



Effect of Nursing Instructional Module on Pregnant Women' Knowledge and Practice Regarding Climate Changes

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ABSTRACT

Background: Climate change is caused by human activities and results in a rise in temperature, precipitation, sea level, and extreme weather events. Climate change has already affected and will continue to affect population health, such as malnutrition, diarrhea, malaria, dengue fever, injuries, and deaths. **Aim:** This research aims to evaluate the effect of nursing instructional module on pregnant women' knowledge and practice regarding climate change. **Research Design:** A quasi-experimental (one group pre & post) was used in the study. **Setting:** The study was conducted at El-Ghamarawy maternal child health center at Beni-Suef University Hospital. **Sample:** A purposive sample of 116 pregnant women. **Tools for data collection:** Three tools were used to collect data; **Tool (I):** Structured interviewing questionnaire: which is divided into two parts Part 1: Demographic Characteristics, Part 2: Obstetric history. **Tool (II):** Pregnant Women' Knowledge Assessment Questionnaire Regarding Climate Changes. **Tool (III):** Pregnant Women's practice Assessment check list Regarding Climate Changes. **Results** of the current study revealed a highly statistically significant improvement in pregnant women's knowledge and practices regarding climate change. **Conclusion:** The current study concluded that the nursing instructional module had a significant positive effect on pregnant women' knowledge and practice regarding climate changes, which supports the research hypothesis **Recommendations:** Regular educational programs are needed for pregnant women to maintain and refresh their knowledge and practice regarding climate change

Keywords: Climate change, pregnant women, Nursing Instructional Module, knowledge, practices

Introduction

The World Health Organization has identified climate change is the phrase used to describe the gradual rise in global temperatures that is mostly accelerated by human activities. climate change as

a severe health emergency. It is considered the biggest threat to global health in the 21st century, with devastating impacts on human health and the environment, which sustains our well-being. Climate change is a major global health concern

that has become a top priority on the global health agenda (WHO,2022).

Climate change is caused by human activities and results in a rise in temperature, precipitation, sea level, and extreme weather events. Climate change has already affected and will continue to affect population health, such as malnutrition, diarrhea, malaria, dengue fever, injuries, and deaths. Women and newborns are particularly vulnerable to the impacts of climate change due to the physical and socio-cultural changes that occur during pregnancy and childbirth. Climate-related hazards can lead to health issues like anemia, eclampsia, low birth weight, preterm birth, and even miscarriage (Shalaby et al., 2023).

Extreme heat can overwhelm thermoregulatory mechanisms in pregnant women, especially during labor, cause dehydration and endocrine dysfunction, and compromise placental function. Clinical sequelae include hypertensive disorders, gestational diabetes, preterm birth, and stillbirth (Chersich et al., 2020).

Rising temperatures and changing seasonal patterns can lengthen the times when mosquitoes and ticks are most active and widen their range. Changes may increase the prevalence of mosquitoes that transmit viruses, such as the Zika virus and dengue fever. Infected pregnant women with Zika can be passed to their fetuses. Infection can cause certain brain defects. In addition, pregnant women and fetuses are at more risk of developing complications from other mosquito-transmitted illnesses, like dengue fever, due to

immune system changes during pregnancy (Khodadadi et al.,2022)

The effects of climate change on water resources are numerous. Exposure to untreated contaminated water can lead to gastrointestinal and other illnesses, particularly for pregnant women who are at higher risk. In severe cases, these illnesses can result in pregnancy loss and premature birth. Floods and droughts also pose a threat to food quality, production, transportation, availability, and safety. Foodborne illnesses like listeria and toxoplasma can be life-threatening and increase the risk of miscarriage, stillbirth, or premature delivery (Ha, S. 2022).

Climate change may result in an increase in outdoor air pollutants, including dust from droughts, wildfire smoke, and ground-level ozone. Pregnant women are particularly sensitive to the harmful effects of car smoke. It is advisable for them to take extra precautions to reduce their exposure to car smoke, which could impact the development of the fetus and increase the risk of low birth weight and premature birth (Sambath et al.,2022).

Experiencing extreme weather events can lead to psychological stress, exacerbate mental illnesses, and increase emotional stress for pregnant women. Additionally, these events can disrupt support networks, behavioral health services, and access to treatment, all of which can negatively impact women's ability to cope (Cianconi & Janiri.,2020)

An instructional module is a type of active learning that allows pregnant women to increase their awareness of their unique needs. It is an effective method for learning in both the cognitive and psychomotor domains, with the aim of mastering knowledge and applying it in practice through instructional modules, learners receive information and practice after reviewing textbooks and scientific journals. It can also be helpful in introducing principles and step-by-step guidelines prior to demonstrating professional skills (**Hamad et al. 2022**).

Nurses play a crucial role in addressing the impact of climate change on public health. they have a responsibility to promote and support women's well-being. It is important to identify and address the impact of climate change on women and communities. Nurses can advocate for policy change at the local, regional, national, and global levels by supporting clean energy, protecting natural resources, and supporting the effort to reduce greenhouse gas emissions (**Mohammed & Ameen., 2022**).

Nurses can also participate by providing information and support within their local healthcare system that allows better responses to the healthcare challenges posed by a change in the climate. Nurses have the knowledge, skills, and influence to make a real difference in the health of individuals and communities (**Mahmoud., 2023**).

Significance of the study

Climate change is a global health emergency that presents diverse risks to human lives including but not limited to heat exposure and heat stress;

water scarcity, flooding, and droughts; changing distribution of vector-borne and other infectious diseases; and food insecurity and malnutrition. Impacts are felt most intensely by vulnerable populations and communities, including those with preexisting health conditions (**Zittis et al. 2022**).

