

▪ **Basic Research**

**Prevention of Heat Stroke Among Community-Dwelling Older Adults:  
Effect of an Awareness Program**

Zainab Attia Abdallah<sup>1</sup>, Tayser Bauomei Fahmei<sup>2</sup>, Zainab Gazar Alkotb AlAgamy<sup>3</sup>

[1] Lecturer of Community Health Nursing - Faculty of Nursing - Modern University for Technology and Information (MTI). [2] Lecturer of Gerontological Nursing - Faculty of Nursing - Modern University for Technology and Information (MTI). [3] Assistant Professor of Community Health Nursing and Gerontological Nursing - Faculty of Nursing – Fayom University

**Corresponding author:** Zainab Attia Abdallah. e-mail: [Z.attia30@gmail.com](mailto:Z.attia30@gmail.com)

**Abstract**

**Introduction:** Heat stroke (HS) is a severe heat illness that results in a body temperature greater than 40.0°C. Heat intensity among older adults is life-threatening because of potential complications such as epileptic fits or renal failure. Older adults are especially vulnerable to develop HS rather than any age group related to normal age-related changes. **Aim:** To determine the effect of the awareness program on knowledge, perception and practice of community-dwelling older adults regarding HS prevention. **Research design:** A quasi experimental pre-post-test design was used. **Setting:** The study was carried out at Al Sabeen Fadan primary health care center in Al Moquattam zone, Cairo governorate, Egypt. **Sampling:** A convenience sample of 112 community-dwelling older adults - out of the center attendees- were included in the present study. **Tools:** Five tools were used: 1- socio-demographic characteristics and clinical data of community-dwelling older adults' Structured Interview Schedule Questionnaire Form, 2- Short Portable Mental Status Questionnaire (SPMSQ), 3- Pre-Post knowledge assessment questionnaire, 4- pre-post perception assessment questionnaire and 5- pre-post practice assessment questionnaire. **Results:** 69.6% of the older adults improved their knowledge regarding indoor & outdoor preventive measures to reduce the risk of HS and 64.3% regarding the first aid & management measures of suspected HS victims. There is a development in the positive perception regarding the prevention of HS through the post-test, which developed to 80.4%. In addition to improvement of the older adults' total adequate practices regarding the prevention of HS through the post-test (89.3%) with a highly statistical significant difference  $p= 0.001$ . **Conclusion:** The conducted awareness program proved a significant positive impact on knowledge, perception and practices among community-dwelling older adults regarding the prevention of HS. **Recommendation:** HS awareness programs can be conducted at other governorates among community-dwelling older adults and then can be generalized at allover Egypt governorates to save this vulnerable age group from HS.

**Keywords:** Heat stroke, prevention, community-dwelling older adults and awareness program.

**Introduction:**

Heat stroke is one of the most critical heat-related illnesses. Center of Disease Control and Prevention (CDC) 2022 defines HS as it occurs when the body can no longer control temperature, the body's temperature rises rapidly, the sweating mechanism fails, and the body becomes unable to cool down. As HS occurs, the body temperature can increase to 106 °F or higher by 15 minutes. HS can be resulted in disability or death for older adults when they didn't receive emergency treatment [1]. HS can be presented from heat waves as older adult's exposure to prolonged and unusually high temperatures which obviously affect general health of older adults, and specifically older adults who suffer from different comorbidities. HS is resulting from heat waves as the glob is affected from climate change which threat lives of older adults because of age related changes as a normal process facing all humankind and for other factors such as certain health conditions [2-3].

World health organization (WHO) revealed that the exposure to intense heat as driven by climate change is exacerbating health issues worldwide. CDC, 2020 stated that extreme heat days were associated with an average of 1373 additional deaths per year, with variations present depending on the definition of extreme heat used. Among the 10,470 decedents for whom age information was available, 748 (7%) were aged <15 years, 2,010 (19%) were aged 15–44 years, 3,693 (35%) were aged 45–64 years, and 4,019 (39%) were aged ≥65 years; the rate of heat-related deaths among persons aged ≥65 years was 0.7 per 100,000 populations as the highest across all age groups [4]. Intense heat exposure leads to increase morbidity and mortality rate through heat exhaustion especially that older adults suffer from chronic conditions such as diabetes mellitus or hypertension which resulting in a higher incidence of acute illnesses like myocardial infarction and stroke [5].

With advancing age, there is normal age-related changes may place older adults at risk to develop HS. Such as, decrease central nervous system in response to heat stimulation which decreased capacity to adapt the changes in body temperature and alter sweat gland function lead to decrease heat tolerance. Skin decrease in elasticity and become fragile, thirst sensation decreases which increased risk for dehydration especially in heat waves [6].

