstroke hours [13]. However, it is hard to compare our findings with previous studies from Saudi Arabia and other regions, mainly due to the variations in study populations between different studies. Combining this variation in KAP among different populations with our findings, where the level of knowledge was not optimal and the level of attitude was low, there is a need for further research to investigate KAP among outdoor workers in the whole Kingdom to improve KAP and, in turn, avoid the consequences of HRI.

A previous Saudi study focused on pilgrims' guides reported that most of the participants had poor knowledge and practice toward HRIs; however, the levels were improved after education [14]. Such findings differed from ours due to variation in the study population, although pilgrim guides are also vulnerable to HRI. However, it was stated that knowledge and practice were improved after education, which indicated the significance of education and training. In the current study, receiving training was one of the most important actions adopted for preparedness for the prevention of HRI.

Safety measures include mandated rest periods and facilitating clean potable water; however, often they are inadequate during extreme heat [15]. In our study, more than one-half of the workers reported the availability of shaded regions for rest and the availability of drinking water. Additionally, most of the workers reported the availability of first aid, and more than one-half reported the availability of emergency procedures to deal with the cases; such findings indicate that the workers had a good level of preparedness.

The risk factors of occupational HRI include lack of safety training regarding the use of preventive and protective clothing, inadequate health care, and low levels of knowledge and education [9]. In our study, training was reported by 99.4% of the workers; however, knowledge was still not optimal, which represents a risk factor for HRI among the workers in the current study.

In this study, we found that knowledge and practice varied considerably across all demographics, whereas attitude varied across all demographics except for education. Additionally, a positive correlation was found between knowledge and attitude, whereas a negative association was found between attitude and practice. Therefore, it is important to increase the level of knowledge to increase the attitude of the workers.

Our findings were in agreement regarding some points and in contrast regarding some points to the findings of a previous Saudi study. A previous Saudi study enrolled military personnel and discovered no significant differences in knowledge scores based on age- or educational level, while some age and education-related differences were noted in practice scores ($p < 0.05$). Additionally, there was a positive correlation between knowledge and attitudes ($r = 0.222$, $p = 0.004$), knowledge and practices ($r = 0.165$, $p = 0.033$), and attitudes and practice ($r = 0.326$, $p < 0.001$) [6].

A previous Saudi study on the general population revealed that an increased KAP score was linked with increased age ($b = 0.177$, $p < 0.000$), females ($b = -2.25$, $p < 0.000$), and those who received health education about HRIs ($b = 2.327$, $p < 0.000$) [10]. However, in our study, we assessed the correlations regarding each aspect alone, where the correlations were investigated for knowledge alone, then for attitude and practice, and we did not assess the correlations with the overall KAP.

Regarding barriers to applying heat-related illness prevention measures, more than one-third of the workers reported no barriers. Although 99.4% of participants reported receiving heat-stress prevention training, 17.1% identified inadequate training, together with high workload and lack of shaded areas, as a barrier. This finding does not necessarily indicate an absence of training; rather, participants may have perceived the training received as insufficient or inadequate for effective implementation of preventive measures. Thus, receipt of training and perceived adequacy of training represent different aspects of workplace preparedness. Further assessment of the content, frequency, quality, and practical effectiveness of heat-stress training is warranted. A previous study concerned with US farmworkers 'barriers to prevent HRI included nine studies and reported that there were several themes related to prevention barriers, including access to prevention, education and training, work culture, and compensation [16]. Despite the variation in the studied population in our study and the previous review, training seems to be an important factor in applying preventive measures.

Conclusion

Among the non-Saudi outdoor workers attending the outpatient clinics of the participating healthcare institution, heat stroke was the most frequently reported previous healthcare-provider diagnosis of heat-related illness. The participants demonstrated acceptable knowledge, low attitude, good preventive practices, and preparedness regarding heat-related illness prevention. However, these findings should be interpreted within the context of the study population and setting and should not be generalized to all outdoor workers in Saudi Arabia. Further multicenter studies involving diverse outdoor-worker populations across different regions of Saudi Arabia are warranted.

Limitations

The study has several limitations. First, the sample size was relatively small, and all participants were non-Saudi outdoor workers recruited from the outpatient clinics of a single healthcare institution. Therefore, the findings may not be generalizable to Saudi outdoor workers as a whole, to Saudi nationals, to outdoor workers in other regions, or to workers who do not attend healthcare facilities. Second, the study was conducted in a single healthcare setting, which may have introduced selection bias. Third, previous heat-related illness diagnoses were based on participants' self-reports and were not independently verified through medical records. Finally, the cross-sectional design limits the ability to establish causal relationships between knowledge, attitudes, practices, preparedness, and previous heat-related illness.

List of abbreviations

HRI	Heat-related illness
KAP	Knowledge, attitude, and practice
SPSS	Statistical package for social science

Conflict of interest

None.