Egypt is considered one of five highly vulnerable countries in the world to climate change due to its triple effect: the weather, low rainfall, and hot summers; the nature of the land (large desert) and densely populated cities and geography (**Anwar et al.,2022**). There is clear evidence that climate change is already having a negative impact on the health of vulnerable populations, particularly pregnant women who are at risk of experiencing health problems related to climate change. These problems include anemia, eclampsia, low birth weight, preterm birth, and even miscarriage. So that the aim of this study is to evaluate the effect of nursing instructional module on pregnant women's knowledge and practice regarding climate change.

Aim of the research:

This research aimed to evaluate the effect of Nursing Instructional Module on Pregnant Women's Knowledge and Practice Regarding Climate Changes

Research hypotheses:

H1: Implementing of Nursing Instructional Module will improve Pregnant Women's Knowledge and Practice Regarding Climate Changes

Operational definition:

An instructional module is a type of active learning that allows pregnant women to increase their awareness of their unique needs.

Subject and methods:

Research design

A quasi-experimental (one group pre & post) was used in the study

Setting

The study was conducted at El-Ghamarawy MCH center at Beni Suef, Egypt. It provides a wide range of services to women, including antenatal care, family planning, and Immunization clinics.

2.3. Sampling

A purposive sample of 116 pregnant women who attended at El-Ghamarawy MCH center to follow up the pregnancy and take the required vaccinations according to inclusion and exclusion criteria as the following:

Inclusion criteria:

1-Age from 20-35 years old.

Exclusion criteria:

1-Pregnant women with high-risk pregnancy.

Sample size: Based on the following equation

$$N= 700 \quad p=0.5 \quad d=0.05 \quad z=1.96$$

$$n = \frac{N \times p(1 - p)}{([N - 1 \times (d^2 \div z^2)] + p(1 - p))}$$

$$n = \frac{700 \times 0.5(1-0.5)}{([700-1 \times (0.0025 \div 3.8416)] + 0.5(1-0.5))} = 116$$

N = Community size

Z= Class standard corresponding to the level of significance equal to 0.95 and 1.96

D = the error rate is equal to 0.05

P = Ratio provides a neutral property = 0.5

Data Collection tools

Three tools were used for data collection:

First tool: A Structured Interviewing Questionnaire

It was developed by the researcher based on the recent related literature review and experts' opinion. It included two parts:

Part one: Socio-demographic data such as; - age, level of education, occupation and socioeconomic level.

Part two: Past& current obstetric history such as; - last menstrual period, gestational age and expected date of delivery, number of pregnancies, delivery and abortion, intrauterine fetal death and premature rupture of membrane

Second tool: Pregnant Women' Knowledge Assessment Questionnaire regarding climate changes: It was developed by the researchers in the Arabic language after reviewing related literature such as; definition, causes and health effects of climate changes that included (10) questions (Ahmed, et al.,2023)

Scoring system:

The questionnaire contained, 10 items related to knowledge assessment, three points Likert scale (0 – 2) as Correct complete answer was given two scores, while correct incomplete answers was given one score, don't know& wrong answer was given (0) point. The pregnant women's knowledge was evaluated giving a score of 0- 20.

The total knowledge score was divided into:

- Satisfactory knowledge \geq (60%) (12-20 points)

- Unsatisfactory knowledge < (60%) (0-11 points)

Third tool: Pregnant women' self-reported practices questionnaire regarding climate changes: It was developed in the Arabic language by the researchers after reviewing related literature to assess pregnant women's practice to reduce the effects of climate changes include; preventive measures during high temperature, severe cold, high rate of air pollution, measures against infectious diseases and during the winter rains (Mohammed., 2022).

Scoring system:

It was scored as one (1) score for done, and zero (0) score for not done.

The total practice scores were classified as the following:

- Satisfactory Practice \geq (60%) (27.6 – 46 points)
- Unsatisfactory practice < (60%) (0 – 27.5 points)

Supportive material(Arabic educational booklet)

It was developed and designed by the researchers based on the recent literature review

(Reference) and had been confirmed by experts to enhance pregnant women's knowledge and self-reported practices regarding climate changes. It was designed using simple Arabic language and different illustrative pictures to facilitate the women understanding of its contents. it was composed of two parts that focused on the basic knowledge about definition, causes and

health effects of climate changes and self-management practices to be reduced or relieved.

Methods

The following steps were followed in carrying out the research:

Administrative Approval

A written letter was obtained from the faculty of nursing Beni Suef University and then directed to MCH director. This research was conducted under the approval of the Faculty of Nursing Ethical Committee, Beni Suef University. The directors of the previously stated settings formally granted permission to carry it out after outlining the goal of the study. During the data collection phase, each pregnant woman in the study was asked to provide informed consent following appropriate explanation.

Validity

Three nursing specialists of obstetrics and gynecological nursing reviewed the data collecting tools to determine the validity of the content. The tools were corrected in accordance with the panel's recommendations about the clarity of the sentences and the relevance of the material.

Reliability

Reliability of the study tools were tested for its internal consistency by Cronbach's Alpha. Reliability of the study tools was 0.708 for knowledge sheet 0.873 for the practice checklist.

Ethical considerations

The Scientific Research Ethical Committee of Faculty of Nursing Beni Suef University granted study approval so that this research could be

completed. Before each woman filled out the questionnaires, the purpose of the research was explained in order to earn trust and cooperation. Consent to participate in the research was signed by each pregnant woman. After statistical analysis, all data gathering equipment were protected confidentially. The research instruments were designed to guarantee that the data gathering process did not inflict any harm onto participants, nor did they violate their cultural, traditional, or religious characteristics. The women have the right to stop participating in the study at any time.

