

Mother's Awareness Regarding Health Consequences of Heat Stress Related to Climate Change among their Preschool Children

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Abstract

Background: Climate change poses significant risks to preschool children, particularly in relation to heat stress due to the underdeveloped thermoregulatory systems and limited ability to communicate discomfort. **Aim:** The aim of this study was to assess mother's awareness regarding health consequences of heat stress related to climate change among their preschool children. **Study design:** Descriptive research design was utilized to conduct this study. **Setting:** The present study was conducted at 50% of twenty Kindergartens in Benha City equal ten of kindergartens. **Sampling:** Simple random sample was chosen from total number of preschool children and their mothers in Kindergartens in Benha City. It includes 291 from the total number of all preschool children in selected setting = 1065. **Tools of data collection:** Two tools were used - **Tool I:** A structured interviewing questionnaire: Which include 4 parts: A- Demographic characteristics of mothers and preschool child, B- Health problems of preschool children related to heat stress at the last year, C- Preschool children mothers' knowledge regarding health consequences of heat stress related to climate change and D- Reported practices of mothers regarding measures to prevent consequences of heat stress related to climate change on the preschool children. **Tool II:** Was concerned with scale to measure attitude of mothers regarding health consequences of heat stress related to climate change of their preschool children. **Results:** 56.4% of the studied mothers aged from 25 to <35 years mean (22.5), 52.6% of studied children aged from 3 to <4 years old mean (3.5), 71.8% of studied children had facial redness when exposed to heatstroke or heat exhaustion, 60.1% of the studied mothers had poor total knowledge level about climate change and heat stress. 53.6% of the studied mothers had unsatisfactory total reported practices level and 63.2% of the studied mothers had positive total attitude level. **Conclusion:** There are three quarters of studied children had facial redness when exposed to heatstroke or heat exhaustion and one third of them had skin rash when exposed to heat rash. Finally, there was statistical positive correlation between total knowledge scores and total reported practices scores and total attitude scores. **Recommendations:** Develop health educational program for mothers to increase their knowledge and practices regarding health consequences related to heat stress.

Key words: Climate Change, Health Consequences, Heat Stress, Mother's Awareness, Preschool Children

Introduction

Preschool age years are the period from 3years to less than six years old and aren't in full-time education. Preschool children under six years are the future of any country and precious resources of sustainable development

of the human society. Improving health status of development and the transformation of any country children is the basic for realization of the comprehensive. Currently, the preschool children are enthusiastic about learning and

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acquire knowledge through experiences and playing (**Handayani et al., 2023**).

Climate change refers to long-term shifts in global or regional weather patterns and average temperatures, primarily caused by human activities, particularly the emission of greenhouse gases into the atmosphere. Climate change is a phenomenon characterized by alterations in temperature, precipitation patterns, wind patterns, and other aspects of the Earth's climate system. These changes can occur over extended periods, ranging from decades to centuries or even longer. The primary driver of climate change is the increase in greenhouse gases, such as carbon dioxide, methane, and nitrous oxide, resulting from the burning of fossil fuels, deforestation, and industrial processes (**Wulandari et al., 2023**).

Climate change has far-reaching consequences for the health of preschool children. Rising temperatures and extreme weather events associated with climate change can directly impact the well-being. Heat waves increase the risk of heat-related illnesses, such as dehydration and heatstroke, which can be particularly dangerous for preschool children who may struggle to regulate body temperature effectively. Poor air quality resulting from increased pollution and wildfires can exacerbate respiratory conditions like asthma and allergies, leading to respiratory distress and reduced lung function (**Zhang et al., 2023**).

Heat stress is the total heat load on the body from metabolic heat production plus external environmental factors; and heat strain is the total physiological stresses resulting from heat stress. Common heat stress combines heat load and its consequences; Heat stress is any combination of work, airflow, humidity, air temperature, thermal radiation, or internal body condition that strains the body as it tries to regulate its temperature. When the

strain to regulate body temperature exceeds the body's capability to adjust, heat stress has become excessive (**Carlsten et al., 2021**).