Funding

None.

Consent to participate

Participants visiting the outpatient clinics provided consent before participation.

Ethical approval

The study was approved by the IRB committee of Care Medical Hospital, Approval number: IRB-015/220926, Approved Date: 25 Aug. 2026.

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REFERENCES

1. Park J, Kim Y, Oh I. Factors affecting heat-related diseases in outdoor workers exposed to extreme heat. Ann Occup Environ Med. 2017;29(1):30. https://doi.org/10.1186/s40557-017-0183-y
2. Almuzaini Y, Alburayh M, Alahmari A, Alamri F, Sabbagh AY, Alsalamah M, et al. Mitigation strategies for heat-related illness during mass gatherings: hajj experience. Front Public Health. 2022;10:957576. https://doi.org/10.3389/fpubh.2022.957576
3. Khan AA. Heat related illnesses. Review of an ongoing challenge. Saudi Med J. 2019 Dec;40(12):1195–201. https://doi.org/10.15537/smj.2019.12.24727
4. Siriyala UN, Daniel RA, Chenchula S, Saggurthi P. Prevalence of heat-related illnesses among adult brick kiln workers in rural south India: a cross-sectional study. Int J Community Med Public Health. 2025;12(8):3690–5. https://doi.org/10.18203/2394-6040.ijcmph20252481
5. Alkassas W, Rajab AM, Alrashood ST, Khan MA, Dibas M, Zaman M. Heat-related illnesses in a mass gathering event and the necessity for newer diagnostic criteria: a field study. Environ Sci Pollut Res Int. 2021;28(13):16682–9. https://doi.org/10.1007/s11356-020-12154-4
6. AlJohani RA, Marzook NT. Knowledge, attitudes, and practices of military personnel regarding heat-related illness. Cureus. 2023;15(12):e49821. https://doi.org/10.7759/cureus.49821
7. Almohammadi A. Heat-related illnesses in Saudi Arabia: prevention, early recognition, and public health strategies. J Umm Al-Qura Univ Med Sci. 2026;12(1):7. https://doi.org/10.1007/s44361-025-00018-w
8. Osman BM, Farghaly WK, Abdalla LS. Effect of Heat Waves Adaptation strategies on outdoor waste collector workers' knowledge and practice. Tanta

Sci Nurs J. 2024;35(4). https://doi.org/10.21608/tsnj.2024.406221

9. Morrissey MC, Casa DJ, Brewer GJ, Adams WM, Hosokawa Y, Benjamin CL, et al. Heat safety in the workplace: modified Delphi consensus to establish strategies and resources to protect the US workers. Geohealth. 2021;5(8):e2021GH000443. https://doi.org/10.1029/2021GH000443
10. El-Gamal F, Ghandoura A, Alammari A, Alghamdi B, Babhair L, Alsabhani S. Knowledge, attitude and practice towards heat related illnesses of the general public of Jeddah, Saudi Arabia. Middle East J. Fam. Med. 2021;7(9):21. https://doi.org/10.5742/MEWFM.2021.94120
11. Bhati N, Sheth A. Occupational heat stress and adaptation among outdoor workers: a narrative review of global evidence and policy responses. Int J Biometeorol. 2026;70(1):19. https://doi.org/10.1007/s00484-025-03101-4
12. Nurul Izzah AS, Adnan AA, Amin NM, Waras MN, Nurul Atikah CH, Sabri N, et al. Heat exposure and predictors of heat-related illness symptoms among outdoor municipal workers. J Environ Health. 2026;18 1si:171–81. https://doi.org/10.20473/jkl.v18i1si.2026.171-181
13. Athira B, Vasantha Kalyani C. Prevention of heatstroke: knowledge, attitude and practices among community population - a cross-sectional study in Jharkhand, India. Int J Res Med Sci. 2026;14(3):944–50. https://doi.org/10.18203/2320-6012.ijrms20260608
14. Alkot MM, Goweda RA, Shatla MM, AlFalogy EH. Knowledge and practices of Mutawifeen (Pilgrims' Guides) regarding heat related illnesses before and after exposure to an educational program. Eur J Prev Med. 2016;4(4):95–9. https://doi.org/10.11648/j.ejpm.20160404.11
15. Xiang J, Hansen A, Pisaniello D, Bi P. Perceptions of workplace heat exposure and controls among occupational hygienists and relevant specialists in Australia. PLoS One. 2015;10(8):e0135040. https://doi.org/10.1371/journal.pone.0135040
16. Edgerly A, Gillespie GL, Hittle BM, Bhattacharya A. US farmworkers' barriers to preventing heat-related illness: An integrative review. Public Health Chall. 2024;3(3):e222. https://doi.org/10.1002/puh2.222