A Pilot Study

The pilot study was carried out on 10% of the total sample (11 pregnant women) to confirm sequence, clarity and applicability of tool and detect any problem of the tool statements as well as estimation the amount of time needed to complete the questionnaire. Pregnant women involved in the pilot study were included in the sample as there weren't any modifications.

Field Work

The study took place over a three-month period from the beginning of October to end of December. These months were selected because they experienced varied weather patterns, including fluctuations in temperature and sandstorms. This made them an ideal choice for the study. The study setting was visited by researchers until the predetermined sample size was reached three days a week from 9:00 am to 12:00 pm

Assessment phase

During this stage, every pregnant woman in the MCH waiting area was interviewed individually. The researchers greeted the women at the start of the interview, introduced themselves to each pregnant woman involved in the study, explained the goal of the study, and obtained the woman's written consent to participate in the research. The researchers started to assess pregnant women's general characteristics, obstetric history, and knowledge. Then, pregnant women were asked to answer self-reported practices questionnaire regarding climate changes include; preventive measures during high temperature, severe cold, high rate of air pollution, measures against infectious diseases and during the winter rains. They were informed that data would be collected to establish a baseline data (pretest). The researchers also oriented pregnant women about the coming session of module and schedule of four sessions.

Implementation phase

This stage was performed to providing four sessions for pregnant women (each session lasted about 30 to 45 minutes) using lecture with PowerPoint, discussion, role-playing and presentations in a separate room in the pre-mentioned setting. At the start of the next session, feedback on the previous one was gathered, and as a result, the prepared educational material was thoroughly reviewed again. At the conclusion of the session, each pregnant woman was given information concerning the timing of the following ones. Feedback on the previous session and the new session's goals kicked off the following one.

The first session included providing women knowledge about definition, causes, consequences, and health effects of climate changes, effects of climate changes on pregnancy and management of the health effects

The second session was related to healthy practices regarding preventive measures during high temperatures and severe cold it involved. Drinking plenty of water throughout the day to ensure that the body stays hydrated. Avoid being in places with high heat or humidity, using a cold-water inhaler with the pregnant woman while outside home and taking frequent cold shower at home. wear loose, light-colored clothing, and avoiding dark colors clothes, use ahead cap when going out home, walk in appropriate time (early in the morning or at sunset) close the sun-facing room curtains to keep rooms cool, and only open windows during the night to cool the house, eat fresh fruit or green salad, and drink sugar-free fruit juices which contains a high percentage of nutrients, at bed time, reduce clothes and bed linen. Avoiding caffeine and smoking. Taking care for signs of heat exhaustion such as nausea, muscle weakness and cramping. While during cold weather. Wear appropriate clothing when going out in cold weather. Eat a spoonful of honey daily. Eat vegetables and fruits, to enhance the body's immunity. Drink warm liquids, especially anise. Open the windows of the house shortly before going out, to balance the weather with the outside weather, to protect from colds. Put tissues on the nose area when leaving the house in cold weather, to avoid direct exposure to cold air.

The third session concerned with healthy practices to deal high rate of air pollution. It involved Avoid going out of the house except for extreme and necessary cases during air pollution. Wearing medical masks or a tissue soaked in water, in addition to wearing glasses to protect the eyes outside home, close doors and windows to prevent dust from entering buildings and homes. Maintain the proper moisture balance in home to prevent mold formation and multiplication. Make sure to clean home regularly, to avoid dust accumulation on its floor and furniture, as dust is one of the most prominent allergens and asthma. Use the hood during cooking and in bathrooms. Stay away from detergents that contain toxic chemicals and replace them with natural cleaners that are environmentally friendly and healthy. Make sure to change the filters of air conditioners and heating appliances in home periodically, avoid crowded places and smokers.

The fourth session concerned with other precaution regarding measures against infectious diseases and heavy rain, lightning, and thunderstorms. It involved Make sure to wash hands for 20 seconds frequently and avoid contact with the nose. Avoid being in crowded places and observe social distancing guidelines. Drink plenty of water and caffeine-free liquids, wearing masks and replacing them every period to prevent the transmission of infection. Make sure to clean and disinfect mobile phone, which carries a populated number of infectious microbes. Eat a lot of vegetables and fruits rich in vitamin C, which increases the strength of immunity during pregnancy. Get recommended vaccines during

pregnancy, which can help protect from the flu vaccine. Contact doctor if have any concerns about pregnancy, or if develop symptoms of the virus. Avoid eating ready-made foods from the outside and replace them with foods made inside home. While concerned with other precaution regarding the risks of heavy rain, lightning and thunderstorms involved follow the report of the Meteorological Authority every morning, to be aware of the weather conditions. using an umbrella with during rainfall to avoid getting wet in cold weather. Disconnect all electrical appliances from inside home or work office during thunderstorms and lightning. Avoid electricity poles and boxes in the streets during heavy rain, to protect self from electric shock. Turn off air conditioners or electric heater during rain to avoid any short circuit. Walk carefully and not wear high-heeled shoes to avoid slipping. Do not leave the house unless necessary and listen to weather forecasts and various media.

Evaluation phase

After Implementing of Nursing Instructional Module, the pregnant women were contacted by the researchers by telephone to confirm their attendance at **MCH center** to evaluate the effectiveness of the Nursing Instructional Module then the researcher met with the woman individually to complete the post-test questionnaire (pregnant women's knowledge questionnaire, and self-reported practices questionnaire regarding climate changes).

Statistical Design

Data were verified before being automatically entered. The statistical package for social sciences, or SPSS version 25, was used for data tabulation

and analysis. Descriptive statistics, such as means, standard deviations, frequencies, and percentages, were employed. Chi-square tests, the Paired Samples T test, and Pearson correlation coefficients were used. Every statistical test that was conducted yielded a p-value: > 0.05 meant that there was no statistically significant difference, <0.05 meant that there was, and ≤ 0.001 meant that there was a highly significant difference.