Heat stress in preschool children can manifest in various physical symptoms, including: Excessive sweating: Children may sweat profusely as the body attempts to cool down and regulate temperature, dehydration: Heat stress can lead to dehydration, resulting in dry mouth, decreased urine output, dark or concentrated urine, and increased thirst, increased body temperature: The child's body temperature may rise above the normal range (37°C or 98.6°F) and may feel hot to touch, flushed or red skin: The child's skin may appear red, flushed, or feel hot due to increased blood flow to the surface of the skin (**Hong et al., 2023**).

Heat stress can also exacerbate existing health conditions, such as respiratory problems like asthma, leading to increased breathing difficulties. It is crucial to protect preschool children from heat stress by ensuring they have access to cool and shaded environments, adequate hydration, and appropriate clothing. Educating preschool children mothers about the signs and symptoms of heat stress and implementing preventive measures can help safeguard the health and well-being of preschool children during periods of hot weather (**Moyo et al., 2023**).

Awareness is an acquire concern and sensitivity towards the environment and its problems. The concept of awareness as used in this research refers to having concern about something, being mindful of something, taking cognizance of something, being alert, and responsiveness. Being aware means knowing about something and the something in this research is climate change, heat stress, and the associated consequences for and impacts on society (**Corinthia & Uwizeyimana, 2021**).

Community health nurses play important role to provide health education about climate

changes to mothers have preschool children as following: Increasing rest periods for preschool children. Activities lasting >15 minute should be reduced in conditions of high humidity, and ambient temperatures above critical limits, ensure adequate hydration prior to extended exercise in the heat. Intermittent drinking periods should be enforced, regardless of thirst (100–250 mil letter every 20 minute). Weighing a preschool child pre and post-exercise can assist with verifying hydration, lightweight, light-colored, single-layer clothing should be worn that is absorbent. Sweat-soaked garments should be replaced and provide education on heat illness and hydration practices should be adopted to help raise awareness of prevention, and recognition of the signs and symptoms of heat stress and injury (**Bernhardt et al., 2023**).

Significance of the study

Egypt is highly vulnerable to climate change, with projected increase in heat waves, dust storms, storms along the Mediterranean coast and extreme weather events. Stronger warming has been documented over the past 30 years, with average temperatures increasing by 0.53 degree Celsius per decade. The country's climate risks will impact the younger generations of today (**United Nations International Children's Emergency Fund, 2023**).

In Egypt, an estimated 60% of the population lives in informality in its urban areas. At the same time, Egypt is exposed to increasingly erratic weather events due to climate change. Among other climatic impacts, extreme heat waves were recorded in July 2007, in the summer of 2015, and more recently, in August 2021. In 2015, especially in Greater Cairo, temperatures soared 67%, more likely due to anthropogenic climate change. In Egypt, the heat wave of 2018 has killed around 65 children within three days when the temperature reached about 47°C

(**Abdallah & Farag, 2022 & Laue et al., 2022**).

Heat stress related to climate change has serious health consequences on health status of preschool children. So this study conducted to assess mother's awareness regarding health consequences of heat stress related to climate change among their preschool children.

Aim of the study:

The aim of this study was to assess mother's awareness regarding health consequences of heat stress related to climate change among their preschool children.

Research questions:

1. What are the health problems of preschool children related to heat stress at the last year?
2. What is the mothers' knowledge regarding health consequences of heat stress related to climate change?
3. What are the mothers' reported practices to prevent the health consequences of heat stress related to climate change of their preschool children?
4. What is the mothers' attitude regarding health consequences of heat stress related to climate change of their preschool children?
5. What is the correlation between knowledge, practices and attitude of the preschool children mothers regarding health consequences of heat stress related to climate change?

Subjects and Method

Study design:

Descriptive research design was utilized to conduct this study.

Setting:

The present study was conducted at 50% of twenty Kindergartens in Benha City equal ten of Kindergartens as namely: (Anas Ibn Malek, Huda Shaarawy, Elsoura, Elemam Mohamed Abdo, Al eslah Elzraay, Taha houssen, Gamal Eldien Elafggany, Omar Ibn Abdelaziz, Mohamed Faried, Kamal Eldien Houssen). Getting total number of preschool children and their mothers from the

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kindergarten department in the directorate of education in the of Benha City.

Sampling:

Simple random sample was chosen from total number of preschool children and their mothers in Kindergartens in Benha City.