There are factors that put older adults at greater risk and more liable to developing HS. These may include health problems such as presence of chronic diseases as Diabetes mellitus, Cardiovascular, lung, or kidney disease which can result in weakness or fever. Polypharmacy such as diuretics and sedatives or Obesity may make it harder for the body

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to cool itself. Lifestyle can also increase risk for HS, including extremely hot living quarters without air conditioning or fans, lack of transportation, overdressing, visiting overcrowded places. Moreover, lack of public awareness about heat stroke especially for older adults [7].

Egypt community is a susceptible region to climate change, as all the population experience raised heat discomfort and intensity that is due to environmental circumstances, socio-economic status, the lack of adaptation strategies as well. In Egypt, an estimated 60% of the population lives in informality in urban region. At the same time, Egypt is exposed to increasingly irregular weather events due to global climate change. This can affect vulnerable populations as “deaths were blamed on overpopulation and cramped living conditions”, usually within informal settlements [8]. Through the heat wave of Egypt 2018, there was 65 victims from older adults within three days because of the temperature which reached around 47°C (116 F). Also the *Egyptian Meteorological Authority* declared in its latest results of the weather studies that summer of 2021 was the hottest through the last five years which led to increasing in the HS victims especially from the elders [9].

HS clinical manifestations among older adults result as body temperature cannot regulate itself may include fainting, confusion, combativeness, staggering, delirium or even can lead to coma. Dry flushed skin and a strong rapid pulse or lack of sweating can also appear among older adult who suffer from HS. Moreover, HS serious consequences on the older adults' health increase money spend on health care services and increase national and international care costs. HS among older adults increased morbidity, delayed functional recovery, prolonged hospitalization and increase mortality rate among older adults which can exceed 50%. The global estimate of deaths related to HS will reach 90.000 deaths per year in 2030 and by 2050, the deaths will be increased to more than 255.000. HS and its related factors still unrecognized for large number population and especially for older adults themselves. So, it is very important to identify HS and related factors as early as possible by proper assessment of the patient to prevent its occurrence and consequently prevent its complications and for proper management [10-11].

Simple measures can prevent HS among older adults such as staying cool, drink a lot of fluids and wear light-colored/loose-fitting clothes in natural cotton. Older adults without fans or air conditions should keep their homes cool as possible. Management of victims suffering from HS can include introduce fluids as water and fruit or vegetables' juices, but not alcohol or caffeine. Apply a cold, wet cloth to the wrists, neck, axillary, and groin. Encourage older adults to shower, bathe, or sponge off with cool water [12]. The

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following diagram displays the proper indoor and outdoor measures which could be followed by older adults for prevention of HS.



**Fig 1. Preventive measures towards HS**

*(Mike Monroney Aeronautical Center (MMAC), 2022) [13]*

Nurses have a significant role in preventing HS among older adults through health education programs and campaigns covered different regions for increase awareness toward managing signs and symptoms of HS by introducing proper intervention and first aid. Health education content could emphasize on wearing white weight clothes, drink plenty of water and avoid exposure to sun from 10-3 pm. For proper intervention and/or first aid, starting with regulating the environmental temperature by removing victim excessive clothing and blanket, adjusting the room temperature by air condition or fan, providing body cooling technique as recommended by *T-Heather Herdman, et al, 2022* in their latest NANDA International Nursing Diagnoses Book "12th edition". They preferred immersion in cold water or evaporating cooling technique by ice or cooling blanket. Therefore, the present study hypothesized that in populations with limited resources, a contextually relevant, simple educational program aimed at reducing heat exposure and facilitating early management among older adults by improved knowledge, attitude and practices to decrease the incidence of hospitalizations and mortality rate among older adults related to HS [14-15].

**Aims of the study:**

This study aimed to determine the awareness program's effect on knowledge, perception and practices of community dwelling older adults regarding HS prevention through:

- Assessing the community dwelling older adults' knowledge level, perception and practice towards HS.
- Designing and implementing HS prevention's awareness program (based on the pre assessment levels of community dwelling older adults' knowledge, perception and practice).
- Evaluating the awareness program's effect on Pre-post changes in knowledge level, perception and practice of community dwelling older adults regarding HS prevention.
- Finding out availability of significant relationships among the study variables.

**Research Hypothesis:**

Implementation of the awareness program will positively change the community dwelling older adults' knowledge, perception and practices regarding HS prevention.

**Subject and methods:**

**Research Design:** A quasi experimental pre-post-test design was used.

**Setting:** This study was carried out at Al Sabeen Fadan primary health care center, Al Moquattam zone, Cairo governorate, Egypt. This is a central one which mainly serves the older adults coming to family medicine clinics.

**Subjects:** A convenient sample consists of 112 community dwelling older adults of those attending the family medicine clinics for examination or follow up of chronic illnesses. Selection of the study sample was based on the following criteria:

- Age is 60 years and/or above.
- Having an intact cognitive function based on the Mini Cog Test.
- Acceptance to participate in the study.
- No cognitive impairment (0-2).