Results:

Table (1) shows that more than half of the studied pregnant women (50.9%) are from 26-30 years old with Mean + SD= 1.89 ± 0.694 , nearly less than two thirds (63.8) of them are housewives, nearly less than one third (29.3) are high education and more than half (57.8) are from rural areas.

Table (2) reveals that more than two fifth (44.8%) of the studied pregnant women have two gravida, nearly two fifth (42.2%) have 1 para, Majority (86.2%) of them have no abortion, more than two thirds (70.7%) of them have 1-3 children, more than half (59.5%) of them have normal previous pregnancy, half (50%) of them have C.S deliveries, majority (84.5%) of them have PROM in Previous deliveries, all of them have no Intrauterine fetal death, more than half (55.2%) of the neonatal outcome are alive, less than two fifth (38.8%) of them are underweight and at first trimester, respectively.

Table(3) points to nearly than two fifth (38.8% & 40.2%) of the studied pregnant women complains from elevation blood pressure and anxiety, respectively, less than half (45.7% & 44.8%) of them complain from

Overheating and Mood change, respectively and more than half (52.6%) of them complain from Excessive sweating and pale .

Figure (1) demonstrated that, the highest percentage (28.4%) of the studied pregnant women' knowledge about complications related to climate changes during pregnancy are gestational diabetes.

Table (4) proves that the studied pregnant women' knowledge toward climate changes improved through nursing instructional module implementation phases as (11.2%, 13.8%, 11.2% and 11.2%), of them have complete correct answers, respectively pre implementation which improved to majority (83.6%, 81.9%, 82.8% and 83.6%) post implementation, respectively towards definition of climate changes, Humans causes of climate change, The effects of climate change on natural disasters and effects of climate changes on pregnancy with a highly statistically significant difference ($p < 0.000$) and with Mean \pm SD 16.93 \pm 2.03 post implementation.

Figure (2) clear that only (8%) of the studied pregnant women have satisfactory knowledge pre implementation, which improved to be most (92%) of them have satisfactory knowledge post implementation.

Figure (3) illustrate that less than half (45.7%) of the studied pregnant women have information from social media, but only (2.6%) of them have information from friends and family.

It is evident from table (5) that the studied pregnant women' practices towards climate

changes improves post nursing instructional module implementation with a highly statistically significant difference ($p < 0.000$) of all items of practices.

Figure (4) demonstrates that only (6%) of the studied pregnant women have satisfactory practice pre nursing instructional module implementation, which improved to be most (94%) of them have satisfactory practice post nursing instructional module implementation.

Table (6) proves that, there highly statistically significant difference ($p < 0.001$) between the studied pregnant women' knowledge level and their age and educational level, but there is no statistically significant difference between the studied pregnant women' knowledge level and their occupation.

Table (7) demonstrates that, there highly statistically significant difference ($p < 0.001$) between the studied pregnant women' practice level and their age and educational level, but there is no statistically significant difference between the studied pregnant women' practice level and their occupation.

Table (8) shows that, there was highly statistically significant positive correlation between the studied pregnant women' total knowledge score post and their total practices score post and there was highly statistically significant positive correlation between the studied pregnant women' Total practices score pre and their total practices score post ($p < 0.001$).

Table (1): Distribution of the studied pregnant women according to their demographic characteristics (n=116).

Demographic characteristics	No.	%
Age		
20- 25 years	35	30.1
26-30 years	<u>59</u>	<u>50.9</u>
31-35 years	22	19
Mean + SD= 1.89±0.694		
Occupation		
House wife	<u>74</u>	<u>63.8</u>
Working	42	36.2
Education		
Illiterate	23	19.8
Primary school	31	26.7
Secondary school	28	24.1
High (university) school	<u>34</u>	<u>29.3</u>
Residence		
Rural	<u>67</u>	<u>57.8</u>
urban	49	42.2

Table (2): Distribution of the studied pregnant women according to their Obstetric history (n=116).

Obstetric history	No.	%
Number of gravida:-		
Primi gravida	31	26.7
2	<u>52</u>	<u>44.8</u>
3	20	17.2
More than 3	13	11.2
Number of para:-		
Non	34	29.3
1	<u>49</u>	<u>42.2</u>
2	33	28.4
Number of abortion:-		
None	<u>113</u>	<u>86.2</u>
Once	3	13.8
Number of children:-		
non	34	29.3
1-3	<u>82</u>	<u>70.7</u>
Previous pregnancies:-		
Primi gravida	31	26.7
Normal	<u>69</u>	<u>59.5</u>
High risk	16	13.8
Previous deliveries:-		
Non	34	29.3
Vaginal delivery	24	20.7
C.S	<u>58</u>	<u>50</u>
PROM in Previous deliveries:-		
No	<u>98</u>	<u>84.5</u>
Yes	18	15.5
Intrauterine fetal death:-		
No	<u>116</u>	<u>100</u>
Neonatal outcome:		
Non	34	29.3
Still birth	1	15.5
A live	<u>64</u>	<u>55.2</u>
BMI		
Under wight	<u>45</u>	<u>38.8</u>
Normal	39	33.6
Over wight	27	23.3
Obese	5	4.3
Gestational age:-		
first trimester	<u>45</u>	<u>38.8</u>
Second trimester	42	36.2
Third trimester	29	25
Mean + SD= 1.862 ± 0.7901		

Table (3): Distribution of the studied pregnant women' complains and complication related to climate change during pregnancy (n=116).

