

Effect of an Educational Program about Climate Change Based on Protection Motivation Theory on Knowledge and Daily Life Practices of Rural Women

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Abstract

Background: Climate change is a critical global challenge that requires urgent and inclusive responses. Empowering rural women by recognizing their knowledge and practices is essential to strengthen resilience and promote sustainable communities. **Aim:** to evaluate effect of an educational program about climate change based on protection motivation theory on knowledge and daily life practices of rural women. **Study design:** A quasi-experimental research design was utilized. **Study setting:** This study was conducted at Kharsit Rural Health Unit, El-Gharbeya Governorate, which is affiliated with the Ministry of Health and Population. **Study subjects:** A convenience sample of 150 rural women who attended the aforementioned setting for various reasons and were willing to participate. **Study tools:** Three tools were used for data collection: **Tool (I):** Rural women's knowledge about climate change, which consisted of two parts: Socio-demographic characteristics of rural women and rural women's knowledge about climate change. **Tool (II):** Protection motivation scale. **Tool (III):** Self-reported daily life practices of rural women regarding climate change. **Results:** The majority of the studied rural women had low levels of knowledge and unsatisfactory practice scores regarding climate change before the program, and all participants also exhibited low protection motivation. Two months after the intervention, more than three-quarters of the women demonstrated high levels of knowledge and protection motivation, and about two-thirds achieved satisfactory practices. **Conclusion:** The health education program about climate change based on the Protection Motivation Theory was effective in improving rural women's knowledge and daily life practices in relation to climate change. **Recommendations:** Rural health services need to implement climate change health education initiatives for rural communities, by adopting culturally sensitive and socially relevant communication strategies.

Keywords: Educational program, Climate change, Protection Motivation Theory, Knowledge, Daily life practices, Rural women.

Introduction

Climate change is an urgent global issue requiring immediate attention and action. It involves enduring shifts in temperature, humidity, and rainfall, not just short-term weather fluctuations, observed over several decades. Human activities are the primary causes of these changes (**National Aeronautics and Space Administration [NASA], 2024**). Overuse of fossil fuels (coal, oil, and gas) to generate electricity, deforestation, land-use changes, industrial operations, and agricultural practices emit massive amounts of greenhouse gases such as carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) into the atmosphere. The Earth's average temperature and climate variability increase as a result of these gases' absorption of solar heat (**U.S. Environmental Protection Agency [EPA], 2025**).

Increasing global temperatures, changes in precipitation patterns, melting polar ice caps, ocean acidification, and increasing sea levels have all occurred due to increased emissions in recent years. According to the National Centers for Environmental Information (2025), the average rise in global temperature was 1.27°C in 2024 and is expected to increase to 4.9°C in 2100 unless it is mitigated beforehand. This results in frequent heat waves, water scarcity, drought, and wildfires. Also, global sea level is expected to reach 2 meters by the end of this century due to ongoing global warming and melting of polar ice caps, leading to flash floods and displacement of

coastal communities (**National Oceanic and Atmospheric Administration [NOAA], 2023**).

No country or region is exempt from the catastrophic effects of climate change; however, developing countries, including Egyptian rural communities are vulnerable to its effects due to a combination of socioeconomic, environmental, geographical factors, and a decrease in their adaptive resources and their overreliance on agriculture, which is a climate-sensitive sector. One of the three hotspots for severe climate vulnerability in the world is the Nile River Delta in Egypt. (**World Bank Group [WBG], 2021**).

The agriculture sector, which is a pillar of Egypt's economy, is projected to suffer. Crop production is projected to decrease by 8 to 47% by 2060 due to increased temperatures, extreme weather events, drought, and the proliferation of plant diseases and pests. This decline in production is likely to drive up food prices, affecting Egyptian rural communities (**WBG, 2022**). Water resources are also at risk. Egypt already has an annual water shortage of over 7 billion cubic meters. Climate change exacerbates this issue by increasing water demand and reducing the availability of water resources (**National Water Research Center [NWRC], 2025**).

Responding to these potential dangers, Egypt has launched the National Climate Change Strategy 2050. The primary objective of Egypt's strategy is to enhance awareness and manage knowledge

about climate change. The country acknowledges the crucial role of educating rural communities in cultivating their collective responsibility and commitment to climate change mitigation (**Egyptian Environmental Affairs Agency [EEAA], 2022**).

