The Effectiveness of the Self-Instructional Module in Pregnant Women's Awareness and Self-Care Practices Regarding Climate Change

Eman Mahmoud Ali[1], Entesar Fatouh Abdel Moniem[2], Fatma Aboulkhair Farag [3], Shaimaa Hassan Mohamady [4]

B.sc[1]. Assistant Lecturer[1] of Maternal and Neonatal Health Nursing, Faculty of nursing – Fayoum University.

Professor[2] of Maternal and Neonatal Health Nursing, faculty of nursing – Helwan University.

Professor [3]of Maternal and Neonatal Nursing school of Nursing - Fayoum University and Badr University in Cairo.

Professor[4] of Maternal and Neonatal Health Nursing, faculty of nursing – Helwan University.

Abstract: **Background: Climate changes are the greatest threat to public health in the twenty-first century, a widespread issue with far-reaching effects especially in vulnerable population as pregnant women. Pregnant women's health may be improved by educating them about the hazards involved in their pregnancy. Aim of the study: To evaluate the effectiveness of the Self-Instructional module in pregnant women's awareness and self-care practices regarding climate change. Research Design: A quasi-experimental study design one group (Pre-posttest) was used to fulfill this study. Setting: The current study was conducted in Maternal and Child health Center at Fayoum city. Sample: A Convenient sample of 70 pregnant women. Tools for data collection: One tool (structured interviewing questionnaire sheets) was used to collect data:- Demographic Characteristics, Obstetric history, pregnant women's Awareness Assessment Sheet, pregnant women's self-reported practices regarding their adaption towards climate changes and Pregnant women's satisfaction sheet. Results: pre-implementation of self- instructional module, 17.1% of the pregnant women exhibited satisfactory knowledge regarding climate change as compared to 85.7% exhibited satisfactory knowledge post-implementation. Concerning the practices score, it was significantly improved post- implementation as compared to pre-implementation (88.6% vs. 20%, respectively). Moreover, a significant positive shift in the total attitude score of pregnant women related to climate change post- implementation as compared to pre- implementation (91.4% vs. 34.3%, respectively). Conclusion: The current study concluded that the nursing instructional module had a significant positive effect on pregnant women' knowledge and practices regarding climate changes, which supports the research hypothesis. Recommendations: Awareness initiatives are needed for pregnant women to enhance their knowledge, preventive measure of practices and improve their attitude regarding climate change.**

Keywords: **Awareness, Climate change, Nursing Instructional Module, practices, Pregnant women.**

1. INTRODUCTION

Pregnancy is the most beautiful and gratifying occurrence in the life of women. Pregnancy is a term used to describe the period in which a fetus develops inside a woman's uterus. Pregnancy usually lasts about 40 weeks as measured from the last menstrual period to delivery. During pregnancy, series of changes take place in a woman's organs and tissues because of a developing fetus **(Banafshi et al., 2024).** The World Health Organization has identified climate changes are the phrase used to describe the gradual rise in global temperatures that are mostly accelerated by human activities. Climate changes as a severe health emergency are 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 changes are a major global health concern that has become a top priority on the global health agenda **(Siiba et al., 2024).**

Climate change, an increasingly pressing global issue, has far-reaching implications for human health. Global Warming (GW) refers to the evolving temperature rise on Earth's surface. Greenhouse Gases (GHGs) such as CO2 and methane naturally exist in the atmosphere and facilitate keeping the Earth's surface heat enough to sustain life **(Mostafa et al., 2025)**. The recent and ongoing increase in the average temperature of the Earth's surface and oceans has negative environmental impacts that can affect human health and life. According to climate scientists, human and man-created activities are the main cause of global warming **(Neale et al., 2025).** As rising temperatures, changing precipitation patterns, and extreme weather events become more common, they bring about a range of health consequences, including the proliferation of vector-borne diseases, respiratory issues due to air pollution, and heat-related illnesses. Other expected consequences are higher sea and lower potable water levels, with agricultural problems leading to food insufficiency and economic problems **(Nickoloff et al., 2025).** Understanding and addressing these impacts is crucial for developing effective public health strategies and fostering a resilient society **(Devi, 2025)**.

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 **(Aborode et al., 2025).**

Extreme heat can overwhelm thermo-regulatory 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 **(Filipec et al., 2025).** 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 **(Wilson, 2025).** 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 **(Ali, 2025).**

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 **(Beevers et al., 2025).** 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 **(Mittal, 2025).**

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 **(Chen et al. 2025).**

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 **(Wang et al., 2025).** 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 **(El–Nasr et al., 2025).**

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 12, Issue 2, pp: (136-156), Month: May - August 2025, Available at: **www.noveltyjournals.com**

Significance of the study:

According to a recent assessment by the United Nations Intergovernmental Panel on Climate Changes (IPCC), climate changes are occurring more quickly than anticipated. 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 **(Bonell et al., 2024).** Climate change is responsible for a minimum of 150,000 deaths every Year worldwide, a number that is Expected to double by 2030 **(Ibrahim et al., 2023).**

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 **(Akhtar, 2024).** The crisis of the Egyptian Ministry of health confirmed during the year (2021) that the number of deaths due to heat stress reached 95 cases and 1914 injured, since the beginning of the heat wave, and the most of deaths, most of them are over the age of 60 years, and among them are pregnant women in different months of pregnancy, and most of them suffer from pathological problems due to failure or decline in the heart muscle or chronic high blood pressure **(Afifi et al., 2024).**

Pregnant women are especially vulnerable to the health risks associated with climate change, including preterm birth, small for gestational age, hypertensive disorders of pregnancy, and other negative reproductive health and birth outcomes **(Fan & Zlatnik, 2023).**

According a study of **(Adebayo et al ., 2020)** educating pregnant women about climate change health risks through narrative format enhances knowledge, risk perception, self-efficacy, and information seeking, improving maternal and child health outcomes.

Therefore, effective awareness initiatives are needed to improve awareness of pregnant women about climate change to improve pregnancy outcomes for women.

2. AIM OF THE STUDY

The current study aimed to evaluate the effectiveness of the Self-Instructional module in pregnant women's awareness and self-care practices regarding climate change.

This aim was achieved though:

1- Assessing the level of pregnant women awareness and attitude regarding climate change.

2- Assessing pregnant women reported practices regarding their adaptation towards climate changes.

3- Implementing a self-instructional module regarding climate changes.

4- Evaluating the effect of self-instructional module regarding climate changes.

5- Assessing level of satisfaction among women used self-instructional module

Research Hypotheses:

-   Pregnant women will exhibit better awareness and attitude regarding effect of climate change after implementation of self-instructional module.

-   Pregnant women will be satisfied with self-instructional module   regarding climate change.

Operational definitions:

Effectiveness: Refers to the desired outcome of the self-instructional module on awareness and self-care practices regarding climate changes among pregnant women.

Self-instructional module: Refers to up to date knowledge and practices for the effective delivery of health care includes physiological, psychological change during climate change utilizing audio-visual aids and printed Arabic booklet.

Awareness: Means knowledge and practices in the current study .

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 12, Issue 2, pp: (136-156), Month: May - August 2025, Available at: **www.noveltyjournals.com**

3. SUBJECTS & METHODS

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

Setting: The study was conducted at the study was conducted in Maternal and Child health Center in (Al-Hadiqa) at Fayoum city.

Sampling:

Convenience sample was used in this study. The sample was selected according to this equation:-

$$n = \left(\frac{Z_{1-\alpha/2} + Z_{1-\beta}}{ES} \right)^2$$

$Z\alpha$ = Standard normal deviate for α = 1.9600.

$Z\beta$ = Standard normal deviate for β = 0.8416.

B = $(Z\alpha + Z\beta)2$ = 7.8489.

C = $(E/S\Delta)2$ = 0.1128.

N = B/C = 69. 5972.

The N thus calculated is rounded up to the next highest integer to give the group size.