complains related to climate change during pregnancy	Yes		No	
	No.	%	No.	%
Elevation blood pressure	45	38.8	71	61.2
Dehydration	20	17.2	96	82.8
Overheating	53	45.7	63	54.3
Sunburn and skin pigmentation.	38	32.8	78	67.2
Dizziness and confusion	33	28.4	83	71.6
Loss of appetite and feeling sick	33	28.4	83	71.6
Excessive sweating and pale	61	52.6	55	47.4
Cramps in arms, legs, and stomach	34	29.3	82	70.7
Fast breathing and pulse	26	22.4	90	77.6
Intense thirst.	19	16.4	97	83.6
Reaches	33	28.4	83	71.6
Numbness in the fingers of the hand and leg	35	30.2	81	69.8
Recurrent common cold infection	35	30.2	81	69.8
Shortness of breathing due to the dusty atmosphere	7	6	109	94
Sleep disturbance	35	30.2	81	69.8
Anxiety	47	40.5	69	59.5
Stress	35	30.2	81	69.8
Irritability	21	18.1	95	81.9
Mood change	52	44.8	64	55.2
Social isolation	33	28.4	83	71.6

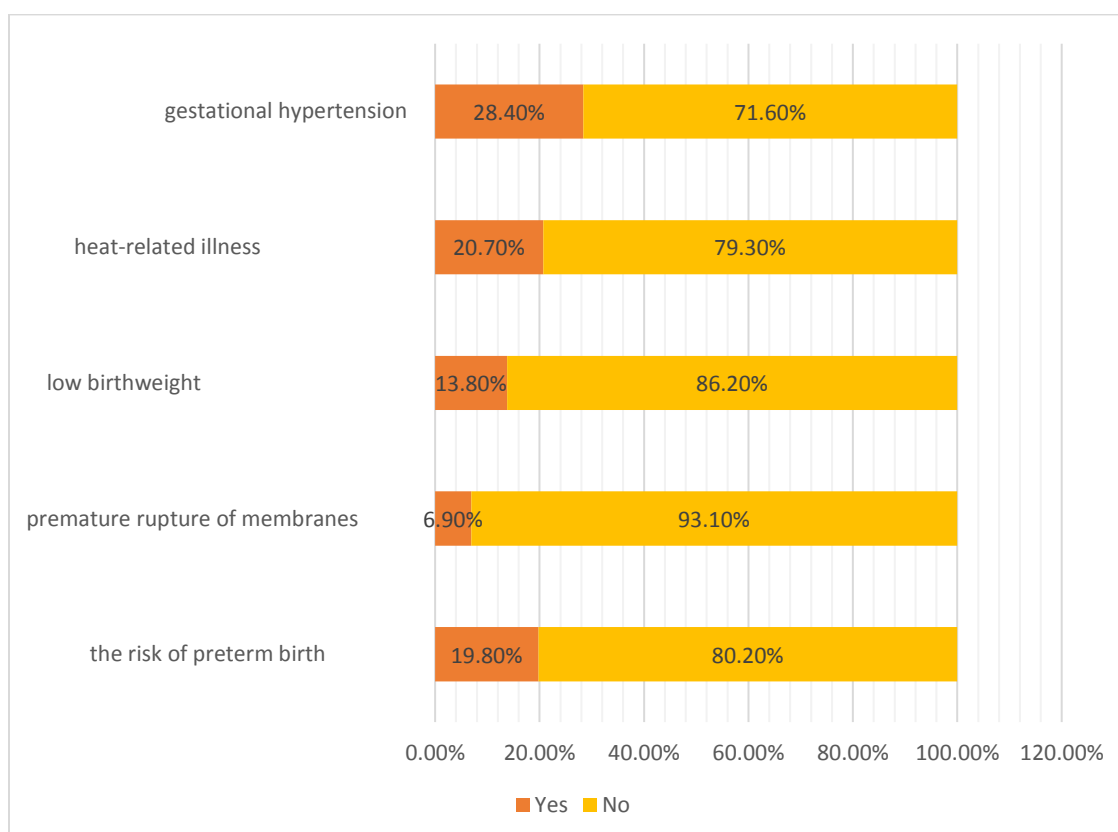
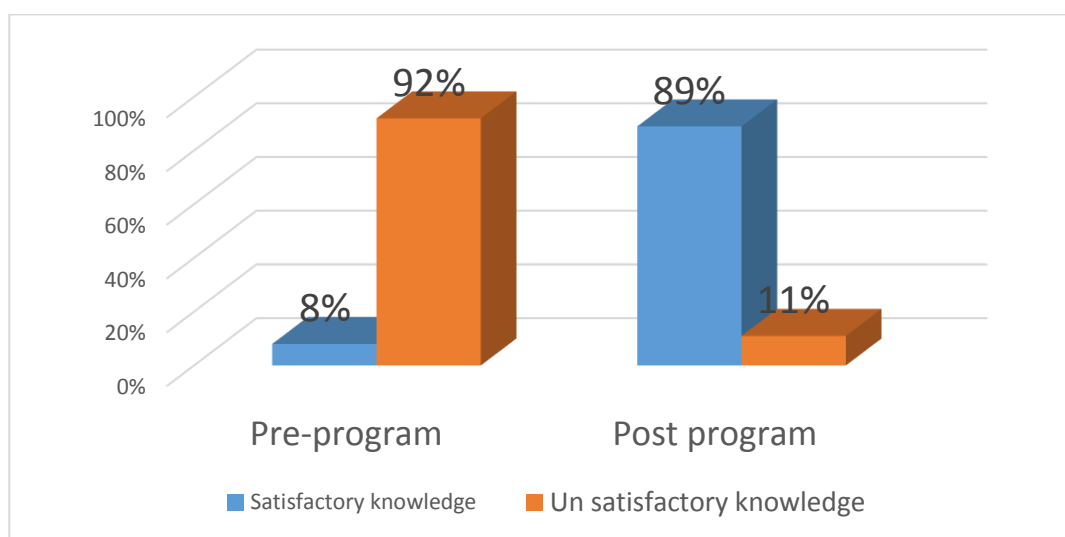


Figure (1): distribution of the studied pregnant women' knowledge about complications related to climate changes during pregnancy (n=116).