Rural women, being the primary household managers, are key to transitioning toward a sustainable future for mitigating climate change impacts. Their close interaction with the environment makes them responsible for resource management and conservation (**Chitiga-Mabugu, Henseler, Maisonnave, & Mabugu, 2023**). Health education is crucial for equipping them with knowledge about climate change and its effects. This education should promote climate-friendly behaviors such as efficient water use, clean energy adoption, and waste recycling. It should also encourage the reduction of food waste, use of energy-efficient appliances, eco-friendly products, and sustainable transportation (**Boermans, Jagoda, Lemiski, Wegener, & Krzywonos, 2024**). Protection Motivation Theory (PMT) is a communication framework first introduced by Rogers in 1975. Theory sheds light on the factors that affect an individual's willingness to react to a perceived risk. It is presumed that the decision to get involved in protective behaviors is based on an assessment of two primary components: threat appraisal and coping appraisal. Threat appraisal is a cognitive process that comprises perceived severity and susceptibility, whereas coping

appraisal is an individual's ability to respond to a danger, which includes self-efficacy, response efficacy, and perceived cost. According to this theory, rural women are more likely to engage in climate-friendly behaviors when perceived severity, susceptibility, self-efficacy, and response efficacy are high and perceived costs are low (**Rogers, 1975**).

Community health nurses play a vital role in educating rural women about climate change and its environmental impact. They can increase knowledge and adoption of climate-friendly practices by creating awareness about risks and potential consequences. By engaging and empowering rural women, they can support the creation of a climate-friendly community, promoting a sustainable and resilient future (**Maiz, M. A., Rashed, M., & Shetaway, A., 2024**).

Significance of the study:

According to the Notre Dame Global Adaptation Initiative (ND-GAIN) Index, Egypt ranked 105th out of 182 nations in 2023. It was also ranked 27th globally in energy-related CO₂ emissions (**Abdallah & El-Shennawy, 2020**). Therefore, Egypt recognized the importance of strengthening and promoting pro-environmental behaviors, particularly among rural women as active agents in their rural communities (**Eletrebi & Zaki, 2023**). Rural women's conscious choices and proactive environmentally friendly behaviors are crucial for driving sustainability and combating climate change, highlighting the significant

environmental impact of their daily-life practices (Aldosari, 2025).

Study aim was to evaluate effect of an educational program about climate change based on protection motivation theory on knowledge and daily life practices of rural women.

Study design: A quasi-experimental research design was utilized in this study.

Study setting: This study was conducted at Kharsit Rural Health Unit, El-Gharbeya Governorate, which is affiliated with the Ministry of Health and Population.

Subjects: A convenience sample of 150 rural women who attended the aforementioned setting for various reasons and were willing to participate.

The sample size and power analysis were calculated using the Epi-Info software statistical package. The criteria used for sample size calculation were as follows: 95% confidence limit, 80% study power analysis, and attendance rate = 205 clients/ month. Based on the previously mentioned criteria, the sample size was found to be N=150 rural women.

Data collection tools

Tool I: Rural women's knowledge about climate change. It was developed by the researcher in the Arabic language after reviewing related literature (Salem et al., 2022; Sambath, Narayan, Kumar, Kumar, & Pradyumna, 2022). It included the following two parts:

Part (1): Socio-demographic characteristics of rural women: - Data on rural women's age, marital status, occupation, educational

attainment, number of rooms, number of household members, and the family's monthly income were included.

Part (2): Rural women's knowledge about climate change:-It involved nine questions covering definitions of climate change and global warming, causes, contributing factors, daily life practices, greenhouse gases, climate change implications, mitigating strategies, and stakeholders' responsibility.

The scoring system: the knowledge score was calculated as follows: the correct answer was scored "one", while incorrect/don't know answers were scored "zero." These scores were summed up. The total knowledge score was 56. The total score was converted into a percentage score and classified into:

- **Low level of knowledge:** < 50% of the total knowledge score.
- **Moderate level of knowledge:** 50% - < 65% of the total knowledge score.
- **High level of knowledge:** ≥ 65% of the total knowledge score.

Tool II: Protection motivation scale. The constructs of this scale were adapted by the researcher based on the constructs of protection motivation theory developed by Rogers 1975 (Rogers, 1975). This scale was used to assess protection motivation factors affecting rural women's reactions to climate change. It consisted of the following constructs:

I. Threat appraisal

a. Rural women's perceived severity of climate change: This comprised of eight statements that

addressed rural women's beliefs on the serious and negative consequences of climate change.

b. Rural women's perceived vulnerability to climate change:

This comprised eight statements assessing rural women's beliefs regarding the susceptibility of themselves, their families, and their communities to the negative impacts of climate change.