**Technical Design:**

Five tools were used for data collection as follows:

**First tool: Structured interview questionnaire form of socio-demographic characteristics and clinical data of community dwelling older adults** was developed by the researchers, based on reviewing related literatures to assess the community dwelling older adults' socio-demographic and basic data as age, sex, educational level, marital status, work, economic status, residence, chronic diseases and body mass index (BMI) [[16-17-18-19](#)].

**Second tool: Short Portable Mental Status Questionnaire (SPMSQ):** This scale was used to assess the study subjects' cognitive function, using the valid Arabic version by *Abd Elsalam.R, 2012* with a high reliability  $r = 0.89$  [20].

**Scoring system:** The total score was 10 points to be classified into four grades as following:

- No cognitive impairment (0-2).
- Mild cognitive impairment (3-4).
- Moderate cognitive impairment (5-7).
- Severe cognitive impairment (8-10).

**Third tool: Pre-post knowledge questionnaire,** structured by the researchers based on the related review literatures and mainly on the study of *Mustafa A. et al, 2018* [16], to assess the community dwelling older adults' knowledge regarding HS. It consisted of 33 true & false questions divided into 10 questions about facts and general information about HS, 5 questions about causes and risk factors, 5 questions about common signs and symptoms, 2 questions about complications and health related consequences of HS, 5 questions about first aid and management and 6 questions about indoor/outdoor preventive measures to reduce HS risk. [21]

**Scoring system:** Responses of questions were “correct/incorrect.” The total score of knowledge was calculated by summing up the correct answers then converted into a categorized percent:

- Good knowledge >70%.
- Average knowledge 50-70%.
- Poor knowledge <50%.

**Fourth tool: Pre-post perception questionnaire,** adopted from *Wang X. et al, 2018* [10]; to assess the community dwelling older adults' perception regarding own considerations and prevention related to HS. It was a four points Likert scale consisted of 4 statements.[22]

**Scoring system:** Responses to all statements were (very much, much, sometimes & not at all) by score (4, 3, 2, 1). Total perception score was summed up and converted into a percent to:

- Positive perception  $\geq 60\%$ .
- Negative perception <60%.

**Fifth tool: Pre-post practices questionnaire**, adopted from *Wang X. et al, 2018*, to assess the community dwelling older adults' practice. It involved 6 questions measuring both indoor and outdoor practices regarding prevention of HS. [22]

**Scoring system:** Responses of all statements were “yes,” or “no”. Total score was calculated by summing up the "yes" responses and converted into a percent to:

- Adequate practices  $\geq 60\%$ .
- Inadequate practices  $< 60\%$ .

**Content validity:** The knowledge questionnaire was submitted to a group of 5 expertise in community health and geriatric nursing and 2 medical expertise in tropical and geriatric medicine to test the content validity. Result of content validity approved a strong acceptance for knowledge with measuring score (0.90). Also they reviewed the awareness program contents.

**Reliability:** It was done by using Cronbach's Alpha test which proved that items of the community dwelling older adults' knowledge questionnaire were relatively homogenous by high reliability (0.917). [23]

**Ethical considerations:**

The study protocol and questionnaires were reviewed and approved by the Research Ethics Committee, Faculty of Nursing, Modern University for Technology, and Information (MTI), Cairo, Egypt, with the formal approval number (FAN/37/2022).

Authors explained the purpose of the study to participants including benefits and potential risk involved, then verbal informed consent was obtained.

**Statistical design:**

SPSS 24.0 statistical software package used in data entry and statistical analysis. Frequency and percentage were used for presenting the qualitative variables and mean & standard deviation for the quantitative variables. Normality of the study variables was tested by using Kolmogorov Smirnov test. Wilcoxon signed-rank paired t-test (T) was used to compare the non-parametric qualitative ordinal variables and McNemar paired t-test (T) was used for comparing the non-parametric qualitative nominal variables. Spearman rank correlation coefficient analysis was used for assessing the inter-relationships among ranked qualitative variables, at p-value  $< 0.05$  was considered significant. Ordinal logistic regression model was used to measure the correlation between ordinary dependent variable and independent variables.

**Operational Design:**

**Preparatory Phase:** A review of literature was done to cover the HS aspects and related preventive activities based on the current and past available literature. This help the

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researchers to be more aware with the real dimensions and magnitude of HS issue in Egypt and worldwide [24-25-26]. It is also useful in designing the data collection tools and contents of the program.

**Pilot Study:** It was carried out before beginning of data collection on 10% of the total sample size. It helped in investigating the tools' feasibility, simplicity, applicability, and clarity or carrying out any added modifications if needed.

**Field Work:** The study data was collected through five interviewing tools over four months from January to May 2022. Pre-test data was collected within two weeks. HS awareness program was implemented within about one month. In addition to three months' duration from the program finishing to the beginning of post-test data collection which was done over two weeks.