$n = (\frac{1.96 + 0.84}{0.1128.})^2$ = 69.5972$\approx$ 70 pregnant women) Rosner B. Fundamentals of **Biostatistics (2016)**

Sample size:-

Included 70 pregnant women to achieve a power of 95% and a level of significance of 5% (two sided), assuming effect size 0.45 and SD 1.34

Tools of data collection:

The data was collected by using one tool (structured interviewing questionnaire sheet was divided into five parts:

Part I:-

Socio-demographic characteristics of pregnant women included (age, educational level, occupation level).

Part II:-

It consisted of questions related to obstetric history It consisted of questions related to obstetric history (Number of previous pregnancies, Parity, Previous miscarriage, History from twins , History from pre term baby, History from a dead child , Complications during previous pregnancyand previous birth and during current pregnancy, current gestational age) .

Part III:

Pregnant women's awareness assessment sheet was designed by the researchers after reviewing related literatures . It was modified from **(Ahmed et al., 2025)** , **(Mohammed et al., 2024)** , **(Ahmed Abd-Elhamed et al., 2023)** and **(Elsayed et al., 2024)** . It was translated by the researchers into Arabic language. It involves multiple choice questions design to:

1- Pregnant women's knowledge regarding climate change.

It consisted of questions related to climate change (Definition, causes, effects, Complications for the pregnant woman , the fetus and source of information) .

Scoring system of knowledge:

The questionnaire was contained of 13 questions, each question evaluated as "the complete correct answer was scored as two degrees, the incomplete was scored as a one degree" and incorrect answer or don't know was scored as a zero. The total

Page | 139

scores of the questionnaire were 24 grades. These scores were summed and converted into a percent score. It was classified into 2 categories:

- **Satisfactory if** score ≥ 60% (15-24 grades).

- **Unsatisfactory** if score <60%. (0-14 grades).

2- Pregnant Women Attitude Regarding Climate Change Scale:

It was adapted from **Climate Change Partnership (2017)** and modified by the researcher, it used to assess the attitude towards impact of climate change on pregnant women the items were scored according to a three-point Likert scale it will be included **27** items such as (Believe that climate change is a huge problem that affects all parts of the world , Think that climate change is harmful to the pregnant woman and the fetus , Feel nervous when learn about the climate change) . continuum from agree (3), neutral (2), and disagree (1).

 Scoring system:

The scale was contained of 27 items, the scale using a 3-point scale that ranges from 3 "agree", 2 "neutral" to 1 "disagree". The total scores of the scale were 81 grades. These scores were summed and converted into a percent score. It was classified into 2 categories:

- **Positive** if score ≥ 60%. (49-81 grades)

- **Negative** if score from <60%. (27-48 grades).

Part IV:

Pregnant women's reported practices regarding their adaption towards climate changes, It was adopted from **Brown et al., (2022),** and modified by the researcher. Included (contained 51 items, divided into 6 subscales (women' reported practice about Preventive measures to take during high temperatures subscale which consisted of 10 items, Preventive measures to practice during severe cold waves subscale which consisted of 10 items, Preventive measures to practice during high levels of air pollution in the atmosphere which contain 8 items, Preventive measures to practice during food contamination which involve 11 items, Preventive measures to take while using toxic chemicals which contain 7 items and Preventive measures to take during rain in winter which involve 5 items.).

Scoring system:

The scale using a 2-point scale that ranges from 1 "Done", zero "not done". The total scores of the scale were 16 grades. These scores were summed and converted into a percent score. It was classified into 2 categories:

- **Adequate** if score ≥ 60%. (31-51 grades)

- In adequate if score from <60%. (0-30 grades).

Part V:

Pregnant women's satisfaction sheet, It was adapted from *Mansour et al., (2020)* and the necessary modifications was done by the researchers. The scale used to assess the pregnant women's regarding the self-instructional module implementation, it consisted of 10 items as (the subject was interesting, The teaching method was effective , It contributed to the efficient use of time, The scientific content was new and useful , The scientific material included in the booklet was clear and easy to understand, The organization and quality of the printed booklet , The language of the booklet was easy to understand , The booklet covered all the items of the topic , Motivated to read about the topic , Satisfied with the use of the self-learning unit) .

Scoring system:

The scale was contained of 10 items, the scale using a 3-point scale that ranges from 3 "agree", 2 "uncertain" to 1 "disagree". The total scores of the scale were 30 grades. These scores were summed and converted into a percent score. It was classified into 2 categories:

- **Satisfied if** score ≥ 75%. (23-30 grades)

- **Un satisfied if** score from < 75%. (10-22 grades).

Validity of the tools: Tools of data collection were investigated for content validity by a panel of three jury experts in the field of obstetrics and gynecological nursing at Helwan University to judge clarity, relevance, comprehensiveness, understanding and applicability of tools. The opinions were elicited regarding the layout, format and sequence of the questions and all of their remarks were taken into considerations and the tools were considered valid from the experts' point of view.

Reliability of the tools:

Reliability for tools was applied by the researchers for testing the internal consistency of the tools by administrating the same tool to the same subjects under similar condition. Internal consistency reliability of all items of the tools was assessed using Cronbach's alpha coefficient test. The internal consistency of knowledge was 0.970, attitudes was 0.982 and practices was 0.981 and satisfaction was 0.978.

Ethical considerations:

An official permission to conduct the proposed study was obtained from the Scientific Research Ethics Committee Faculty of Nursing Helwan University. Participation in the study is voluntary and subjects were given complete full information about the study and their role before signing the informed consent. The ethical considerations included explaining the purpose and nature of the study, stating the possibility to withdraw at any time, confidentiality of the information where it was not accessed by any other party without taking permission of the participants. Ethics, values, culture, and beliefs were respected.

Pilot study:

It was carried out on 10% (7) of pregnant women under the study to test the applicability, clarity, and efficiency of the tools. There were no modifications found after the pilot study. So, these (7) pregnant women were included in the study.

Fieldwork:

This study was carried out through 6 months starting from the beginning of August 2024 to the end of January 2025. 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 two 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 distributed part (I): A self administered questionnaire to assess general characteristics of pregnant women and obstetrical history. The researchers used part (II): maternal knowledge questionnaire to assess pregnant women's knowledge regarding climate changes, part (III): Modified Likert scale to assess pregnant women's attitudes regarding climate changes and part (IV): maternal reported practices to assess reported practices of pregnant women regarding climate changes. Average time needed for completion of questionnaires was around (45- 50 minutes). The number of interviewed women ranged from 1-2 women /week.

Planning phase:

Based on the results that were obtained from assessment phase, the educational program regarding climate changes was developed by the researchers in a form of educational sessions and simple clarified booklet. The booklet was designed according to pregnant women needs regarding climate changes in simple Arabic language to suit the level of understanding and to satisfy the studied pregnant women's deficit knowledge and practices regarding climate changes. Sessions number and its contents, different methods of teaching and instructional media were determined. Objectives were constructed to be attained after completion of educational program. By the end of the educational program, pregnant women would be able to acquire essential knowledge, positive attitude and healthy reported practices related to climate changes**.**

Implementation phase:

The researchers implemented the educational program through three scheduled sessions. Each session took about 30-45 minutes according to studied women's achievement and feedback. At the beginning of the first session pregnant women was oriented with the intervention contents. The subsequent session started by feedback about the previous session and the objectives of the new session, simple Arabic language was used to suit women's level of understanding. At the end of each session, five minutes devoted to permit women to ask questions to clarify the session contents and to correct any misunderstanding. Each woman was informed about the time of the next sessions. Different methods of teaching were used such as lectures, group discussions, critical thinking, problem solving and brainstorming. Instructional media included the booklet was distributed to all recruited women in the study from the first session to achieve its objectives. Moreover, the researchers used supportive tools that function as stimulus control to support desired changes include stickers and flyers that reinforce the concepts of the intervention and emphasizing the effects of educational program on women's knowledge, attitudes and practices.

• **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 Coldwater 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.

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 12, Issue 2, pp: (136-156), Month: May - August 2025, Available at: www.noveltyjournals.com

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 where the researcher evaluated women's knowledge, attitudes and practices 4 weeks post-implementation from the last session.