II. Coping appraisal

a. Rural women's perceived response-efficacy of climate change:

This included 35 statements that addressed rural women's beliefs in the effectiveness of recommended practices for reducing climate change impacts. It was divided into five categories. These categories were energy conservation, water conservation, transportation, waste reduction and recycle practices and community participation practices.

b. Rural women's perceived self-efficacy of climate change: This consisted of six statements illustrating rural women's belief in their ability and confidence to adopt climate-friendly practices.

c. Rural women's perceived costs of climate change: This construct comprised of five statements that describe rural women's beliefs regarding obstacles that prevent them from engaging in climate-friendly practices.

III. Rural women's protection motivation (intention) of climate change: This included overall statement and 35 sub-

statements that covered rural women's intention to change their lifestyle and habits that reduce greenhouse gas emissions and mitigate the effects of climate change.

The scoring system: For perceived severity, perceived vulnerability, and protection motivation (intention) constructs, rural women responded on a three-point Likert scale from 1-3, indicating that they agreed (3), were neutral (2), or disagreed (1). Regarding perceived costs construct items, the scale was inverted as follows disagree (3), neutral (2), agree (1). In terms of perceived response efficacy, construct items were rated on a three-point Likert scale ranging from 1-3: very effective (3), quite effective (2), and not effective at all (1). While items in the perceived self-efficacy construct were scored on a three-point Likert scale from 1-3, indicating very certain (3), quite certain (2), or not certain at all (1).). The total scores were calculated for each construct then summed up to calculate the total score of protection motivation scale. The total score ranged (98-294). The higher score indicated the higher self-protection motivation of rural women. The total score was converted into percentage, and then classified into:

- **Low protection motivation:** < 70 % of the total score.
- **High protection motivation:** ≥ 70 % of the total score.

Tool III: Self-reported daily life practices of rural women regarding climate change. The researcher developed this tool based on literatures review (Kircher et al.,

2022; Talavera, Bustos, & Rebancos, 2020) to assess rural women's self-reported climate change-related practices in daily life. It consisted of 35 statements related to energy conservation and the usage of clean energy, water conservation, smart transportation, waste reduction and recycling, and active participation in environmental protection practices.

The scoring system: Using a three-point Likert scale with a range of 1-3, the daily life practices of rural women were scored as follows, always (3), sometimes (2) and never (1). Statements related to self-reported practices on energy conservation and the use of smart transportation that were recorded according to their availability (if available or not), they were excluded from calculation of the total score. The excluded items comprised three specific statements. Total practice score for all other items was summed up to be (96). The higher scores signified better adoption of climate-friendly practices. The total score was divided into the following categories after being converted to a percentage: **Unsatisfactory practices:** < 70% of the total practice score. **Satisfactory practices:** ≥ 70% of the total practice score.

Method

Obtaining approval: The Dean of the Faculty of Nursing granted the director of the Kharsit Rural Health Unit official permission to conduct this study.

Ethical considerations: Before initiating the study, official approval was received from Tanta University's

Faculty of Nursing Scientific Research Ethical Committee. (Code: 305/10/2023). After a detailed explanation of the study's objectives, all participating women provided informed consent. Each participant was informed that she could withdraw from the study at any time. The study procedures did not cause any injury or discomfort to participants, and strict measures were taken to preserve the confidentiality and privacy of all obtained data. Additionally, the interview sheet was designed to ensure complete anonymity.

Validity: The questionnaire's face validity was evaluated by experts and found to be 95%, while the content validity index of its items was 98% for the knowledge questionnaire, 96% for the Protection Motivation Scale questionnaire, and 95% for the self-reported daily life practices questionnaire. The overall questionnaire content validity index was 96%.

Pilot study: The researcher conducted a pilot study on 15 rural women, representing 10% of the total sample, to assess the clarity, applicability, and reliability of the study tools, as well as to estimate the time required for data collection from each. The necessary modifications were made, and these women were excluded from the main study.

Reliability: Cronbach's alpha coefficient was used to assess the reliability of the tools for 150 items applied to 15 women. The reliability coefficient was 0.803.

Development of the educational program: The program was implemented in the following phases:

I) Assessment phase: During the pre-intervention assessment, predesigned study tools were used to interview each woman individually in the predetermined setting to assess women's knowledge, protection motivation, and daily life practices related to climate change, as well as socio-demographic data about the study subjects.