**Program construction:**

The awareness program of HS prevention was conducted within three phases: assessment, implementation, and evaluation as following:

*Assessment phase:* The awareness program was designed by the researchers based on the pre-test results (pre-program assessment). The main objective of the program was improvement of the community dwelling older adults' knowledge, perception and indoor & outdoor practices regarding HS prevention. Different teaching methods were used for the program conduction such as lectures, brainstorming, group discussion and models. Also, different audiovisual aids were used as posters, screen show, videos, pictures, power point slides and handout.

*Implementation phase* for all the study subjects (112 elders) was carried out within three sessions over one month and conducted in groups from five to ten participants in each session. The program was implemented at the outpatient waiting area of Al Sabeen Fadan primary health care center, from the beginning to finishing work. The awareness program content was covering the following elements:

- General facts and introduction around HS.
- Causes and risk factors of HS.
- Common signs and symptoms of HS.
- Complications/health related consequences of HS.
- Basic management and indoor/outdoor preventive measures to reduce HS risk.
- Behaviors regarding own considerations related to HS.
- Demonstration of basic management and first aid for HS victims.

*Evaluation phase* was done two times. First, was before the program conduction through the pre-test. Second, was after 3 months from the program end to determine its effect on

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knowledge, perception and practices of community dwelling older adults regarding HS prevention.

**Results:**

**Table 1:** Shows that the mean age of community dwelling older adults was  $67.14 \pm 4.66$  with 67 years' median age, 60.7% of them were males and 71.4 % & 70.5% were married and living at their own home in a low socio-economic level for 48.2% of all of them. Regarding the educational level, 32.1% were highly educated and 21.4% were still working. Also there was 59.8% of the older adults had chronic diseases with special diet by 39.3% and 50.9 % of them had a normal body mass index.

**Table 2:** Clarifies improving in the post-test good knowledge level of 69.6% of the older adults regarding indoor & outdoor preventive measures to reduce risk of HS and 64.3% regarding the first aid & management measures of suspected HS victim. Also 60.7% and 55.7% of the older adults had good knowledge related to facts & general background and common signs & symptoms of HS through the post-test. Complications of HS good knowledge was 53.6%, but causes and risk factors knowledge level was 50.9% average after the awareness program implementation. Also the total good knowledge was improved from 3.6% at the pre-test to 63.4% at the post-test. There were highly statistical significant ranking differences between pre-test and post-test levels of all knowledge classifications and total score level at  $p < 0.001$ .

**Figure 1:** Reflects the development of community dwelling older adults' total positive perception regarding HS prevention through post-test, which developed from 3.6% pre-test to 80.4% post-test with a highly significant difference at  $p < 0.001$ .

**Table 3:** Reports improving in the older adults' (yes) responses regarding the practices questions through the post-test, which were asking about their arrangement to the outdoor activities at a high temperature warning is released (84.8%), preparing preventive measures before going out for outdoor activities (79.5%), paying more attention to signs and symptom of HS during outdoor activities (75.9%), in addition to preparing of good HS intervention measures as medications, fluids and temperature decreasing devices (73.2%), with a highly statistical significant difference between all of the pre-test and post-test practice questions' (yes) responses at  $p < 0.001$ .

**Figure 2:** Indicates the development of the older adults' total adequate practices regarding prevention of HS through the post-test, which developed from 9.8% to 89.3% with a highly significant difference at  $p = 0.001$ .

**Table 4:** this model clarifies a highly statistical significant correlation between total knowledge score level of the older adults and their age, educational level & work through

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post-test at  $p=0.001$ , in addition to a statistical significant correlation with sex at  $p=0.05$ . Also this ordinal regression model explains about 80.1% of the improvement of post-test total knowledge score level of the older adults after implementation of the program.

**Table 5:** Shows a highly statistical correlation between older adults' post-test total attitude level and their educational level, economic level and residence ( $r=.461$ ,  $r=.377$  &  $r=-.397$ ). Also a highly statistical correlation between post-test total practices level and marital status, educational level, chronic diseases and BMI ( $r=.470$ ,  $r=.333$ ,  $r=-.258$  &  $r=.376$ ) at  $p=.000$

**Table 6:** Reveals a highly statistical positive correlation between community dwelling older adults' total knowledge score level and total attitude & practice towards HS through the post-test ( $r=.636$  &  $r=.451$ ), as well as a highly statistical positive correlation between total attitude and practice ( $r=.548$ ) at  $p=.000$

**Table 1: Distribution of community dwelling older adults according to socio-demographic characteristics, medical data and BMI (n=112):**