Statistical analysis:

The statistical analysis of data was done by using the computer software of Microsoft Excel Program and Statistical Package for Social Science (SPSS) version 25. Data were presented using descriptive statistics in the form of frequencies and percentage for categorical data, the arithmetic mean (X) and standard deviation (SD) for quantitative data. Qualitative variables were compared using chi square test (X^2). Different between the groups during the two visits were assessed by paired t test. In addition, R- test were used to identify the correlation between the study variables. Reliability of the study tools was done using Cronbach's Alpha. Degrees of significance of results were considered as follows: P-value ≥ 0.05 Not significant (NS), P-value < 0.05 Significant (S), P-value < 0.01 Highly Significant (HS).

4. RESULTS

Table (1): shows that, 34.2% of the studied women were aged between 25-<30 years old, the mean SD of age was 29.36 ± 4.57 years. Also, 44.3% of them have a technical education. Furthermore, 58.6% of them were housewife.

Table (2): shows that, 37.1% of the studied women have first pregnancy. Also, 45.8% of them have one birth. Moreover, 84.3% and 94.3% of them don't have history from previous miscarriage and twins' baby, respectively. Furthermore, 95.7% and 97.1% of them don't have history from preterm baby and dead child, respectively. Also, 35.7% of the studied women have history from complications during previous pregnancy, 44.0% of them have history from miscarriage. Likewise, 14.3% of the studied women have history from complications during previous birth, 40.0% of them have difficult labor. Also, 21.4% of the studied women have history from complications during current pregnancy, 53.3% of them have hypertension. Furthermore, 71.4% OF them in second trimester of pregnancy.

Table (3): shows that there was a significant improvement in pregnant women's knowledge toward climate change and its effect on pregnancy after implementation of self-instructional module with a highly significant difference at (p < 0.01). As evidence, 5.7% and 4.3% of the studied women have complete correct knowledge about the causes of climate change and complications caused by climate change for the pregnant woman at pre-implementation phase which changed to 91.4% and 85.7% after implementation of self-instructional module, respectively. Also, 5.7% and 17.1% of them have complete correct knowledge about the effect of climate change on nervous and digestive systems at pre -implementation phase which changed to 85.7% and 84.3% after implementation of self-instructional module, respectively. Also, the current gestational age was second trimester and the mean SD was 21.63 ± 6.63 weeks.

Figure (1): displays that, 34.3% and 31.4% of the studied pregnant women have information about climate change and its effect on pregnancy from internet and TV, respectively.

Figure (2): shows that, 17.1% of the studied pregnant women have adequate level of total knowledge about climate change and its effect on pregnancy at pre- implementation phase while changed to 85.7% after implementation of self- instructional module.

Table (4): shows that, there was a significant improvement in total pregnant women's attitude regarding climate change and its effect on pregnancy after implementation self- instructional module with a highly statistically significant difference at (P= < 0.01). As evidence, 34.3% of the studied pregnant women have positive attitude regarding climate change and its effect on pregnancy at pre implementation phase. While changed to 91.4% after implementation of self- instructional module.

Table (5): shows that, there was a marked improvement in all subscales of pregnant women's reported practices regarding climate change and its effect on pregnancy after implementation self-instructional module with a highly significant difference at (p < 0.01). As evidence, 28.6%, 30.0% and 25.7% of the studied women have adequate practices regarding preventive measures regarding high temperatures, severe cold waves and air pollution in the atmosphere at pre-implementation phase. While changed to 88.6%, 90.0% and 84.3% after implementation self-instructional module, respectively. Also, 22.9%, 11.4% and 28.6% of the studied women have adequate practices regarding preventive measures regarding food contamination, toxic chemicals and rain in winter at pre implementation phase. While changed to 88.6%, 88.6% and 90.0% after implementation self-instructional module, respectively.

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 12, Issue 2, pp: (136-156), Month: May - August 2025, Available at: www.noveltyjournals.com

Table (6) presents that, there was highly statistically significant relation between total pregnant women' knowledge at pre-implementation and their age and educational level at (P= < 0.01). While there was no statistically significant relation with their occupation at (P= > 0.05). In addition, the results reveal that, there were highly statistically significant relation between total pregnant women' knowledge at post-implementation and their age and educational level at (P= < 0.01). While there was no statistically significant relation with their occupation at (P= > 0.05).

Table (7): reveals that, there was high significant statistical positive correlation between total pregnant women' knowledge score, total attitude score and total reported practices score at pre and post implementation of self-instructional module at p < 0.01.

Table (1): Number and percentage distribution of the studied women according to their socio demographic characteristics (n=70).

Demographic characteristics	No.	%
Age (Years)		
18-<25	7	10.0
25-<30	**24**	**34.2**
30-<35	23	32.9
≥35	16	22.9
Mean ± SD 29.36 ± 4.57		
Education level		
Cannot read and write	6	6.6
Technical diploma	**31**	**44.3**
Institute Education	21	30.0
University education	12	17.1
Occupation		
Working	29	41.4
Housewife	**41**	**58.6**

Table (2): Number and percentage distribution of the studied women according to their obstetric history (n=70).

Obstetric history	No.	%
Number of previous pregnancies		
First pregnancy	**26**	**37.1**
Second pregnancy	25	35.7
Third pregnancy	16	229
Fourth pregnancy and more	3	4.3
Parity		
One	**32**	**45.8**
Two	22	31.4
Three	15	21.4
More than three	1	1.4
Previous miscarriage		
Yes	11	15.7
No	**59**	**84.3**
History from twins		
Yes	4	5.7
No	**66**	**94.3**
History from pre term baby		
Yes	3	4.3
No	**67**	**95.7**
History from a dead child		
Yes	2	2.9
No	**68**	**97.1**

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 12, Issue 2, pp: (136-156), Month: May - August 2025, Available at: www.noveltyjournals.com

Complications during previous pregnancy		
Yes	**25**	**35.7**
No	45	64.3
If yes, what are complications? (n=25)		
Miscarriage	**11**	**44.0**
Premature rupture of amniotic fluid	8	32.0
Gestational diabetes	5	20.0
Preeclampsia	1	5.0
Complications during previous birth		
Yes	**10**	**14.3**
No	60	85.7
If yes what are complications? (n=10)		
Difficult labor	**4**	**40.0**
Stillbirth	2	20.0
Bleeding	2	20.0
Premature labor	2	20.0
Complications during current pregnancy		
Yes	**15**	**21.4**
No	55	78.6
If yes what are complications? (n=15)		
Hypertension	**8**	**53.3**
Gestational diabetes	7	46.7
Current gestational age		
First trimester	7	10
Second trimester	**50**	**71.4**
Third trimester	13	18.6
Mean ± SD 21.63 ± 6.63 weeks		

Table (3): Comparison between pregnant women's knowledge about climate change and its effect on pregnancy pre, and post implementation self-instructional module (n=70).

Items	Pre -implementation						Post – implementation (T= 1 M)						X^2	P-value
	Complete correct answer		Incomplete correct answer		Incorrect /don't know		Complete correct answer		Incomplete correct answer		Incorrect /don't know			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
Definition of climate change	4	5.7	36	51.4	30	42.9	52	74.3	16	22.9	2	2.9	**73.33**	**0.000****
Causes of climate change	**4**	**5.7**	43	61.4	23	32.9	**64**	**91.4**	6	8.6	0	0.0	**103.88**	**0.000****
Effect of climate change on nervous system	**4**	**5.7**	38	54.3	28	40.0	**60**	**85.7**	9	12.9	1	1.4	**92.02**	**0.000****
Effect of climate change on cardiovascular	8	11.4	31	44.3	31	44.3	56	80.0	12	17.1	2	2.9	**69.88**	**0.000****
Effect of climate change on respiratory system	4	5.7	34	48.6	32	45.7	57	81.4	13	18.6	0	0.0	**87.43**	**0.000****
Effect of climate change on digestive system	**12**	**17.1**	36	51.4	22	31.4	**59**	**84.3**	10	14.3	1	1.4	**64.98**	**0.000****
Effect of climate change on muscular system	8	11.4	43	61.4	19	27.2	48	68.6	20	28.6	2	2.9	**50.73**	**0.000****
Effect of climate change on eyes	4	5.7	24	34.3	42	60.0	60	85.7	9	12.9	1	1.4	**94.91**	**0.000****