Table (4): Distribution of the studied pregnant women' knowledge regarding climate changes pre and post nursing instructional module implementation (n=116).

Knowledge items	Pre- implementation						Post- implementation						T test	P value
	Correct & complete		Correct & incomplete		Don't know		Correct & complete		Correct & incomplete		Don't know			
	N	%	N	%	N	%	N	%	N	%	N	%		
definition of climate changes	13	11.2	37	31.9	66	56.9	<u>97</u>	<u>83.6</u>	12	10.3	7	6.1	18.0	0.000**
global issues of climate changes	16	13.8	70	60.3	30	25.9	69	59.5	24	20.7	23	19.8	7.3	0.000**
Humans causes of climate change	13	11.2	40	34.5	63	54.3	<u>95</u>	<u>81.9</u>	18	15.5	3	2.6	17.8	0.000**
The effects of climate change on natural disasters	16	13.8	60	51.7	40	34.5	<u>96</u>	<u>82.8</u>	11	9.5	9	7.8	13.2	0.000**
causes of climate changes	9	7.8	60	51.7	47	40.5	82	70.7	22	19	12	10.3	14.7	0.000**
consequences of climate changes	7	6.1	10	8.6	99	85.3	68	58.6	35	30.2	13	11.2	19.2	0.000**
Ability to minimize climate change	9	7.8	80	68.9	27	23.3	68	58.6	38	32.8	10	8.6	47.8	0.000**
effects of climate changes on pregnancy	13	11.2	60	51.7	43	37.1	<u>97</u>	<u>83.6</u>	10	8.6	9	7.8	21.2	0.000**
Management of the health effects of climate change	6	5.2	50	43.1	60	51.7	78	67.2	30	25.9	8	6.9	17.5	0.000**
Current methods appropriate to contribute to mitigating climate change	6	5.2	70	60.3	40	34.5	74	63.8	30	25.9	12	10.3	14.7	0.000**
Mean \pm SD	6.33 \pm 1.34						16.93 \pm 2.03							

(**) Highly statistically significant $p < 0.001$ **Figure (2): distribution of the studied pregnant women' total knowledge level regarding climate changes pre and post nursing instructional module implementation (n=116).**

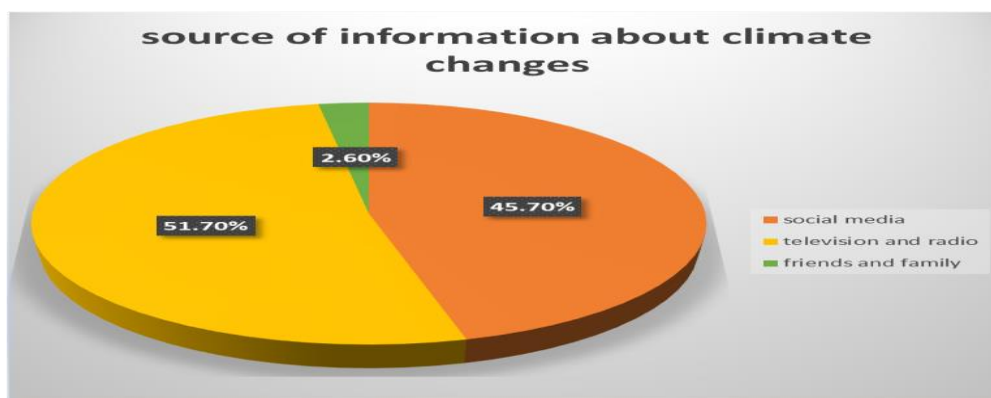


Figure (3) Distribution of the studied pregnant women according source of information regarding climate changes (n=116)

Table (5): Distribution of the studied pregnant women' practice regarding climate changes pre and post nursing instructional module implementation (n=116).

practice items	Pre-implementation Mean±SD	Pre-implementation Mean±SD	X ²	p-value
self-care practice during hot weather	5.41 ± 1.209	9.22 ± 1.72	19.764	0.000**
self-care practice during cold weather	4.59 ± 1.35	7.43 ± 1.38	16.22	0.000**
self-care practice regarding infectious diseases	3.98 ± 1.43	7.03 ± 1.54	16.81	0.000**
self-care practice regarding the risks of heavy rain, lightning and thunderstorms	3.6 ± 0.8	6.29 ± 1.59	16.003	0.000**
self-care practice regarding to avoid air pollution	4.59 ± 0.49	7.47 ± 1.39	21.633	0.000**