Sample size was calculated using the following formula:

$$n = \frac{N}{1 + N(e)^2}$$

Where "n" is sample size.

N is total number of all preschool children in the selected Kindergarten in Benha City (2022).

N=1065

'e' is Coefficient factor=0.05

Sample size is=291

Tools of data collection:

Data were collected through the following two tools -

Tool I: A structured interviewing questionnaire:

This tool was developed by the researchers after reviewing related literature, and it was written in clear simple Arabic language and consisted of four parts:

First part: Was concerned with demographic characteristics of studied sample, which included two parts:

A. Was concerned with the demographic characteristics of mothers of preschool children as (Age / year, marital status, education level, occupation, place of residence and family income).

B. Was concerned with the personal characteristics of preschool child as (gender, age, ranking and class level).

Second part: Was concerned with health problems of preschool children related to heat stress at the last year included 3 questions as (has your child been exposed to symptoms of heatstroke or heat exhaustion, is your child exposed to heat cramps, has your child had symptoms of heat rash).

Third part: Was concerned with preschool children mothers' knowledge regarding health consequences of heat stress related to climate change which included two parts:

A. Was concerned with knowledge of mothers about climate change, which included 6 questions as (meaning, causes, indicators, impact of climate change on child health, high-risk people to the effects of climate change and measures of reducing climate change).

B. Was concerned with knowledge of mothers about heat stress related to climate change, which included 7 questions as (meaning, causes, symptoms, complications, prevention of exposure to heat stress, treatment of heat stress related to climate change and source of knowledge about climate change and heat stress).

Scoring system of knowledge adapted as following:

The scoring system of knowledge was calculated as follows 2 score for correct and complete answer, while 1 score for correct and incomplete answer, and 0 for don't know. For each question of knowledge, the score of the items was summed-up and the total divided by the number of items. These scores were converted into a percent score.

Total knowledge scores: 24 points

Total knowledge scores were classified as the following:

- Good when total scores were ($\geq 75\%$) equal (≥ 18 points).
- Average when the total scores were 50% to less than 75% (12-18 points).
- Poor when the total scores was less than 50% (<12points)

*N.B: The source of knowledge didn't included in scoring system.

Fourth part: Was concerned with reported practices of mothers regarding measures to prevent health consequences of heat stress related to climate change on the preschool children which included 9 section as (general measures for heat stress which consisted of 5 statements, diet which consisted of 4 statements, clothing which consisted of 4 statements, sports activities which consisted of 7 statements, needs to medical care which consisted of 2 statements, necessary measures in the occurring of a child's heatstroke which consisted of 4 statements, necessary measures in the occurring of a child's heat exhaustion which consisted of 4 statements, dealing with child heat cramps which consisted of 4 statements and dealing with child heat rash which consisted of 5 statements).

Scoring system of reported practices:

The scoring system for mothers reported practices was calculated as follows 2 score for Always, while 1 score for sometimes, and 0 for never, the score of the items was summed-up and the total divided by the number of items. These scores were converted into a percent score.

Total reported practices scores: 78 points

The total practices score:

- Satisfactory practices scores when the score ($\geq 60\%$) equal (≥ 46 points).
- Unsatisfactory practices scores when the score ($< 60\%$) equal (< 46 points).

Tool II: Was concerned with scale to measure attitude of mothers regarding health consequences of heat stress related to climate change of their preschool children which adapted from (El-Gamal et al., 2021) and included two parts:

A: Attitude of mothers regarding climate change which consisted of 10 items.

B: Attitude of mothers regarding heat stress related to climate change which consisted of 7 items.

Scoring system of mother's attitude:

The scoring system for mother's attitudes likert scale was calculated as follow (2) for agree and (1) for neutral while (0) for disagree.

The total score of attitude: 34 points

The total attitude score:

-Positive attitude scores when the score ($\geq 80\%$) equal (≥ 27 points).

- Negative attitude scores when the score ($< 80\%$) equal (< 27 points).

Content validity of tools:

Tools validity was done through three expertise of Community Health Nursing Department Staff, Faculty of Nursing, Benha University who reviewed the tools for clarity, relevance, comprehensiveness, and applicability.