Effect of climate change on skin	4	5.7	42	60.0	24	34.3	56	80.0	13	18.6	1	1.4	**81.51**	**0.000****
Effect of climate change on psychological changes	5	7.1	8	11.4	57	81.4	60	85.7	8	11.4	2	2.9	**97.81**	**0.000****
Complications caused by climate change for the pregnant woman	**3**	**4.3**	4	5.7	63	90.0	**60**	**85.7**	9	12.9	1	1.4	**113.55**	**0.000****
Complications caused by climate change for the fetus	1	1.4	44	62.9	25	35.7	62	88.6	7	10.0	1	1.4	**108.06**	**0.000****

X^2: Chi Square Test. (**) highly statistically significant at $p<0.01$.
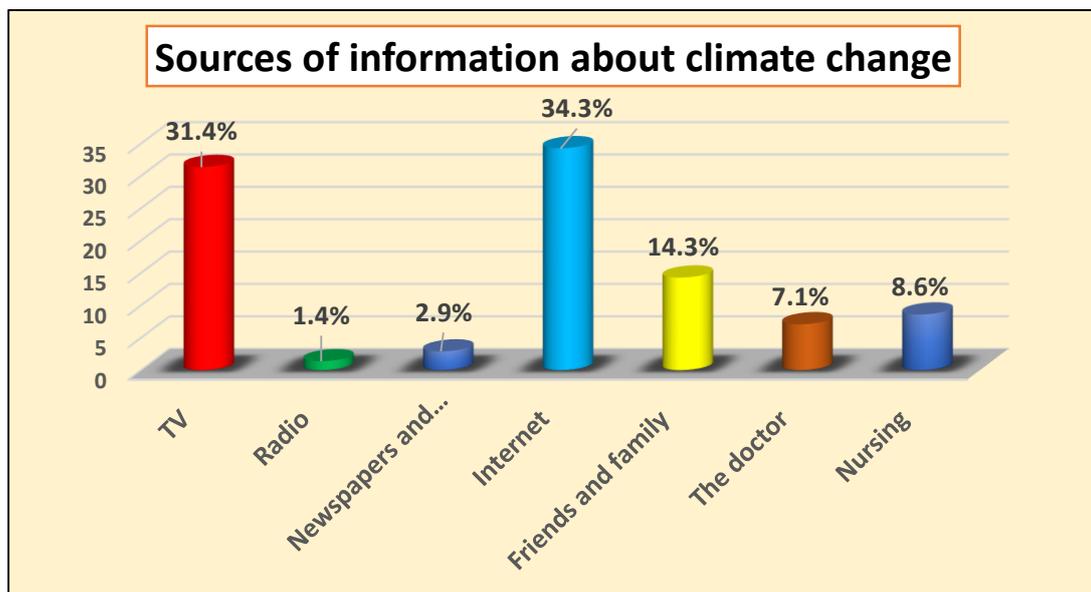
Figure (1): Percentage distribution of the studied pregnant women according to their sources of information about climate change (n=70).
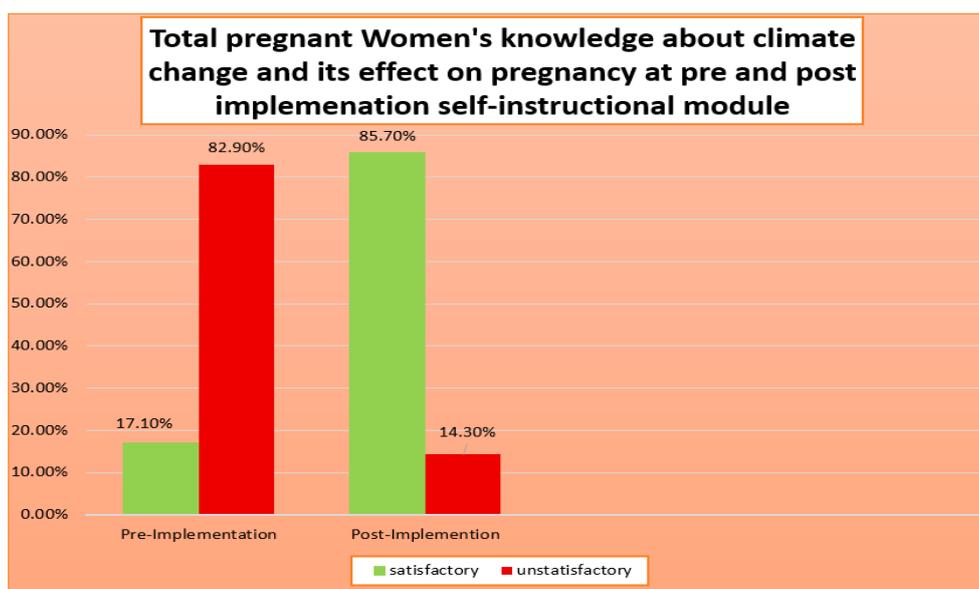
Figure (2): Percentage distribution of total pregnant women's knowledge about climate change and its effect on pregnancy at pre, and post implementation self- instructional module (n=70).

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 12, Issue 2, pp: (136-156), Month: May - August 2025, Available at: www.noveltyjournals.com

Table (4): Comparison between pregnant women's attitude regarding climate change and its effect on pregnancy at pre and post implementation self- instructional module (n=70).

Levels of total Attitudes	Pre-implementation		Post – implementation (T= 1 M)		X^2	P-value
	No.	%	No.	%		
Positive	24	34.3	64	91.4	48.95	0.000**
Negative	46	65.7	6	8.6		
Mean SD	36.92±11.07		77.97±9.44		t=26.61	0.000**

X^2: Chi Square Test.　　t= Paired test.　　(**) highly Statistically significant at p <0.01.

Table (5): Comparison between total pregnant women's reported practices regarding climate change and its effect on pregnancy at pre, and post implementation self-instructional module. (n=70).

Reported practice subscales	Pre-– implementation				Post – implementation (T= 1 M)				X^2	P-value
	Adequate		Inadequate		Adequate		Inadequate			
	No.	%	No.	%	No.	%	No.	%		
High temperatures	20	28.6	50	71.4	62	88.6	8	11.4	51.92	0.000**
Severe cold waves	21	30.0	49	70.0	63	90.0	7	10.0	52.50	0.000**
Air pollution in the atmosphere	18	25.7	52	74.3	59	84.3	11	15.7	48.51	0.000**
Food contamination	16	22.9	54	77.1	62	88.6	8	11.4	61.25	0.000**
Toxic chemicals	8	11.4	62	88.6	62	88.6	8	11.4	83.31	0.000**
Rain in winter	20	28.6	50	71.4	63	90.0	7	10.0	54.71	0.000**
Total reported practice score	14	20.0	56	80.0	62	88.6	8	11.4	66.31	0.000**
Mean SD	15.27±9.39				46.02±7.79				t=24.58	0.000**

X^2: Chi Square Test. t= Paired test. (**) highly Statistically significant at p <0.01.

Table (6): Relations between demographic characteristics of the studied pregnant women and their total knowledge score at pre and post implementation self-instructional module (n=70).

Demographic characteristic	Total knowledge at pre- implementation				X^2	P-Value	Total knowledge at post- implementation (T= 1 M)				X^2	P-Value
	Satisfactory (n=12)		Un satisfactory (n=58)				Satisfactory (n=59)		Unsatisfactory (n=11)			
	No.	%	No.	%			No.	%	No.	%		
Age (years)												
18-<25	0	0.0	7	12.1	48.87	0.000**	0	0.0	7	63.6	44.833	0.000**
25-<30	0	0.0	24	41.4			20	33.9	4	36.4		
30-<35	0	0.0	23	39.6			23	39.0	0	0.0		
≥35	12	100.0	4	6.9			16	27.1	0	0.0		
Education level												
Cannot read and write	0	0.0	6	10.0	17.65	0.000**	0	0.0	6	54.5	38.33	0.000**
Technical diploma	3	25.0	28	48.3			26	44.1	5	45.5		
Institute Education	2	16.7	19	32.9			21	35.6	0	0.0		
University education	7	58.3	5	8.6			12	20.3	0	0.0		
Occupation level												
Working	7	58.3	22	37.9	1.706	0.192	26	44.1	3	27.3	1.078	0.299
Housewife	5	41.7	36	62.1			33	55.9	8	72.7		

X^2 = Chi square test. No significant at p > 0.05. **highly significant at p ‹ 0.01.