II) Planning phase: The following steps were taken in order to plan the educational program in accordance with the needs of the women as identified by the assessment phase and the literature review:

A. The general goal of the educational program: was to improve the rural women's knowledge, protection motivation, and daily life practices regarding climate change mitigation. **The specific objectives:** were formulated for each session.

B. Preparing educational program content (booklet): according to the predetermined needs of women.

C. Teaching methods and materials: Lectures, group discussions, and brainstorming sessions were used to actively engage the participants. Women were encouraged to share their personal experiences and perspectives through storytelling. The educational content was delivered using PowerPoint presentations and illustrative

pictures and videos. Additionally, each woman received a booklet designed as a guided learning resource to support and reinforce the program's content.

III) Implementation: The educational program was structured into four well-organized sessions, each lasting approximately 45 to 60 minutes as follows:

Sessoir (1): It aimed to inform the studied women about the significance of the program, its sessions and contents.

Session (2): It aimed to help the studied women to identify the risk groups of climate change, its causes, and impacts particularly, in rural and on women's and family's health, livelihoods, and well-being.

Session (3): It aimed to enable and convince the studied women to identify and adopt climate-friendly practices.

Session (4): It aimed to help studied women to overcome barriers to adopt climate change mitigation practices and build confidence in their ability to take action to address climate change.

The researcher implemented the entire educational program to ensure the delivery of comprehensive, consistent, and accurate knowledge about climate change. The researcher met with participating women in the health unit's conference room, built rapport with them, described the program's purpose and relevance, and received their informed consent to participate. A pretest assessment of women's baseline knowledge, Protection Motivation Theory (PMT)

constructs, and daily life practices related to climate change were conducted to identify their learning needs. Each session included approximately five to six women, with group size determined according to the total number of participants and their circumstances. The timing of subsequent sessions was arranged individually with each participant, and educational booklets on climate change were distributed as reference materials. The post-test assessment schedule was also set with each woman and contact information (telephone number or address) was collected to facilitate follow-up after two months. The total duration of the study extended over approximately eight months, from April to November 2024.

IV) Evaluation phase: Evaluation was conducted twice.

- **First time (pre-test):** Prior to the beginning of the educational program for the women using tools I, II, and III.
- **Second time (Follow-up):** Two months after the implementation of the educational program, evaluation was conducted using tools I (part 2), II, and III.

Statistical analysis

The Statistical Package for the Social Sciences (SPSS) software, version 25 (IBM Corp., Armonk, NY, USA), was used to code, enter, and statistically analyze the data that had been gathered. The Kruskal–Wallis’s test (χ^2 value) was used to compare means between more than two groups, whereas the Mann–Whitney U test (Z value) was used to compare means between two independent

groups with non-parametric data. The relationship between the variables was evaluated using Pearson's correlation coefficient (r). For all analyses, a significance level of $p < 0.05$ was considered statistically significant.

Results

Table (I) demonstrates the socioeconomic characteristics of the women under study. It shows that the average age of the rural women in the study was 31.31 ± 5.03 years, with a range of 23–43 years. Additionally, the table indicated that over half (52.7% and 55.3, respectively) of them were housewives and had a secondary level of education. Half (50%) of the studied women had families of four members, while 61.3% of them had two rooms in their houses. The majority (92%) of the studied women reported that their family monthly income was just enough.

Table (II) shows levels of total knowledge score among studied rural women throughout the study period. It shows that prior to the program's implementation, the majority of the women in the study (82.7%) had low knowledge about climate change; after the program, this percentage dropped to 0.7%. Moreover, over three-quarters (76%) of them showed a statistically significant improvement in their knowledge ($P=0.0001$). Moreover, the table reveals that there was a significant increase in the total mean score of studied rural women's knowledge throughout the study period, from 19.93 ± 12.02 before the program to

45.94 ± 9.63 two months after the program.

Table (III) demonstrates a statistically significant increase in the mean scores of all protection motivation constructs for the rural women under study, two months after program implementation. Additionally, the table demonstrates a statistically significant improvement in the total means scores of protection motivation constructs ($p = 0.0001$). Similarly, the total coping appraisal score showed a marked rise ($p = 0.0001$). Consequently, the total protection motivation scale mean score exhibited a marked and statistically significant increase from 159.31 ± 23.29 before the intervention to 265.90 ± 24.37 two months after the intervention ($p = 0.0001$).

Figure (I) demonstrates the total score levels of protection motivation scale of the studied women throughout the study period. It shows that two months after the intervention, the total levels of the protection motivation scale improved in a highly statistically significant manner ($p = 0.0001$). As all studied rural women (100%) exhibited a low level of protection motivation prior to the educational program. However, two months post-intervention, this percentage markedly improved, with 79.3% of the women gaining a high level of protection motivation.