Reliability of tools:

Reliability of tools was applied by researcher for testing the internal consistency of the tool, by administration of the same tools to the same subjects under similar condition on one or more occasion. Answers from repeated testing were compared (Cronbach's Alpha coefficient) equal 0.831 for knowledge, 0.768 for reported practice and 0.833 for attitude.

Ethical consideration:

Formal approval was taken from the Research Ethics Committee of the Faculty of Nursing at Benha University. Approval and an informed consent from all study mothers were obtained after explaining the purpose of the study to gain their trust and cooperation. Each mother had a choice to continue or withdraw from here studies. Privacy and confidentiality was assured. Ethics, values, culture, and beliefs were respected.

Pilot study:

The pilot study was carried out on 10% of the studied sample size of total number (29) mothers and chosen randomly before embarking on the data collection to test the tool feasibility according to the results obtained from data. The pilot study was aimed to assess the tool clarity and time needed to fill each

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sheet as well as to identify any possible obstacles that may hinder the data collection. No any modification done in the pilot study sample so this sample of mother included in this study sample.

Field work:

The actual field work was carried out through four months from the beginning of February 2023 to the end May 2023. The researcher visited kindergartens from 8:00 a.m. to 2:00 p.m., three day per week (Sundays, Tuesdays, and Thursdays) to collect data from mothers of preschool children. The average time needed for the sheet was around 20-25 minutes, the average number of mothers interviewed at kindergartens were 6-7 mothers/day depending on their responses to the interviewers and interview was conduct at playground of the school.

Administrative approval:

Official letters were obtained from Dean of Faculty of Nursing, Benha University concerned the title, objectives, tools, and the study technique illustrated to the Director kindergartens where the present study was conducted. After obtaining the approvals for conducting the present study, the researcher started to communicate with mothers and explained the aim of the study.

Statistical analysis:

The collected data was analyzed, tabulated and presented in figures by using the suitable statistical methods as number and percentage distribution by Statistical Package for Social Science (SPSS) version 22. The following statistical tests were used: Number and Percentage: Mean and stander deviation (SD) and Chisquare X and person correlation (r) was used for qualitative data. Data were presented by using proper statistical tests that were used to determine whether there was significant relation or not as follows:

- P value > 0.05 is non- statistically significant difference.

- P value < 0.05 is statistically significant difference.
- P value < 0.001 is highly statistically significant difference.

Results:

Table (1): Shows that, 56.4% of the studied mothers aged from 25 to <35 years with mean was (22.5), 92.4% of them were married and 67.0% of them had university education or more. Regarding occupation 73.9% of them sometime were working, 76.6% of them lived in urban areas and 42.6% of them had enough income.

Table (2): Reveals that 58.1% of studied children were male, 52.6% of them aged from 3 to <4 years old with mean was (3.5), 40.9% of them were the second child in their family and 53.3% of them at KG1.

Table (3): Reveals that 71.8% of studied children had facial redness when exposed to symptoms of heatstroke or heat exhaustion, 34.4% of them had fever when exposed to symptoms of heat cramps and 29.2 % of them had skin rash when exposed to symptoms of heat rash.

Figure (1): Displays that 60.1% of the studied mothers had poor total knowledge level about climate change and heat stress. And only 14.5% of them had good total knowledge level regarding climate change and heat stress.

Figure (2): Shows that, 53.6% of the studied mothers had unsatisfactory total reported practices level, while 46.4% of them had satisfactory total reported practices level regarding heat stress.

Figure (3): Shows that, 63.2% of the studied mothers had positive total attitude level, while 36.8% of them had negative total attitude level regarding health consequences of heat stress related to climate change.

Table (4): Clarifies that, there was statistical positive correlation between total knowledge scores and total reported practices scores and total attitude scores.

Table (1): Frequency distribution of studied mothers regarding their demographic characteristics (n=291).

Items	NO	%
Age / year		
<25 years old	49	16.8
25- <35 years old	164	56.4
36- <46 years old	61	21.0
46 years old and more	17	5.8
Mean \pmSD 22.5 \pm 3.21		
Marital status		
Married	269	92.4
Divorced	22	7.6
Education level		
Basic education	50	17.2
Secondary education	46	15.8
University education or more	195	67.0
Occupation		
Working	215	73.9
Not working	76	26.1
Place of residence		
Urban	223	76.6
Rural	68	23.4
Family income		
Enough and saving	95	32.6
Enough	124	42.6
Not enough	72	24.7

Table (2): Frequency distribution of studied children regarding their personal characteristics (n=291).