Table (7): Correlation between total pregnant women' knowledge score, total attitude score, and total reported practices score regarding climate change and its effect on pregnancy at pre and post implementation self-instructional module (n=70).

Variables		Total knowledge score		Total attitude score	
		Pre-implementation	Post – implementation (T= 1 M)	Pre- implementation	Post – implementation (T= 1 M)
Total knowledge score	R P				
Total attitude score	R P	0.615 0.000**	0.704 0.000**		
Total reported practices score	R P	0.789 0.000**	0.860 0.000**	0.857 0.000**	0.793 0.000**

R= Pearson correlation coefficient test. P= p-value. (**) highly Statistically significant at $p < 0.01$.

5. DISCUSSION

Climate change has become a global health threat, leading to various environmental issues, such as global warming, precipitation, fires, storms, vector-borne diseases, and extreme weather events. These environmental problems have been linked to certain health risks to pregnant women and their fetuses, including anemia, eclampsia, low birth weight, preterm birth, and miscarriage. Pregnant individuals are particularly vulnerable to climate change impacts since pregnancy represents a time of both psychological and physiological change that can be extremely sensitive to the environment. **(Howells et al., 2025)** . Thus, the aim of this research is to evaluate the effectiveness of the Self- Instructional module in pregnant women's awareness and self-care practices regarding climate change.

Regarding general characteristics of the studied pregnant women, the present research results cleared that, more than one third of the studied pregnant women are from 25-<30 years old with Mean + SD= 29.36 ± 4.57 years. Regarding occupation, more than half of them were housewives.

This result was in the same line with **Kaya et al. (2025)** who conducted "impact of Climate Change Education on Pregnant Women's Anxiety and Awareness" found that the mean age of the studied sample was 29 ± 5.63 years and the majority of the studied sample were housewives. From the researchers point of view, the similarity of the findings might be explained by the fact that this age group represents the most common reproductive age group.

This result is not consistent with the study done by **Shalaby et al. (2023)** who conducted **"**Knowledge and practices of maternity nurses related to the potential impacts of climate change on women's health" reported that the mean age of the studied sample was 36.07±11.01 years. Furthermore, these results are in agreement with **Spencer et al. (2022)** about "The challenges of working in the heat whilst pregnant: insights from Gambian women farmers in the face of climate change." Who reported that the majority of the sample were worked.

Regarding the educational level, the finding of the current study revealed that, more than two fifth of them had diploma. This result in the same line with the study performed by **Afifi et al. (2024)** about Knowledge and Health-Related Behaviors toward Climate Changes and Heat Stress among Pregnant Women Working Outdoors, who stated that more than two fifth of them had diploma education. This congruence of the results may be the social similarity of sample.

This results is not consistent with the study done by **Shamsuddoha et al. (2024)** who conducted " Impacts of climate change-induced natural hazards on women and their human rights implications " reported that slightly more than quarter of them had diploma education. It is may be due to difference between the study samples.

As regards obstetrical history, the findings of current research indicated that, more than one third of the studied women had first pregnancy and the majority of the studied sample didn't have history from previous miscarriage. Also, more than two fifth of them had one birth. These findings are similar to the result of the study performed by **Mohamed et al. (2024)** who conducted "Effect of Climate Change Awareness Program on Knowledge, Attitude and Preventive Practices among Pregnant Women" that reported one third of them had first pregnancy, the majority of the studied sample didn't have history from previous miscarriage and more than two fifth of them had one birth.

However, This results is disagree with the study done by **(Acar & Öter2024)" "**Climate change awareness in pregnant women " and revealed that less than one quarter of the studied women had first pregnancy and nearly half of the studied women didn't have history from previous miscarriage. Also, one quarter of the them had one birth.

Regarding pregnant women' complication related to current pregnancy the current study reveals that more than half of the studied pregnant women complains from elevation blood pressure this finding was in the same line with **Xie et al. (2025).** "Season of conception and risk of hypertensive disorder during pregnancy "reported that more than half of the studied sample had hypertension.

 Moreover, these results are in disagreement with the study done by **ElSayed et al. (2024)** about Effect of Nursing Instructional Module on Pregnant Women 'Knowledge and Practice Regarding Climate Changes, who reported that more than one third of them complain from elevation blood pressure.

Additionally, the finding of the current study revealed that , more than half of them was in second trimester of pregnancy . This result in the same line with the study performed by**(Mohamed EL-Said et al., 2025**) about "Impact of Tailored Educational Intervention on Knowledge and Health Related Behaviors among Outdoors Working Pregnant Women Regarding Climate Change. Egyptian Journal of Health Care", who stated that more than more than half of them was in second trimester of pregnancy.

These results are in disagreement with the study done by **(Osman et al ., 2025)** about "Pregnant Women's Climate Change Adaptation Practices. Egyptian Journal of Nursing and Health Sciences" who reported that less than one fifth of pregnant women was in second trimester.

Concerning pregnant women's knowledge about climate change, the present study revealed that less than one fifth 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 **Kaya et al. (2025)** who conducted "impact of Climate Change Education on Pregnant Women's Anxiety and Awareness" who mentioned that more than half of studied pregnant women had poor knowledge.

On the contrary, these results are inconsistent with **Cvetković et al. (2024)** who studied "Exploring environmental awareness, knowledge, and safety: A comparative study among students in Montenegro and North Macedonia" that reported that the majority of the studied sample had high level of awareness regarding climate change.

Additionally ., These results are inconsistent with **(Ahmed Eladham etal., 2025)** who studied " Effect of a Climate Change Educational Program on University Students' Knowledge, Attitudes, and Practices. Egyptian Journal of Health Care " that reported that the majority of the studied sample had high level of awareness regarding climate change .

Regarding the knowledge of studied pregnant women, the findings of the present study revealed that there was highly statistically significant difference in total mean scores of studied women's knowledge regarding climate changes at pre-intervention and post-intervention phases. The total mean score of knowledge was improved from 6.98±3.98 to 18.12±3.17. This significant improvement is very valuable because acquisition of accurate knowledge is considered the basis of pregnant women regarding climate changes, which is linked to positive attitudes and better practices. This finding can be attributed to the positive impact of the educational program and the well- structured educational sessions. The topic of the study was deemed important and sensitive to the women involved in the study, thereby resulting in their high level of interest and satisfaction during educational sessions. Additionally, an instructional booklet was given to the women in an attempt to reduce any potential risks to the mother and the fetus.

This result was agreed with **Yahia et al. (2025)**, who studied " Effect of Educational Program regarding Climate Changes on Knowledge, Attitudes and Practices of Pregnant Women" that found that the majority of studied pregnant women' knowledge had poor knowledge toward climate changes before the implementation of nursing instructional module and improved to most of them after the implementation. Also, this result was in the same line with the study done by **Shalaby et al. (2023)** who conducted "Knowledge and practices of maternity nurses related to the potential impacts of climate change on women's health " who found that, less than one – quarter of studied sample had poor knowledge regarding climate changes and more than half of studied sample had good knowledge regarding climate change and its impact on pregnant women.

Moreover, our study findings agreed with **Acar, & Öter, 2024)** who studied "Climate Change Awareness in Pregnant Women: A Qualitative Study" reported that participants' knowledge of the effects of climate change on maternal and infant health during pregnancy was incomplete and insufficient.

Page | 149

In addition, this result was in accordance with **Mahmoud et al. (2023)** who studied "Knowledge and practices of maternity nurses related to the potential impacts of climate change on women's health" illustrated that general knowledge about climate change was fair in about two thirds of studied sample.

The insufficient knowledge among pregnant women regarding climate changes might be due to the nature of the women life as many of them were unemployed which made them unable to exchange the information and knowledge about the existing global events like in climate changes, also, being unemployed help them to be away somewhat from the heat, sun burn and other bad effects of climate changes that made them uninterested in the climate issues.