Socio-demographic data	N	%
<b>Age (years):</b>		
<b>Mean±SD</b>	67.14±4.66	
<b>Median</b>	67.0	
<b>Sex:</b>		
- Male	68	60.7
- Female	44	39.3
<b>Educational level:</b>		
- Illiterate	17	15.2
- Read & write	15	13.4
- Basic education	28	25.0
- Secondary education	16	14.3
- Highly education and above	36	32.1
<b>Marital status:</b>		
- Single	5	4.5
- Married	80	71.4
- Divorced	17	15.2
- Widow	10	8.9
<b>Current work: (yes)</b>	24	21.4

**Table 1 Cont'd: Distribution of community dwelling older adults according to socio-demographic characteristics, medical data and BMI (n=112):**

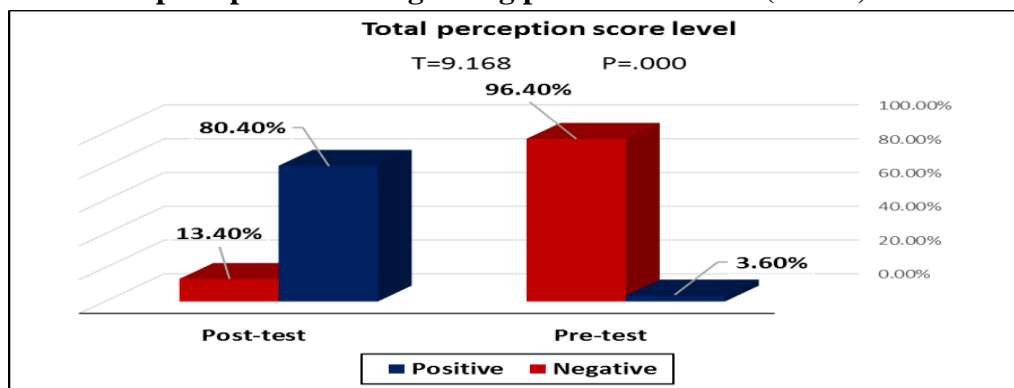
<b>Economic status:</b>		
- Low level	54	48.2
- Middle level	35	31.2
- High level	23	20.5
<b>Place of residence:</b>		
- Own home with family	79	70.5
- In relative's home	16	14.3
- Alone in own home	17	15.2
- In assisted living facility	0	0.0
<b>Residence:</b>		
- Rural	51	45.5
- Urban	61	54.5
<b>Chronic diseases with regular medications:</b>	67	59.8
<b>Body Mass Index (BMI):</b>		
- Under weight	11	9.8
- Normal	57	50.9
- Over weight	27	24.1
- Obese	17	15.2

**Table 2: Pre-test post-test comparison of community dwelling older adults' knowledge classification score levels regarding HS (n=112):**

Knowledge level classification	Pre-test	Post-test	T	P
	N(%)	N(%)		
<b>Facts &amp; general background:</b>				
- Good	2(1.9)	68(60.7)	9.013	.000
- Average	4(3.6)	30(26.8)		
- Poor	106(94.6)	2(1.9)		
<b>Causes &amp; risk factors:</b>				
- Good	3(2.7)	48(42.9)	9.422	.000
- Average	19(16.9)	50(44.6)		
- Poor	90(80.4)	3(2.7)		
<b>Common signs &amp; symptoms:</b>				
- Good	2(1.9)	62(55.4)	9.695	.000
- Average	52(46.4)	43(38.4)		
- Poor	58(51.8)	0(0)		
<b>Complications as health related consequences of HS:</b>				
- Good	2(1.9)	60(53.6)	8.804	.000
- Average	38(33.9)	40(35.7)		
- Poor	72(64.3)	5(4.5)		
<b>First aid &amp; management measures (if suspect in HS):</b>				
- Good	5(4.5)	72(64.3)	9.172	.000
- Average	46(41.1)	30(26.8)		
- Poor	61(54.5)	3(2.7)		
<b>Indoor &amp; outdoor preventive measures to reduce risk of HS:</b>				
- Good	12(10.7)	78(69.6)	8.007	.000
- Average	17(15.2)	12(10.7)		
- Poor	83(74.1)	15(13.4)		
<b>Total knowledge score level:</b>				
- Good	4(3.6)	71(63.4)	8.985	.000
- Average	25(22.3)	29(25.9)		
- Poor	83(74.1)	5(4.5)		

*Non-parametric paired t-test (Wilcoxon signed-rank test)*

**Figure 1: Pre-test post-test comparison of the community dwelling older adults' total perception level regarding prevention of HS (n=112):**