Personal characteristics	NO	%
Gender		
Male	169	58.1
Female	122	41.9
Age		
3-<4 years old	153	52.6
5-<6 years old	138	47.4
Mean \pmSD 3.5 \pm1.21		
Ranking		
The first	37	12.7
The second	119	40.9
The third	74	25.4
The fourth and more	39	13.4
The only	22	7.6
Class		
KG1	155	53.3
KG2	136	46.7

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Table (3): Frequency distribution of studied children regarding their health problems related to heat stress in the past year (n=291).

Items	NO	%
* Has your child been exposed to symptoms of heatstroke or heat exhaustion, such as:		
Fever	188	64.6
Dry skin (inability to secrete sweat)	74	25.4
Facial redness	209	71.8
Difficulty breathing	22	7.6
Tremor	49	16.8
Dizziness	79	27.1
Extreme thirst	33	11.3
Fainting	24	8.2
Headache	22	7.6
Tachycardia	0	0.0
Convulsions	17	5.8
* Is your child exposed to heat cramps such as:		
Muscle pain, especially in the abdominal muscles, arms and feet	46	15.8
Fever	100	34.4
Loss of consciousness and vomiting.	63	21.6
Neck cramps and stiffness.	52	17.9
* Has your child had symptoms of heat rash, such as:		
Itchy skin	42	14.4
Lack of sweating	43	14.8
Skin rash	85	29.2
Painful red skin	63	21.6
Swelling of the skin	52	17.9
Blisters in severe cases	17	5.8

* All answer aren't mutual exclusive

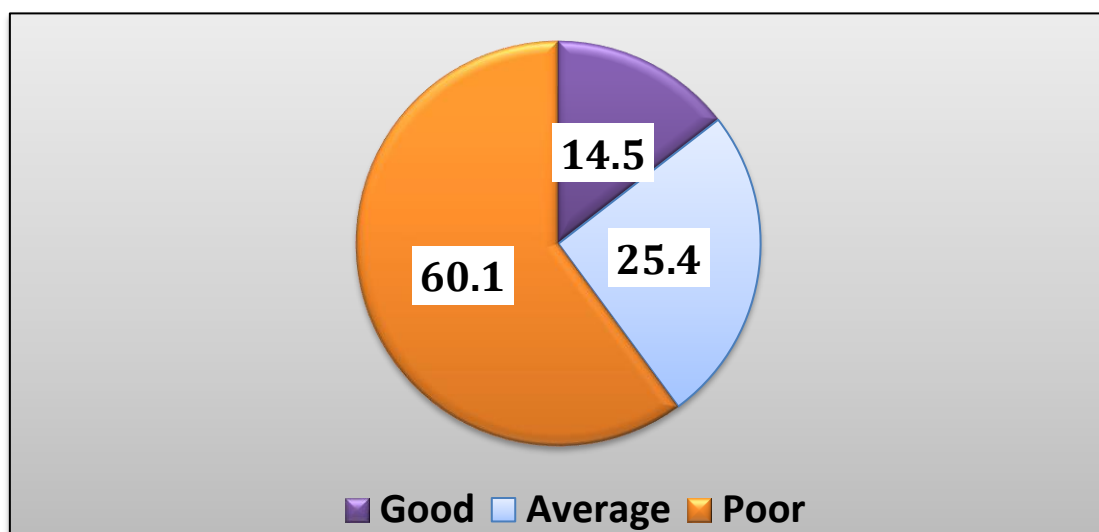


Figure (1): Percentage distribution of studied mothers regarding their total knowledge level about climate change and heat stress (n=291).