Table (IV) demonstrates a statistically significant improvement throughout the study period in the total mean of the rural women's self-reported daily life practices with regard to climate change ($p=0.0001$).

All items under study showed notable improvements. Consequently, the total self-reported daily life practices mean score increased substantially from 51.83 ± 7.27 pre-program to 86.51 ± 8.17 post-program.

Figure (II) demonstrates levels of total self-reported daily life practices of studied rural women throughout the study period. It shows that, before the program implementation, all studied rural women reported unsatisfactory total practice level scores compared with only 37.3% post intervention. Meanwhile, about two-thirds (62.7%) of the studied rural women had satisfactory practices after intervention. A statistically significant difference was observed ($p = 0.0001$).

Table (V) shows that the totals of the scores for all protection motivation constructs, total knowledge, and total self-reported practices were statistically and positively correlated ($r=0.749$, $p=0.0001$).

Table (VI) reveals a statistically significant relationship between the mean total knowledge score and sociodemographic characteristics, including occupation, number of family members, and number of rooms before program implementation. After the program implementation, there was a significant relation between the total mean knowledge score and both occupation and educational level of the studied women.

Table (VII) indicates that the mean total knowledge score and sociodemographic characteristics, such as occupation, number of family members, and number of rooms,

prior to the program implementation had a statistically significant relationship. Following the program's implementation, a significant relationship was found between the studied women's total mean knowledge score, occupation, and educational attainment. The table also shows that age, educational

level, and number of family members were statistically significant determinants of women's practice scores before the program implementation. Meanwhile, the family's monthly income was the only statistically significant determinant after the program's implementation ($p < 0.05$).

Table (I): Distribution of the studied rural women regarding to their socio-demographic characteristics

Socio-demographic characteristics	The studied rural women (n=150)	
	N	%
Age years: -		
23-30	69	46.0
>30-43	81	54.0
Range	23-43	
Mean±SD	31.31±5.03	
Occupation: -		
Housewife	79	52.7
Employee	71	47.3
Educational level: -		
Primary education	13	8.7
Secondary	83	55.3
High education	54	36.0
Number of family members: -		
Three	6	4.0
Four	75	50.0
Five	69	46.0
Number of rooms in the house: -		
Two	92	61.3
Three	58	38.7
Crowding index:-		
≤ 2	150	100
#Family monthly income: -		
Just enough	138	92.0
Enough to be spared	12	8.0

#According to women view

Table (II): Distribution of the studied rural women according to their levels of total knowledge about climate change throughout the study

Total knowledge about climate change	The studied rural women before and two months after educational program (n=150)				χ^2 test P value
	Before		Two months after		
	N	%	N	%	
Total knowledge level					210.412 0.0001*
- Low level	124	82.7	1	0.7	
- Moderate level	12	8.0	35	23.3	
- High level	14	9.3	114	76.0	
Total knowledge score (0-56)					
- Range	3-53		27-55		
- Mean±SD	19.93±12.02		45.94±9.63		
- Z value	13.613				
- P value	0.0001*				

*Statistically significant (P<0.05)

Table (III): Distribution of the studied rural women according to their total mean scores of protection motivation scale constructs throughout the study period

Protection motivation scale (Each item was scored 1-3)	No. of statements (Score)	Mean score of the studied rural women before and two months after educational program (n=150)		Z value P value
		Before	Two months after	
		Range Mean $\pm$ SD	Range Mean $\pm$ SD	
A-Threat appraisal construct scores				
1. Perceived severity	8 (8-24)	8-24 13.22 $\pm$ 4.25	16-24 22.05 $\pm$ 2.55	13.304 0.0001*
2. Perceived vulnerability	8 (8-24)	8-24 16.16 $\pm$ 3.19	16-24 23.50 $\pm$ 1.03	13.488 0.0001*
Total threat appraisal construct score	16 (16-48)	16-48 29.38$\pm$7.11	32-48 45.55$\pm$3.40	13.323 0.0001*
B-Coping appraisal construct scores				
1. Perceived response-efficacy	35 (35-105)	43-72 53.61 $\pm$ 8.31	74-105 92.30 $\pm$ 10.98	15.021 0.0001*
2. Perceived self-efficacy	6 (6-18)	6-12 7.89 $\pm$ 2.25	12-18 15.03 $\pm$ 2.51	14.562 0.0001*
3. Perceived response cost	5 (5-15)	5-11 6.13 $\pm$ 1.56	10-15 13.53 $\pm$ 1.43	15.151 0.0001*
Total coping appraisal construct score	46 (46-138)	54-95 67.62$\pm$10.92	97-138 120.87$\pm$14.22	15.016 0.0001*
C-Protection motivation intention	36 (36-108)	50-79 62.31$\pm$7.92	82-108 99.48$\pm$8.48	15.059 0.0001*
Total protection motivation scale score	98 (98-294)	131-219 159.31$\pm$23.29	222-294 265.90$\pm$24.37	15.014 0.0001*