In addition **Abd-Elhamed et al. (2023)** about" Impact of Narrative versus Didactic Information on Pregnant Women's Knowledge, Attitude and Perception Regarding Climate Change" who supported current research findings when indicated that the comparison between the women's knowledge levels during the pre and post intervention among the narrative and did active group. It is clear that the women's level of knowledge was similar between the two groups in the pre-intervention test, with poor level as the percentage was about more one third among the studied groups. While a clear improvement appeared in the women's level of knowledge in the post intervention test as the narrative group represented good level of knowledge with more than two third compared to the deductive group, which documented only less than one tens with a statistically significant differences between participants among both groups after implementation of the intervention as value was <0.001.

However, this result contradicted with **Nwafor et al. (2025)** who studied An assessment of women's knowledge of climate change information in Nigeria reported that the majority of the studied sample had satisfactory knowledge level about climate changes meanwhile the minority had unsatisfactory knowledge level. This contradiction might be because of culture differences between two studies where in Nigeria there is more awareness about climate change since it is most susceptible to climate changes, droughts and floods.

The findings of the current study showed that more than one third of the studied pregnant women have information from social media and around one third of them have information from TV these results agree with **Tattimani et al. (2021)**" who studied The Role of Television in Creating Awareness About Climate Change Issues Among Women " that reported more than one third of them had information from social media and around one third of them had information from TV. Because social media and television are now considered the language of the era and the way through which a person can understand what is going on around city and the world.

However, this result is not compatible with the study done **by Mohammed et al. (2024)** about " Effect of Educational Program Regarding Climate Change on Nursing Students' Awareness, Attitude and Practices in Suez Canal University" who found that less than one quarter of the studied sample had information from social media and TV .

Regarding attitude of studied Pregnant women regarding climate change in pre and post-test, the current study revealed a highly statistical significant difference between pre and post- test, where nearly one third of the women had positive attitude before implementation of nursing instructional module and improved to majority of them after implementation of nursing instructional module indicating that climate change awareness programs significantly influence attitude regarding climate change. This finding is in the same line with **Menon, 2023)** who concluded in a study entitled as "Urgency of Breastfeeding Promotion in Climate Crisis". That targeted educational interventions can improve attitudes towards climate-related health risks, thereby encouraging pregnant women to adopt healthier lifestyle choices that mitigate climate impacts. That cleared nearly one third of them had positive attitude before implementation of nursing instructional module and improved to majority of them after implementation of nursing instructional module.

Also congruent with **Abd-Elhamed et al. (2023)** about" Impact of Narrative versus Didactic Information on Pregnant Women's Knowledge, Attitude and Perception Regarding Climate Change" who supported current research findings when indicated that Climate change awareness programs can positively impact pregnant women's attitudes by educating them on risks, promoting adaptation strategies, and enhancing resilience to mitigate health risks for both mothers and newborns. That cleared nearly one fifth of them had positive attitude before implementation of nursing instructional module and improved to majority of them after implementation of nursing instructional module.

From researchers' point of view, Climate change awareness programs can positively impact the attitudes of pregnant women by increasing their understanding of the potential risks that climate change poses to maternal and fetal health. By educating expectant mothers about the link between environmental factors and pregnancy outcomes, these programs can empower women to make informed choices that protect themselves and their babies. Ultimately, by fostering a sense of responsibility towards the environment and future generations, climate change awareness programs can help pregnant women develop a more proactive and protective attitude towards their own well-being and that of their unborn child.

On the other hand, these findings were disagreed with **Mohammed et al. (2024)** who studied "Effect of Educational Program Regarding Climate Change on Nursing Students' Awareness, Attitude and Practices in Suez Canal University". That reported that slightly more than half had positive attitude toward climate change before and after implementation of module, disclosed that most of the students they studied had completely favorable attitudes toward climate change and global warming.

From researchers' point of view, because students are different from pregnant women in education and have more awareness of the climate changes and impacts that are taking place around them and that they have gone through before in the curricula they have studied.

Regarding reported practices toward climate changes, the current study findings revealed that, there was high statistical significant difference in total mean scores of studied women's reported practices toward climate changes at pre-intervention and post-intervention phases. The total mean score of reported practices was improved from 15.27 ± 9.39 to 46.02 ± 7.79. This improvement in practices might be due to improvement in the knowledge of the pregnant women and educational sessions as most of the studied women were committed with the booklet. In addition, this change in women's practices reflected the effectiveness of educational program. In general, positively changed attitudes and improved knowledge affected the practices in a clear manner.

This result was in agreement with **Ahmed et al. (2025)** who studied "Effect of a Climate Change Educational Program on University Students' Knowledge, Attitudes, and Practices" who revealed a highly statistical significant difference between pre and post- test, where less than two third of the women had satisfactory level of practices before implementation of the program and improved to majority of the women after implementation of program indicating that climate change awareness programs significantly influence pregnant women's practices regarding climate change.

As well as, **Ghazy & Fathy (2023)** noticed that improving in most aspects of studied sample's daily life reported practices. Moreover, total practices of them revealed that the majority of study participants had good practices after the implementation of program compared to less than one quarter before program with highly statistical significant difference between pre-test and post-test phase.

In addition, this result agreed with **Yahia et al. (2025)**, who studied "Effect of Educational Program regarding Climate Changes on Knowledge, Attitudes and Practices of Pregnant Women" reported that less than third of the women had satisfactory level of practices before implementation of Nursing Instructional Module and improved to more than half of the women after implementation of Nursing Instructional Module..Also,This result supported by study of (**Lykins et al. (2023)** who demonstrated that structured awareness programs not only increase knowledge but also empower women to make informed decisions about their health and environmental practices during pregnancy ; in a study conducted to assess climate change anxiety and antenatal distress in expectant female parents.

However**, Fan & Zlatnik., 2023)** pointed out that while knowledge gains are evident, the long term impact on behavior change remains less clear, suggesting a need for ongoing support and resources beyond initial awareness efforts.

From researchers' point of view, climate change educational programs can have a positive impact on improving practices among pregnant women by increasing knowledge and promoting a better understanding of the potential maternal and fetal health risks associated with climate change, this program can empower pregnant women to take proactive steps to protect themselves and their unborn fetuses. Heightened education lead to changes in lifestyle habits, such as reducing exposure to pollutants or adopting sustainable practices, which can contribute to healthier pregnancies and better birth outcomes.

Concerning relation, 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.

In addition, the results reveal that, there were highly statistically significant relation between total pregnant women' attitude at post-intervention and their age and educational level at (P= < 0.01). This result was agreed with **Yahia et al. (2025)**, who studied " Effect of Educational Program regarding Climate Changes on Knowledge, Attitudes and Practices of Pregnant Women" that found that there were highly statistically significant relation between total pregnant women' attitude at post-intervention and their age and educational level at (P= < 0.01).

Pertaining to relation between practice, age and educational level, the present research results clarified that there, there were highly statistically significant relation between total women' reported practice at post-intervention and their age and educational level at (P= < 0.01). This finding demonstrated consistency with the findings of **Farg et al. (2024)** about "Assessment of Pregnant Women Knowledge about Climate Changes and its Effect on Their Pregnancy" who revealed that there were highly statistically significant relation between total women' reported practice at post-intervention and their age and educational level at (P= < 0.01).

Furthermore, the current study found that there was there was highly statistically significant relation between total pregnant women' satisfaction and their age and educational level at (P= < 0.01). This finding demonstrated consistency with the findings of **ElSayed et al. (2024)** about" Effect of Nursing Instructional Module on Pregnant Women' Knowledge and Practice Regarding Climate Changes" who revealed that there highly statistically significant relation between total pregnant women' satisfaction and their age and educational level at (P= < 0.01).

Moreover, the current study found that there was highly statistically significant relation between total pregnant women' satisfaction at post-intervention and their history from complications during current pregnancy at (P= < 0.01).