(**) Highly statistically significant $p < 0.001$

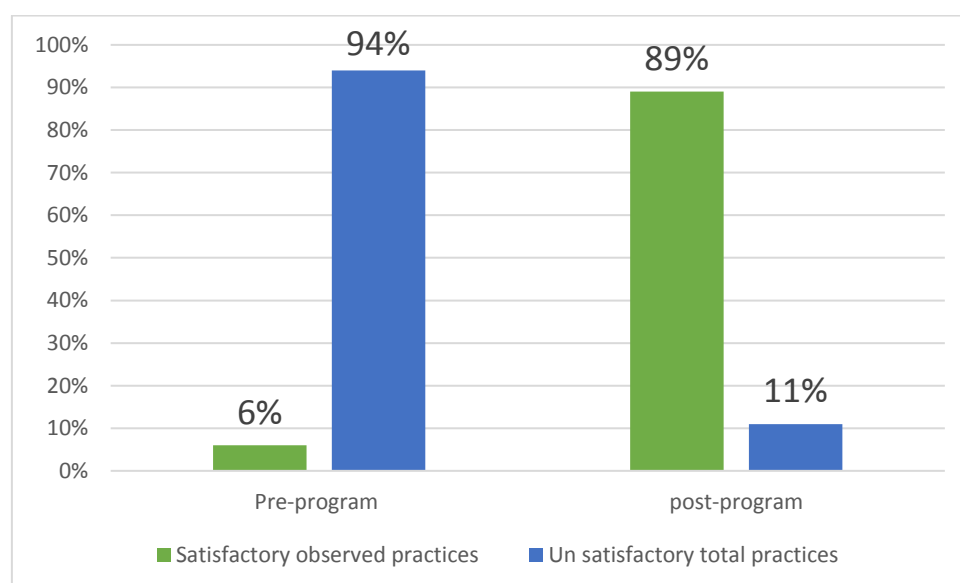


Figure (4) Distribution of the studied pregnant women' total practice level regarding climate changes pre and post nursing instructional module implementation (n=116).

Table (6): Relations between the studied pregnant women' demographic characteristics and their total knowledge score regarding climate changes pre and post nursing instructional module (n=116).

Demographic characteristics	N	Total knowledge level pre				Total knowledge level post				X2	P-value
		satisfactory		unsatisfactory		Satisfactory		unsatisfactory			
		No.	%	No.	%	No.	%	No.	%		
Age											
20-25	35	2	1.7	25	21.5	41	35.3	2	1.7	15.72	0.003
26-30	59	4	3.4	51	44	42	36.2	6	5.2		
31-35	22	2	1.7	32	27.7	22	19	3	2.6		
Occupation											
Housewife	74	6	5.2	80	68.9	71	61.2	3	2.6	1.75	0.552
working	42	5	4.3	25	21.6	35	30.1	7	6.1		
Educational level											
illiterate	23	3	2.6	20	17.2	20	17.2	3	2.6	12.45	0.000**
Elementary school	31	6	5.2	25	21.6	27	23.3	4	3.4		
Secondary school	28	3	2.6	25	21.6	25	21.6	3	2.6		
High school	34	4	3.4	30	25.8	30	25.9	4	3.4		
Residence											
Rural	67	7	6	60	51.7	64	55.2	3	2.6	2.25	0.133
Urban	49	9	7.8	40	34.5	40	34.4	9	7.8		

(**) Highly statistically significant $p < 0.001$ **Table (7): Relations between the studied pregnant women' demographic characteristics and their total practice score regarding climate changes pre and post nursing instructional module (n=116).**

Demographic characteristics	N	Total practice level pre				Total practice level post				X2	P-value
		satisfactory		unsatisfactory		satisfactory		unsatisfactory			
		No.	%	No.	%	No.	%	No.	%		
Age											
20-25	35	4	3.4	50	43.1	75	64.7	4	3.4	15.76	0.003**
26-30	59	6	5.2	33	28.4	18	15.5	4	3.4		
31-35	22	3	2.6	20	17.3	12	10.4	3	2.6		
Occupation											
Housewife	74	4	3.4	70	60.3	71	61.2	3	2.6	0.521	0.470
working	42	2	1.7	40	34.6	39	33.6	3	2.6		
Educational level											
illiterate	23	3	2.6	23	19.8	23	19.8	3	2.6	15.62	0.000**
Elementary school	31	3	2.6	21	18.1	27	23.3	4	3.4		
Secondary school	28	5	4.3	23	19.8	22	19	3	2.6		
High school	34	4	3.4	34	29.4	31	26.7	3	2.6		
Residence											
Rural	67	7	6.1	60	51.7	64	55.2	3	2.6	0.156	0.693
Urban	49	4	3.4	45	38.8	46	39.7	3	2.6		

(**) Highly statistically significant $p < 0.001$ **Table (8): Correlation between the studied pregnant women' total knowledge score and total practices score (n = 116).**

Items		Total knowledge score pre	Total knowledge score post	Total practices score pre	Total practices score post
Total knowledge score pre	r	1	0.008	0.140	0.073
	P-value		0.928	0.134	0.437
Total knowledge score post	r	0.008	1	0.041	0.337
	P-value	0.928		0.665	0.000**
Total practices score pre	r	0.140	0.041	1	0.508
	p-value	0.134	0.665		0.000**
Total practices score post	r	0.073	0.337	0.508	1
	p-value	0.437	0.000**	0.000**	

(**) Highly statistically significant $p < 0.001$

Discussion

Pregnant women and their developing fetuses are considered one of the most vulnerable groups to health risks caused by climate change. Exposures to these risks can have both immediate and long-lasting impacts on the mother and offspring, such as gestational complications, low birth weight, restricted fetal growth, preterm birth, miscarriages, and neonatal mortality. (Baines, A. (2023). The aim of this research is to evaluate the effect of nursing instructional modules on pregnant women's knowledge and practice regarding climate changes.

The present study findings illustrated that the demographic characteristics of the women that more than half of the studied pregnant women are from 26-30 years old with Mean + SD= 1.89±0.694, nearly less than two-thirds of them are housewives, nearly less than one third are high education and more than half are from rural areas. this results agree with (ACAR, & ÖTER, 2024)" Climate Change Awareness in Pregnant Women: A Qualitative Study, Turkey" reported that The age range of the pregnant women who participated in the study was 27-35 years . this result was concordant with the finding of (Eltelt et al., 2023) who brought up that the studied pregnant women were < 20 years old, with mean age (19.8 ± 7.3years), one third of them had basic education, diploma, or higher education, and three quarter were residing in cities.