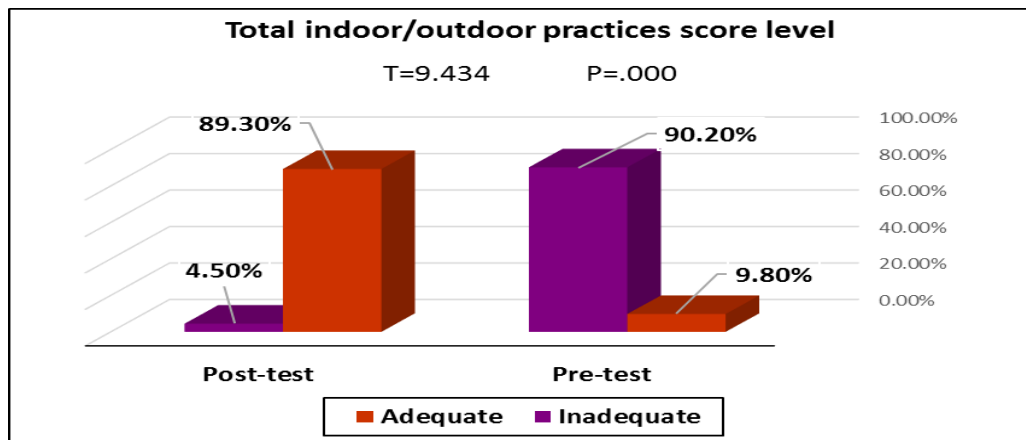
*Non-parametric paired t-test (Wilcoxon signed-rank test)*

**Table 3: Pre-test post-test comparison of the community dwelling older adults' indoor/outdoor practices regarding prevention of HS (n=112):**

Practices questions	(Yes) responses		T-test	P
	Pre-test	Post-test		
	N(%)	N(%)		
Will you arrange outdoor activities at a relative cooler time if a high temperature warning is released?	56(50.0)	95(84.8)	41.023	.000
Before you go out for outdoor activities, do you prepare preventive and coping measures with heat related illness?	46(41.1)	89(79.5)	44.022	.000
When you go out for outdoor activities, do you implement good heat related illness preventive measures?	39(34.8)	76(67.9)	39.024	.000
During outdoor activities, do you pay more attention to signs and symptom of HS?	44(39.3)	85(75.9)	42.481	.000
Do you drink water only in case of thirsty during outdoor activities?	60(53.6)	71(63.4)	28.630	.000
When you got out for outdoor activities, do you prepare good heat related illness intervention measures, such as medications, fluids and temperature decreasing devices?	29(25.9)	82(73.2)	51.019	.000

*Non-parametric paired t-test (McNemar test)*

**Figure 2: Pre-test post-test comparison of the community dwelling older adults' total indoor/outdoor practices regarding prevention of HS (n=112):**



*Non-parametric paired t-test (Wilcoxon signed-rank test)*

**Table 4: Ordinal logistic regression fitting model for correlation between community dwelling older adults' post-test total knowledge score level and socio-demographic data:**

Parameter Estimates	Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval		r-square
						Lower Bound	Upper Bound	
Threshold [Post-test knowledge=1]	57.748	15.633	13.645	1	.000	27.107	88.389	80.1
[Post-test knowledge=2]	64.540	16.796	14.766	1	.000	31.621	97.460	
Location	.507	.132	14.813	1	.000	.249	.765	
Age	2.967	1.356	4.788	1	.029	.309	5.625	
Sex	5.530	1.377	16.120	1	.000	2.830	8.229	
Educational	-1.691	1.427	1.404	1	.236	-	1.106	
Economic level	10.274	2.866	12.849	1	.000	4.488	15.892	
Work Residence	-1.884	1.077	3.058	1	.080	4.656	.227	
						3.995		

*Ordinal logistic regression fitting model*

**Table 5: Correlation between post-test community dwelling older adults' total attitude & practice level and socio-demographic data & medical history:**

Spearman correlation coefficient				
Different variables	Total attitude level		Total practice level	
	r	p	r	p
Marital status	.200*	.041	.470**	.000
Educational level	.461**	.000	.333**	.001
Economic level	.377**	.000	.207*	.035
Residence	-.397**	.000	-.217*	.026
Work	-.198*	.043	-.108-	.271
Chronic diseases	-.196*	.045	-.258**	.008
BMI	-.015-	.882	.376**	.000

(\*\*) Correlation is significant at the 0.01 level

**Table 6: Correlation between post-test community dwelling older adults' total knowledge, attitude and practice score level:**

Spearman correlation coefficient						
	Total knowledge score level		Total attitude level		Total practice level	
	r	p	r	p	r	p
Total knowledge score level			.636**	.000		
Total attitude level					.548**	.000
Total practice level	.451**	.000				

(\*\*) Correlation is significant at the 0.01 level

### Discussion:

A crucial aspect of health, heat stroke raises the likelihood of numerous issues in older people [24]. Therefore, the support training program is a useful tool in minimizing these issues [16]. The purpose of the current study was to assess how older persons who live in communities with health education programs have changed their knowledge and behaviors. The results of these studies could fundamentally alter or modify social, economic, and behavioral patterns in order to address the dangers and consequences of local or global heat wave events.