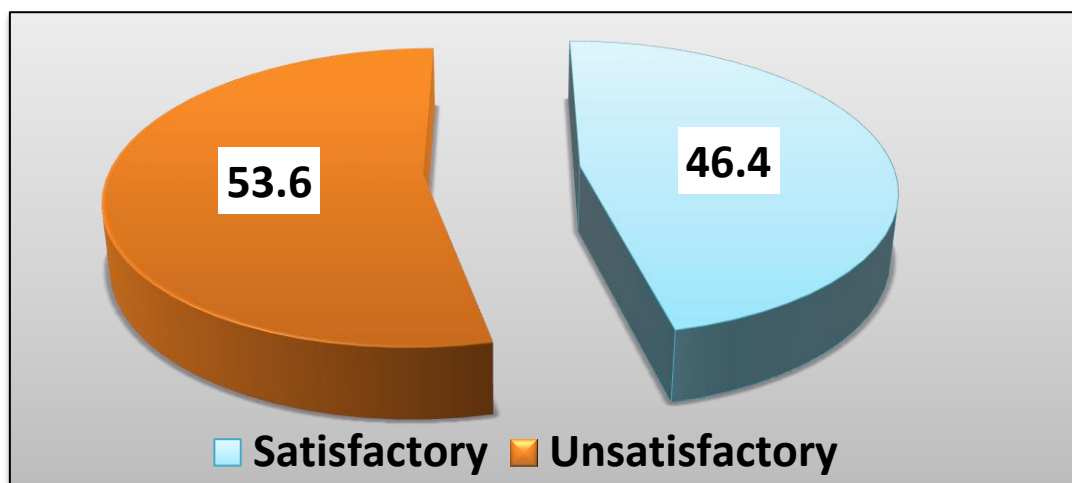


Figure (2): Percentage distribution of studied mothers regarding their total reported practices level regarding measures to prevent consequences of heat stress related to climate change (n=291).

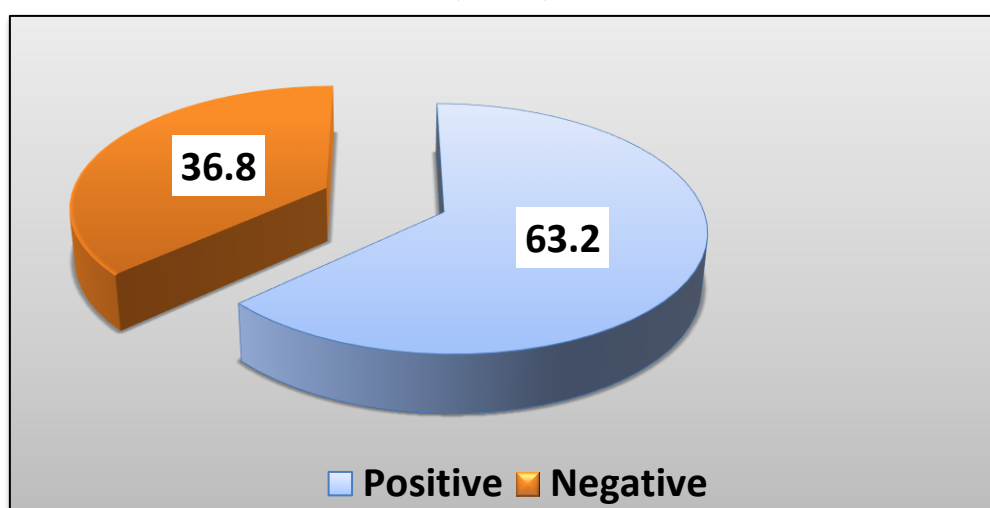


Figure (3): Percentage distribution of studied mothers regarding their total attitude level regarding health consequences of heat stress related to climate change (n=291).

Table (4): Correlation between total knowledge scores, total reported practices scores and total attitude scores among studied mothers (n=291).

Items	Total knowledge score	
	r	p-value
Total reported practices scores	0.572	0.033*
Total attitude scores	.292	0.062

* Statistically significant P value <0.05

Discussion

Climate change poses significant risks to preschool children, particularly in relation to heat stress. Rising global temperatures result in more frequent and intense heat waves, exposing young children to high heat levels

that can have detrimental effects on the health and well-being. Preschool children are particularly vulnerable to heat stress due to the underdeveloped thermoregulatory systems and limited ability to communicate discomfort. Prolonged exposure to high temperatures can

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lead to dehydration, heat exhaustion, and even heatstroke, which can be life-threatening (Watts et al., 2023).