This result was agreed with **ElSayed et al. (2024)** about" Effect of Nursing Instructional Module on Pregnant Women' Knowledge and Practice Regarding Climate Changes" who reported that was highly statistically significant relation between total pregnant women' satisfaction at post-intervention and their history from complications during current pregnancy at (P= < 0.01).

Concerning correlation, the findings of the present study revealed that, there was a highly significant statistical positive correlation between total knowledge score and (total reported practices & total attitude) scores regarding climate changes at pre-intervention and post intervention phase. This outcome could be explained by the fact that as women's knowledge increased, their attitudes about climate changes were positively changed. This implies that women have more positive views the more knowledgeable they are. Therefore, educating pregnant women about climate changes raises their awareness, which in turn boosts the women's compliance with their care regimen, improves care measures, and ultimately yields beneficial results. This result was in accordance with

This result is congruent with **Afifi et al. (2024)** who reported a highly positive statistical correlation between total knowledge and total health-related behaviors of the studied women; in a study carried out to assess Knowledge and Health-related behaviors toward climate changes and heat stress among pregnant women working outdoors: Tailored educational program.

This result was in accordance with **Mohamed et al. (2024)** who revealed that there was a highly positive correlation between post-program total knowledge level, total attitude and total reported practices scores of studied pregnant women. In addition, this result was supported by study of **Lykins et al. (2023)** who studied "Climate change anxiety positively predicts antenatal distress in expectant female parents" demonstrated that structured awareness programs not only increase knowledge but also empower women to make informed decisions about their health and environmental practices during pregnancy. Moreover, this result agreed with **Eltelt et al. (2023)** who mentioned that 60% of pregnant women have unsatisfactory done practice about climate change as heat stress.

6. CONCLUSION

Based on the current research findings; it was concluded that nursing instructional module had a significant positive effect on enhancement of knowledge, practices and attitude of pregnant women towards climate changes. Additionally, there was highly significant statistical positive correlation between total knowledge score and (total reported practices & total attitude) scores regarding climate changes at pre-Implementation and post-Implementation phase. Hence, the aim of the study was achieved and research hypotheses were accepted.

7. RECOMMENDATIONS

Based on the current study's findings, the following recommendations are made:

- Awareness initiatives are needed for pregnant women to enhance their knowledge, preventive measure of practices and improve their attitude regarding climate change.

- Create effective communication tools, such as brochures, that describe the consequences of climate change on maternal and infant health and are distributed to pregnant women during antenatal follow-up.

Further Recommendation:

- Establishing continuous educational programs for maternity nurses is essential because they act as health educators and play pivotal role in fostering pregnant women's awareness regarding effect of climate changes on their health and fetuses.

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

REFERENCES

[1] **Abd-Elhamed M., Ali A. S., Mohammed T., Ahmed T. R. & Mostafa S. (2023):** Impact of Narrative versus Didactic Information on Pregnant Women's Knowledge, Attitude and Perception Regarding Climate Change. Egyptian Journal of Health Care, 14(2): 1096-1109. Anwar, W., Bian, A., El Feky, G.

[2] **Aborode, A. T., Otorkpa, O. J., Abdullateef, A. O., Oluwaseun, O. S., Adegoye, G. A., Aondongu, N. J.,... & Komakech, J. J. (2025):** Impact of Climate Change-Induced Flooding Water Related Diseases and Malnutrition in Borno State, Nigeria: A Public Health Crisis. *Environmental Health Insights*, *19*, 11786302251321683.

[3] **Acar, B. T., & Öter, E. G. (2024):** Climate change awareness in pregnant women: A qualitative study. *Ordu Üniversitesi Hemşirelik Çalışmaları Dergisi*, *7*(1), 38-45.

[4] **Adebayo, A. L., Davidson Mhonde, R., DeNicola, N., & Maibach, E. (2020):** The effectiveness of narrative versus didactic information formats on pregnant women"s knowledge, risk perception, self-efficacy, and information seeking related to climate change health risks. International journal of environmental research and public health, 17(19), 6969.

[5] **Afifi, O. A. W., Baraia, Z. A., Abdel-Mordy, M. A., & Emam, A. M. M. (2024):** Knowledge and Health-Related Behaviors toward Climate Changes and Heat Stress among Pregnant Women Working Outdoors: Tailored Educational Program. Assiut Scientific Nursing Journal, 12(43), 1-19.

[6] **Ahmed Abd-Elhamed, M., Ahmed Ali Al Shamandy, S., Shaaban Mohammed, T., Taha Ahmed Abou-Elazab, R., & Shehata Mostafa, S. (2023):** Impact of Narrative versus Didactic Information on Pregnant Women's Knowledge, Attitude and Perception Regarding Climate Change. Egyptian Journal of Health Care, 14(2), 1096-1109.

[7] **Ahmed Eladham, N., Hassan Hassan Osman, Z., Amin Awad Salama, L., Abdellatif Farrag Hamza, E., & Awad Mekhamier, H. (2025):** Effect of a Climate Change Educational Program on University Students' Knowledge, Attitudes, and Practices. *Egyptian Journal of Health Care*, *16*(1), 16-28.

[8] **Akhtar R. (2024):** Introduction: Climate Change and Human Health Scenarios. In Climate Change and Human Health Scenarios: International Case Studies (pp. 1-12). Cham: Springer Nature Switzerland

[9] **Ali, N. M., Khan, M. K., Mazhar, B., & Mustafa, M. (2025):** Impact of Water Pollution on Waterborne Infections: Emphasizing Microbial Contamination and Associated Health Hazards in Humans. *Discover Water*, *5*(1), 19.

[10] **Banafshi Z., Khatony A., Jalali A. & Jalali R. (2024):** Exploring the lived experiences of women with multiple gestations in Iran: a phenomenological study. BMC Pregnancy and Childbirth, 24(1), 203.

[11] **Beevers, S., Assareh, N., Beddows, A., Stewart, G., Holland, M., Fecht, D.,... & Dajnak, D. (2025):** Climate change policies reduce air pollution and increase physical activity: Benefits, costs, inequalities, and indoor exposures. *Environment International*, *195*, 109164.

[12] **Brown, M. J., White, B. P., & Nicholas, P. K. (2022).** Mental health impacts of climate change: Considerations for nurse practitioners. The Journal for Nurse Practitioners, 18(4), 359-363. https://doi.org/10.1016/j.nurpra. 2021.07.013 .

[13] **Bonell, A., Part, C., Okomo, U., Cole, R., Hajat, S., Kovats, S., & Hirst, J. (2024):** An expert review of environmental heat exposure and stillbirth in the face of climate change: Clinical implications and priority issues. BJOG: An International Journal of Obstetrics & Gynaecology, 131(5), 623-631.

[14] **Chen, S. H., Lin, B. B., Wang, X. Y., Xu, G. R., & Song, J. H. (2025):** Construction and implementation of a comprehensive midwifery skills practice course based on scenario simulation teaching: An action research. *Nurse Education Today*, 106754.

[15] **Cvetković, V. M., Sudar, S., Ivanov, A., Lukić, T., & Grozdanić, G. (2024):** Exploring environmental awareness, knowledge, and safety: A comparative study among students in Montenegro and North Macedonia. *Open Geosciences*, *16*(1), 20220669.

[16] **Devi, S. (2025):** Global Environment Issues For Health. *ldealistic Journal of Advanced Research in Progressive Spectrums (IJARPS) eISSN–2583-6986*, *4*(01), 89-92.

[17] **El–Nasr, E. M. S., Shaban, M. M., El Nour, R. A. E. A., Mohamed, S. M., & Baraka, N. I. M. (2025):** Empowerment Program about Health Risks of Global Warming and Sustainability Practices among Nurses Providing Maternal and Child Health Services.

[18] **ElSayed, H. F., Mohamed, E. A., & Abass, E. I. (2024):** Effect of Nursing Instructional Module on Pregnant Women'Knowledge and Practice Regarding Climate Changes. *International Egyptian Journal of Nursing Sciences and Research*, *4*(2), 504-522.

[19] **Eltelt R. M. H., Shafik S. A. & Mohamed S. S. A. E. G. (2023):** Adverse Health Effects of Climate Change on Pregnant Women Working Outdoors. HIV Nursing, 23(2):473- 488.