The majority of the senior patients in this study were between the ages of 60 and more than 70, and their mean age was  $67\pm 4.66$  years, according to the demographic characteristics of the old population that was being studied (Table 1). This finding agreed with that of **Yatsuda & Nishino (2017)** in Taiwan in their study about an unsolicited HS alert system for the elderly, they reported that the range of age of most participants was 60-70 years [24]. The study group was suitable to achieve the aim of the study.

According to the results of the present study, more than three-fifths of the elderly were male. (Table 1). This finding agrees with that of **Marchand & Gin. (2021)** and **Tyler et al. (2016)** in Canada, in their study, "The cardiovascular system in heat stroke" [25-26]. On the other hand, it was not agreed with the study of **Stearns et al. (2020)** on HS in USA, as they found that it was more common among women than men [27].

With regard to the income of the elderly, most of the members of the studied sample reported low monthly income (Table 1). This may be due to the low standard of living of most elderly people in Egypt, as they had many diseases that required a lot of money in addition to the low pension. This outcome is in line with that of the studies done in Egypt by **El-Minshawi & colleagues (2019)**, in which they reported insufficient income of most study participants [28]. It may be because of their age and because of their urban environment that most people, especially in the last decade, have considered that a higher level of education is necessary to earn money. This finding was disagreed with **Al-Minshawi et al. (2019)** in Egypt, and **Tabassum (2019)**, in Pakistan which reported a university education for more than half of their study sample [29].

As for the current studied participants' residence, more than half of them belonged to urban areas (Table 1). This result may be related to the study setting in the Cairo governorate, which is known for its cities major urban nature. This finding agreed with **Elnady et al. (2020)** at Suhag governorate in Egypt [30].

Concerning to their past medical history, the current study showed that the majority of the studied elders suffered from chronic diseases that required a special diet. (Table 1) This finding agreed with **Saquib et al. (2017)** result in Saudi Arabia which revealed multiple chronic illnesses among the elderly [31].

According to the total elderly knowledge level about HS and related prevention, the study finding reported that most of the studied elderly had poor knowledge about HS at pretest while more than three fifths of them had good knowledge at posttest. The most acquired elements of knowledge were indoor and outdoor preventive measures to reduce the risk of HS, as well as first aid, followed by facts and general backgrounds, common signs and symptoms, complications, and finally, causes of HS and risk factors. This finding might

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be due to the effectiveness of an awareness program to improve elders' knowledge. also increasing the percentage of learners in the study sample (Table 2). This finding is in line with a study done by **Unnimaya & Athirarani (2019)**, who conducted a study on "Knowledge and Practice Regarding Prevention of Heat Stroke Among Mahatma Gandhi National Rural Employment Guarantee Scheme Workers [32]" which revealed that the total knowledge score improved after the implementation of the standardized prevention guidelines and demonstrating the knowledge level across the groups was statistically significantly different after applying the nursing guidelines with a  $P=0.000$ .

Related to the total elderly elders' perception regarding HS, the current result showed an improvement in the older adults' score level through the post-test, with a highly significant difference (Fig. 1). This might be explained by their life experience, age, education level, and effective nursing program. These results were going with the findings of **Wang et al. (2019)** in Taiwan, which revealed that nearly two thirds of their sample had satisfactory perception [16].

Concerning the total elderly's practice regarding HS, the current result showed that their high improving in the older adults' practice questions' (yes) responses regarding the practices questions through the post-test, which were asking about their arrangement to outdoor activities at a high temperature warning , preparing preventive measures before going out for outdoor activities, paying more attention to signs and symptoms of HS during outdoor activities, in addition to planning effective HS intervention strategies such drugs, fluids, and temperature-lowering equipment, had a highly statistically significant difference at  $p 0.001$  (Fig. 2) (Table 3). These results were in the same line with the research results of **Yatsuda et al. (2017)**, which revealed that more than half of their study participants had satisfactory practices [24].

The logistic regression analysis of this study identified an outreach program as a statistically significant predictor of age, sex, work, and education, and this can be explained by the fact that the outreach program included education about prevention measures, the risk of HS, sensitivity to excessive heat, and arrangements for outdoor activities. warning of high temperatures to reduce the severity of HS, and the results of the current study revealed that residence and economic level were statistically significant negative predictors of HS (Table 4). This result matched the study done by **Weinberger et al. (2021)**, who studied hospital admissions, death, and heat warnings among older persons in the United States and found that HS was statistically predicted by age and sex with a  $p$  value =  $<0.05$  [33].

The current study results reported a significant positive correlation between the elderly' total knowledge, perception and practices; that is, when information increased, the total score of elderly practices also increased and helped improve the attitudes (Table 5). **Kheiri et al** findings from Tehran in 2022, which showed a substantial positive correlation between knowledge and practices, confirmed this conclusion [17]. But the present finding disagreed with **Unnimaya et al.'s (2019)** data from the Mahatma Gandhi National Rural Employment Conference showed that knowledge and practice in HS prevention had a weak positive correlation. [32- 33].