Regarding demographic characteristics of the studied mothers, the current study revealed that more than half of the studied mothers aged from 25 to <35 years with mean was (22.5), most of them were married and more than two thirds of them had university education or more and more than three quarter of them lived in urban areas and more than two fifths of them had enough income. These findings were agreed with Filho et al. (2022) ,who studied the "An analysis of climate change and health hazards " in Germany (n=340), and found that high of mothers aged from 30 to less than 35 years, the majority of mothers were working and lived in urban areas. Also, these finding was agreed with El-sharkawy (2023),who studied "Developing kindergarten children mother's awareness of climate change" in Egypt (n=130), and found that the most of mothers were married and high of them had university education and they had enough income.

The present study declared that more than half of studied children were male, and their aged from 3 to <4 years old mean was (3.5), As well as, more than half of them were in KG1. These findings were supported by Xu et al. (2020), who studied "The impact of heat waves on children's health" in united states (n=328) , and illustrated that ,two thirds of children were young male children less than 5years due to high risk group to effect from hot temperature. In the same line the study of Malmquist et al., (2021), who conducted study on" Vulnerability and adaptation to heat waves in preschools " In Sweden (n=376) ,and reported that the most of young children were the age from 3 to 4 years. This result might be due to about three quarters of studied mothers were

working and this age is considered the suitable for nurses.

Regarding health problems of preschool children related to heat stress at the last year. The present study revealed that less than three quarters of studied children had facial redness when exposed to symptoms of heatstroke or heat exhaustion. This finding was agreed with Courtney et al. (2021), they studied " Heat-related illness in children in an era of extreme temperatures" in Iran (n=350) and reported that two thirds of studied children have symptoms of heatstroke such facial redness and hyperthermia. This might be due to rapid rises in heat gain due to exposure to hotter weather.

The present study revealed that more than one third of studied children had skin rash when exposed to symptoms of heat rash. This finding was supported by Hyndman (2019), who studied" Heat-Smart' schools during physical education activities: Developing a policy to protect students from extreme heat" in Australian (n=550), who found that about half of students had symptoms of heat rash, such as skin rash and painful red skin. This might be due to extreme heat than average conditions compromises the body's ability to regulate temperature and can result of illnesses such as facial redness and hyperthermia.

Regarding total knowledge level of mothers. The present study illustrated that about less than two thirds of the studied mothers had poor knowledge level about climate change and heat stress and less than one fifth of them had good total knowledge level about climate change and heat stress. These findings were congruent with Laue et al. (2022), who studied "Heat stress adaptation within informal, low-income urban settlements in Africa" (n=528), who illustrated that the majority of mothers with low income had poor knowledge about climate change and heat

stress. On the other hand these result were disagreed with **Dabaieh et al. (2021)**, who conducted study on "The practice and politics of urban climate change mitigation and adaptation efforts" in Egypt (n=266), who reported that more than half of mothers had good knowledge about climate change and heat stress before education program. This might be due to about three quarters of studied mothers were working and there aren't enough time to update their knowledge about climate change.

Regarding mother's total reported practices level regarding measures to prevent consequences of heat stress and climate change. The present study showed that, more than half of the studied mother had unsatisfactory of total practices level. This result was agreed with study carried out by **İdil-Gaziulusoy, (2020)** who studied "The experiences of parents raising children in times of climate change" in Agenda (n=143), who illustrated that, more than half of mothers and fathers had unsatisfactory of their total practice level about climate change. This might be due to poor information about treating and prevention the heat stress and heat stroke.

The present study showed that, less than two thirds of the studied mother had positive attitude level regarding climate change related to heat stress. This result was in agreement with a study conducted by **Ekholm. (2020)**, who documented that, more than half of mothers had positive attitude level of climate change. This might be due to about three quarters of studied mothers were working and out the child from the home who more vulnerable to the impact of heat waves.

Regarding the correlation between knowledge, practices and attitude of the preschool children's mothers regarding health consequences of heat stress related to climate change. The present study clarified that, there was statistical positive correlation between

total knowledge scores and total reported practices scores and total attitude scores. This result was agreed with **Ekholm (2020)**, who reported that there was statistical correlation between total knowledge, total practices and total attitude among mothers and fathers to climate change. This might be due to high education level improved mothers' knowledge and help them enhance practice and attitude regarding climate change.