[20] **Fan, W., & Zlatnik, M. G. (2023):** Climate change and pregnancy: risks, mitigation, adaptation, and resilience. Obstetrical & gynecological survey, 78(4),223-236.

[21] **Farg, N. A. K., Khamis, M. A., & Mohamed, H. M. (2024):** Assessment of Pregnant Women Knowledge about Climate Changes and its Effect on Their Pregnancy. *Assiut Scientific Nursing Journal*, *12*(45), 277-286.

[22] **Filipec, M., & Đurin, M. J. (2025):** Thermoregulation and Endocrine Response During Exercise in Pregnancy. *Physiologia*, *5*(1), 2.

[23] **Ghazy HK & Fathy DM. (2023):** Effect of Awareness Program Regarding Climate Change on Knowledge, Attitudes and Practices of University Students. International Egyptian Journal of Nursing Sciences and Research (IEJNSR), 3(2):186-203.

[24] **Howells, M., Palmquist, A. E., Josefson, C., Dancause, K., Quinn, E., Daniels, L., & Blair, A. F. O. (2025).** Climate change, evolution, and reproductive health: The impact of water insecurity and heat stress on pregnancy and lactation. Evolution, Medicine, and Public Health, eoaf008.

[25] **Ibrahim, S. M. E., Elmawla, A., Abd Elhameed, D., & Ali, S. M. (2023):** Climate Change and Health: Effect of Awareness Program on Knowledge, Attitudes and Practices of Community Dwelling Elderly. Tanta Scientific Nursing Journal, 32(4), 245-272.

[26] **Japan- Caribbean Climate Change Partnership .(2017)** .Knowledge, attitude and practice study on climate change , available at , https://www.adaptation- undp.org/sites/default/files/resources/knowledge_attitudes_and_practice_ study_on_climate_change_saint_vincent_and_the_grenadines_final.pdf

[27] **Kaya, L., Keles, E., Baydili, K. N., Kaya, Z., & Kumru, P. (2025):** Impact of Climate Change Education on Pregnant Women's Anxiety and Awareness. *Public Health Nursing*, *42*(1), 54-60.

[28] **Lopez, J., J., D., and Malay, C., A., (2019):** "Awareness and Attitude Towards Climate Change of Selected Senior High Students in Cavite, Philippines" Asia Pacific Journal of Multidisciplinary Research, Vol. 7, No. 2, Part III May 2019 http://www.apjmr.com

[29] **Lykins, A. D., Bonich, M., Sundaraja, C., & Cosh, S. (2024):** Climate change anxiety positively predicts antenatal distress in expectant female parents. Journal of Anxiety Disorders, 101, 102801.

[30] **Mansour, S.E., Gouda, A.M.I., and Ibrahim, A.A.(2020):** Effect of an Educational Program on Nurses' Knowledge and Attitudes Regarding Umbilical Cord-blood Stem Cells Preservation. IOSR Journal of Nursing and Health Science (IOSR-JNHS); 9(1): 78-89. DOI: 10.9790/1959-0901137889.

[31] **Mahmoud F. H. & Mahmoud B. H. (2023):** Effect of climate change on health and critical care nurses practice. The Egyptian Journal of Hospital Medicine, 90(1):1149- 1155.

[32] **Menon, P. (2024):** Urgency of Breastfeeding Promotion in Climate Crisis. *Journal of Marine Medical Society*, *26*(3), 450-451.

[33] **Mittal, K. (2025):** Scorching heat impact on health: increasing deaths from mental health problems. In *Health and Climate Change* (pp. 73-95). Academic Press.

[34] **Mohamed EL-Said, F., Morgan Farahat Khatap, A., Youssif Ali Awad, E., & Gamal Mohamed, M. (2025**). Impact of Tailored Educational Intervention on Knowledge and Health Related Behaviors among Outdoors Working Pregnant Women Regarding Climate Change. *Egyptian Journal of Health Care*, *16*(2), 226-244.

[35] **Mohamed, S. H., Ahmed, M. R., Behilak, S. E. G., Ghanem, N. M. A., & Elgamasy, B. S. M. (2024):** Effect of Climate Change Awareness Program on Knowledge, Attitude and Preventive Practices among Pregnant Women. International Egyptian Journal of Nursing Sciences and Research, 5(2), 205-220.

[36] **Mostafa, A. R., Owes, A. M., & Ghoniem, S. A. (2025):** Interconnected impacts of climate change on biodiversity, agriculture and human health. *Advances in Basic and Applied Sciences*, *4*(1), 43-63.

[37] **Neale, P. J., Hylander, S., Banaszak, A. T., Häder, D. P., Rose, K. C., Vione, D.,... & Zepp, R. G. (2025):** Environmental consequences of interacting effects of changes in stratospheric ozone, ultraviolet radiation, and climate: UNEP Environmental Effects Assessment Panel, Update 2024. *Photochemical & photobiological sciences*, 1-36.

[38] **Nickoloff, A. G., Olim, S. T., Eby, M., & Weaver, A. J. (2025):** Environmental impacts from the widespread implementation of ocean thermal energy conversion. *Climatic Change*, *178*(5), 1-21.

[39] **Nwafor-Orizu, O. E., Okonkwo, I. N., & Obiozor-Ekeze, R. N. (2025):** An assessment of women's knowledge of climate change information in Nigeria: The case of Onitsha women. *Journal of Library Services and Technologies*, *7*(1), 72-80.

[40] **Osman, N. E., Mohamed Elsayed, H. E., & Hamed, G. H. (2025**). Pregnant Women's Climate Change Adaptation Practices. *Egyptian Journal of Nursing and Health Sciences*, *6*(2), 54-78.

[41] **Shalaby, N., Mahmoud, A., Hassan, A., Hassan Taman A. (2023):** Knowledge and practices of maternity nurses related to the potential impacts of climate change on women's health. Egyptian journal of health care of Alexandria University, 10.21608/ejhc.2023.309373

[42] **Shamsuddoha, M., Jabed, M. A., Islam, M. S., Sultana, N., Imran, A., Rabbi, S. N. A.,... & Sharif, M. M. (2024):** Impacts of climate change-induced natural hazards on women and their human rights implications: A study in the southwest coast of Bangladesh. *Journal of Migration and Health*, *9*, 100221.

[43] **Siiba A., Kangmennaang J., Baatiema L. & Luginaah I. (2024):** The relationship between climate change, globalization and non-communicable diseases in Africa: A systematic review. Plos one, 19(2), e0297393.

[44] **Spencer, S., Samateh, T., Wabnitz, K., Mayhew, S., Allen, H., & Bonell, A. (2022):** The challenges of working in the heat whilst pregnant: insights from Gambian women farmers in the face of climate change. *Frontiers in Public Health*, *10*, 785254.

[45] **Tattimani, D., Naik, S., & Kakade, O. (2021):** The Role of Television in Creating Awareness About Climate Change Issues Among Women. *Journal of Research in Humanities and Social Science*, *9*(6), 18-23.

[46] **Wang, X., Iqbal, S., Amin, N., Hussain, M., Zaman, S., & Khan, S. (2025).** The role of government effectiveness, technological innovations, natural resource protection on carbon emissions in Gulf Cooperation Council region: A pathway for achieving sustainable development goals by 2030. *Journal of Environmental Management*, *377*, 124506.

[47] **Wilson, M.E. (2025):** Spillover: From climate change to pandemics. *Field Actions Science Reports. The journal of field actions*, (Special Issue 27), 58-64.

[48] **Xie, Y., Mu, Y., Chen, P., Wang, Y., Li, X., Dai, L.,... & Zhu, J. (2025):** Season of conception and risk of hypertensive disorder during pregnancy. *BMC Pregnancy and Childbirth*, *25*(1), 97.

[49] **Yahia Abd-Elshakour, H., Ahmed Hassan Omran, A., Mohamed Salama, A., & Abdel-Wahab Afifi Araby, O. (2025):** Effect of Educational Program regarding Climate Changes on Knowledge, Attitudes and Practices of Pregnant Women. Journal of Nursing Science Benha University, 6(1), 209-226.