Concerning to their Obstetric history the present study findings reveals that more than two fifth of the studied pregnant women multi gravida,

nearly two fifth, Majority (of them have no abortion, more than half of them have normal previous pregnancy, half of them have C.S deliveries, less than two fifth of them are underweight and at first trimester, respectively. This finding agree with (Ahmed, et al., 2023) who studied" Impact of Narrative versus Didactic Information on Pregnant Women's Knowledge, Attitude and Perception Regarding Climate Change, Egypt) who illustrated that more than one third of the women were multigravida and two thirds their mode of birth was vaginal with perinatal tears and cesarean section with a significant notable difference between both groups regarding to women parity.

As regarding pregnant women' complains and complication related to climate change during present pregnancy the current study reveals that nearly than two fifth of the studied pregnant women complains from elevation blood pressure and anxiety, respectively, less than half of them complain from Overheating and Mood change, respectively and more than half of them complain from Excessive sweating and pale this finding supported by (Dehdashti, et al.,2023) who studied "Impacts of Climate Changes on Pregnancy and Birth Outcomes: A Review" mentioned climate change may effect on birth weight, preterm labor, .overheating, eclampsia and preeclampsia, and abortion.

These findings agree with (Spencer, et al., 2022). "The challenges of working in the heat whilst pregnant: insights from gambian women farmers in the face of climate change" mentioned

that All participants in the study discussed their experience of a range of significant physical changes during pregnancy. Common symptoms included nausea, anxiety, fatigue, Excessive sweating, pale and dizziness. Many women noted that these symptoms were made worse when working in the heat.

Concerning pregnant women's knowledge about climate change, the present study revealed that the majority of studied pregnant women' knowledge had poor knowledge toward climate change before the implementation of nursing instructional module and improved after the implementation this finding agree with **(Eltelt et al., 2023)** who studied "Adverse Health Effects of Climate Change on Pregnant Women Working" who mentioned that more than half of studied pregnant women had poor knowledge and also agree with **(Morris et al 2021)** who conducted a study about "Health vs. wealth: Employer, employee and policy-maker perspectives on occupational heat stress across multiple European industries. s" and stated that 65% of participants had poor knowledge.

Also agree with **(ACAR, & ÖTER, 2024)**" Climate Change Awareness in Pregnant Women: A Qualitative Study" who reported that participants' knowledge of the effects of climate change on maternal and infant health during pregnancy was incomplete and insufficient.

The current study revealed that the majority of the studied pregnant women had unsatisfactory knowledge pre-implementation which improved to most of them having satisfactory knowledge post-

implementation. This finding agree with **(Ahmed, et al.,2023)** who studied" Impact of Narrative versus Didactic Information on Pregnant Women's Knowledge, Attitude and Perception Regarding Climate Change, *Egypt*) who illustrated that at pre intervention, more than half of the two groups had unsatisfactory knowledge level about climate changes.

However these results contradicted with **(Ngwenya et al., 2018)** whose result proved that the majority of the participants had satisfactory knowledge level about climate changes meanwhile the minority had unsatisfactory knowledge level. This contradiction might be as a result of conditions and culture differences.

As Regards source of information about climate change, the current study reported clear that less than half of the studied pregnant women have information from social media these results agree with **(Mohammed et al (2022) who studied "Nursing Students Knowledge, Attitude, And Practice Regarding Health Effect of Climate Change, *Egypt*"** reported that less than half of them their source of information about climate change is social media.

As regards the studied pregnant women' practices towards climate change the current study shows that the majority of studied pregnant women have unsatisfactory practice pre-nursing instructional module implementation, which improved to most of them have satisfactory practice post-nursing instructional module implementation. this finding agree with **(Eltelt et al., 2023)** who studied "Adverse Health Effects of

Climate Change on Pregnant Women Working” mentioned that 60% of pregnant women have unsatisfactory done practice about climate change as heat stress

Also agree with (Jasemzadeh et al., 2018) who studied “Effectiveness of a theory-based mobile phone text message intervention for improving protective behaviors of pregnant women against air pollution: a randomized controlled trial, Khuzestan” mentioned that **after** the intervention, there were statistically significant differences between perceived severity, response efficacy, self-efficacy, and protective behaviors between two groups ($P < 0.05$) and agree with (Mohammed et al.,2022) who studied “Nursing Students knowledge, Attitude, And Practice Regarding Health Effect of Climate Change, Egypt” reported that most of the studied students had a poor level of knowledge and practice regarding climate change.

These results give the great sound of that the study was in months experienced varied weather patterns, including fluctuations in temperature and sandstorms. which made them an ideal choice for the study.

The current study proves that there highly statistically significant difference between the studied pregnant women’ knowledge and practice level and their age and educational level this finding agree with (Ahmed, et al.,2023) who studied ” Impact of Narrative versus Didactic Information on Pregnant Women’s Knowledge, Attitude and Perception Regarding Climate Change, Egypt) who illustrated that there are

significant statistically differences between participant women’s demographic data among the two groups and their knowledge, attitude and perception regarding their level of education. This result is in the same line with the finding of Lopez & Malay, (2019) “Awareness and Attitude Towards Climate Change of Selected Senior High Students in Cavite, Philippines” who indicated no significant age- or gender-related disparities regarding the respondents' awareness or attitudes towards climate change.

This could be explained that the level of education helps more in perceiving any important knowledge and seeking for participation.

Conclusion

The current study concluded that the nursing instructional module had a significant positive effect on pregnant women's knowledge and practice regarding climate changes. The knowledge and practice level improved after the implementation of nursing instructional module, which supports the research hypothesis.

Recommendations: based on research findings it was recommended that:

1. Regular educational programs are needed for pregnant women to maintain and refresh their knowledge and practice regarding climate change
2. Provide health education booklets for pregnant women that focus on adapting to climate change.
3. Explore the long-term health effects of climate change on pregnant women and their fetuses

Further Recommendation:

1. Replication of the study on large representative probability sample is recommended in to get more generalization of the results.

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