Conclusion

There are less than three quarters of studied children had facial redness when exposed to symptoms of heatstroke or heat exhaustion and more than one third of them had skin rash when exposed to symptoms of heat rash. Three fifths of the studied mothers had poor total knowledge level about climate change and heat stress. More than half of the studied mothers had unsatisfactory total reported practices level and more than three fifths of the studied mothers had positive total attitude level regarding health consequences of heat stress related to climate change.

There was highly statistically relation between studied mothers total knowledge score and their demographic characteristics (p value <0.001). There were highly statistically significant relation between total reported practices scores and their education level and family income. There were highly statistically significant relation between mother's total attitude scores and their education level. Finally, there was statistical positive correlation between total knowledge scores and total reported practices scores and total attitude scores.

Recommendations:

- Develop health educational program for mothers to increase their knowledge and practices regarding health consequences related to heat stress.
- Cooperation with school nurse for applying periodical screening test to preschool

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children to prevent health consequences related to heat stress

- Illustrated simplified booklet should be available at all Kindergartens including healthy practices in occurring health consequences related to heat stress
- Further studies need to be applied on large sample size of preschool children to improve their wellbeing.
- Educational videos on social media about prevention of health consequences related to heat stress

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وعي الأمهات فيما يتعلق بالآثار الصحية للإجهاد الحراري المرتبط بتغيير المناخ للأطفال في مرحله ما قبل المدرسة

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يشكل تغير المناخ مخاطر كبيرة على الأطفال في مرحلة ما قبل المدرسة، لا سيما فيما يتعلق بالإجهاد الحراري بسبب أنظمة التنظيم الحراري المتخلفة. هدفت الدراسة الي تقييم وعي الأمهات بالعواقب الصحية للإجهاد الحراري المرتبط بتغير المناخ بين أطفالهن في مرحلة ما قبل المدرسة. تم استخدام تصميم البحث الوصفي لإجراء هذه الدراسة. أجريت الدراسة على 50% من عشرين روضة أطفال بمدينة بنها أي ما يعادل عشر رياض أطفال. تم اختيار عينة عشوائية بسيطة من إجمالي عدد أطفال ما قبل المدرسة وأمهاتهم برياض الأطفال بمدينة بنها . وكان العدد الإجمالي للعينة حجم العينة = 291 من إجمالي عدد الأطفال وأمهاتهم = 1065. وظهرت النتائج ان 56.4% من الأمهات الذين شملتهم الدراسة الذين تتراوح أعمارهم بين 25 إلى أقل من 35 سنة يعني (22.5)، 52.6% من الأطفال الذين شملتهم الدراسة الذين تتراوح أعمارهم بين 3 إلى أقل من 4 سنوات متوسط (3.5)، 71.8% من الأطفال الذين شملتهم الدراسة أصيبوا باحمرار في الوجه عند التعرض لضربة الشمس. أو الإنهاك الحراري، 60.1% من الأمهات اللاتي شملتهن الدراسة كان لديهن مستوى معلومات ضعيف حول تغير المناخ والإجهاد الحراري. 53.6% من الأمهات اللاتي شملتهن الدراسة كان لديهن مستوى ممارسات إجمالي غير مرضي و63.2% من الأمهات اللاتي شملتهن الدراسة كان لديهن مستوى اتجاهات إجمالي إيجابي. وخلصت الدراسة بان هناك ثلاثة أرباع الأطفال الذين شملتهم الدراسة أصيبوا باحمرار الوجه عند تعرضهم لضربة الشمس أو الإنهاك الحراري وتلثهم أصيبوا بطفح جلدي عند تعرضهم للطفح الحراري. وأخيرا، وكانت هناك علاقة إحصائية إيجابية بين مجموع درجات المعلومات ومجموع درجات الممارسات المبلغ عنها ومجموع درجات الاتجاهات. وأوصت الدراسة بتطوير برنامج تثقيفي صحي للأمهات لزيادة معرفتهن وممارساتهن فيما يتعلق بالعواقب الصحية المرتبطة بالإجهاد الحراري.