Finally, the efforts made by researchers in the field of nursing have an effect on the design and management of awareness programs on the knowledge, perception and practices among the elderly towards HS, according to the findings of the current study.

This explains why Egypt is currently attempting to work with the rest of the globe to organize the global environmental and climate change conference "COP 27" in Sharm El-Sheikh, Egypt [34]. This was underlined in another study; using mass and social media, such as television, radio, newspapers, and the internet will demand increasing efforts by individuals, local governments and national organizations to raise awareness around heat waves [32-33].

**Conclusion:** In the present study, researchers elucidated the level of knowledge, perception and practices among the elderly about HS before and after awareness program implementing. It was concluded that three-fifths of the older adults had a good knowledge score level, and the majority had a positive perception and acceptable practices regarding HS at the post-test. Elderly knowledge, perception and practices regarding heat stroke showed a strong positive correlation.

**Recommendations:** Based on the current study results, further researches are recommended to be conducted for developing and implementing appropriate and effective awareness and health education programs for the elderly regarding HS prevention before summer, on beaches, in clubs, in geriatric homes, and in schools. This may promote their general health and have beneficial effects on their quality of life.

**Limitations of the Study:**

The findings of this study are based on the experiences of a small group of elderly people who were exposed to too much heat over the summer. Results may not therefore be extrapolated to other time periods.

**Acknowledgement:** The authors deeply thank the community dwelling older adults for their fruitful participation in the study and also the health team members of Al Sabeen Fadan primary health care center who help authors through all the study phases.

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**Disclosure:** The authors report no funding and no conflicts of interest for this work.

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### الملخص العربي:

#### الوقاية من ضربة الحرارة بين كبار السن بالمجتمع: تأثير برنامج توعية

مقدمه

ضربة الحرارة هي داء خطير تسببه حرارة الجو المرتفعة مما قد يؤدي إلى ارتفاع درجة حرارة الجسم إلى أكثر من 40 درجة سيليزية. تعد شدة الحرارة من مهددات الحياة لدى كبار السن لما تسببه من مضاعفات محتملة مثل نوبات الصرع والفشل الكلوي. كبار السن يعدوا من الفئات العمرية الأكثر ضعفا تجاه تطور ضربة الحرارة أكثر من الفئات الأخرى وذلك نظرا للتغيرات الفسيولوجية الطبيعية المصاحبة لتقدم العمر.

**الهدف من الدراسة:** تقييم تأثير برنامج توعوي على معارف، إدراك وممارسات كبار السن بالمجتمع تجاه الوقاية من ضربة الحرارة. تم استخدام دراسة شبه تجريبية قبل وبعد تطبيق البرنامج التوعوي. **مكان الدراسة:** تم تنفيذ الدراسة بمركز الرعاية الصحية الأولية بالسبعين فدان بمنطقة المقطم بمحافظة القاهرة بمصر. **عينة الدراسة:** تم تجميع عينة مناسبة اشتملت على 112 من كبار السن بالمجتمع. **أدوات الدراسة:** تم استخدام خمسة أدوات لتجميع بيانات الدراسة وهي: البيانات الديموجرافية والطبية لكبار السن، استبيان تحديد الحالة العقلية، استبيانات قبل وبعد لتقييم المعارف، الاتجاهات والممارسات الخاصة بالوقاية من ضربة الحرارة. **نتائج الدراسة:** بعد إجراء البرنامج التوعوي لكبار السن، لوحظ 69.6% تحسن في المعارف الخاصة بالإجراءات الوقائية داخل وخارج المنزل للحد من حدوث ضربة الحرارة. كما لوحظ تحسنا بنسبة 64.3% تجاه الإسعافات الأولية وإجراءات إدارة الحالات المحتمل تعرضها لضربة الحرارة. وأيضا يوجد فروق ذات دلالة إحصائية عالية بين ردود كبار السن على كل الأسئلة المتعلقة بإدراكهم ما بين قبل وبعد تطبيق البرنامج. وبالنسبة للنتائج المتعلقة بالممارسات بعد تطبيق البرنامج، وذلك فيما يتعلق بالسؤال عن التجهيزات الخاصة بالأنشطة خارج المنزل في حال وجود تحذير من ارتفاع درجة حرارة الطقس بنسبة 84.8% مع وجود فروق ذات دلالة إحصائية عالية ما بين قبل وبعد تطبيق البرنامج. **خلاصة الدراسة:** أظهر البرنامج التوعوي تأثيرا ملحوظا على مستوى معارف، إدراك و ممارسات كبار السن تجاه الوقاية من ضربة الحرارة. كما أوضحت **توصيات الدراسة** ضرورة تطبيق البرامج التوعوية الخاصة بالوقاية من ضربات الحرارة في باقي محافظات مصر، وذلك لما لها من أثر إيجابي على حماية هذه الفئة من المجتمع.