*Statistically significant (P<0.05)

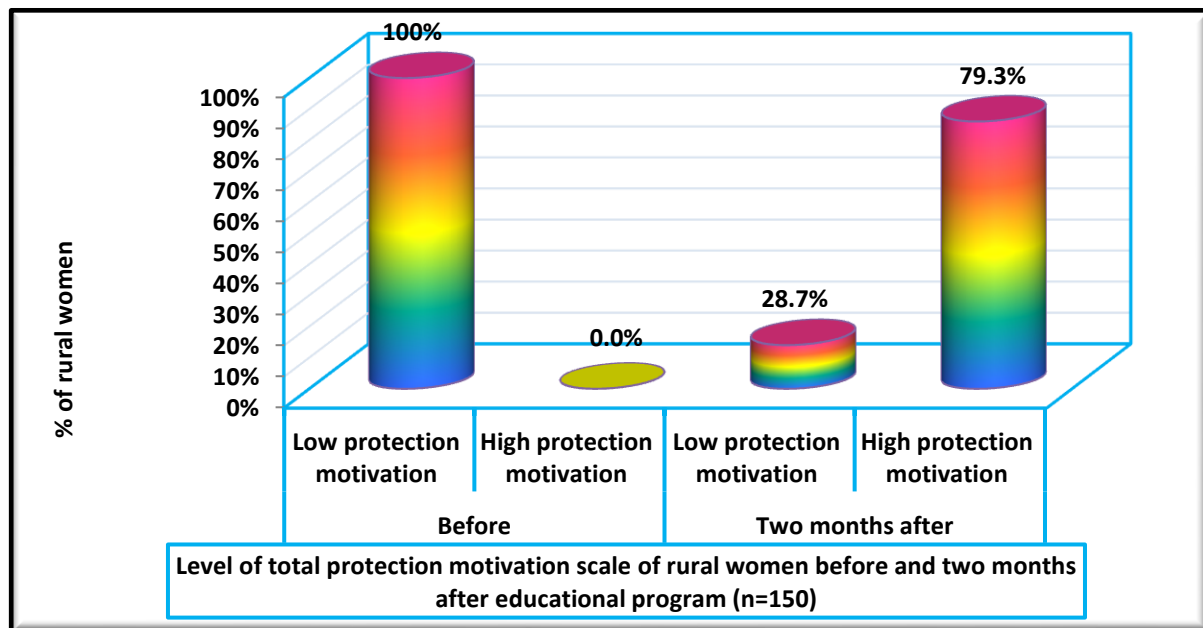


Figure (II): distribution of the studied rural women according to their total score levels of protection motivation scale throughout the study period

Table (IV): Mean and standard deviation of the total score of self-reported daily life practices of the studied rural women throughout the study period

Self-reported daily life practices subitems	No. of items (score)	Mean score of the studied rural women before and two months after educational program (n=150)		Z value P value
		Before	Two months after	
		Range Mean±SD	Range Mean±SD	
#A-Energy conservation and use of clean energy	8 (8-24)	8-18 13.31±2.51	16-24 21.65±2.27	14.795 0.0001*
B-Water conservation	5 (5-15)	5-14 8.03±1.69	10-15 13.55±1.49	14.631 0.0001*
#C- Smart transportation	2 (2-6)	2-5 2.66±1.09	5-6 5.04±0.10	12.938 0.0001*
D-Waste reduction and recycling (sustainable consumption)	13 (13-39)	18-30 22.03±2.75	29-39 36.07±2.85	15.065 0.0001*
E-Active participation in environmental protection and mitigating climate change	4 (4-12)	4-8 5.79±0.99	8-12 10.21±1.49	14.970 0.0001*
Total practice scores	32 (32-96)	43-65 51.83±7.27	73-96 86.51±8.17	15.028 0.0001*

*Statistically significant (P<0.05)

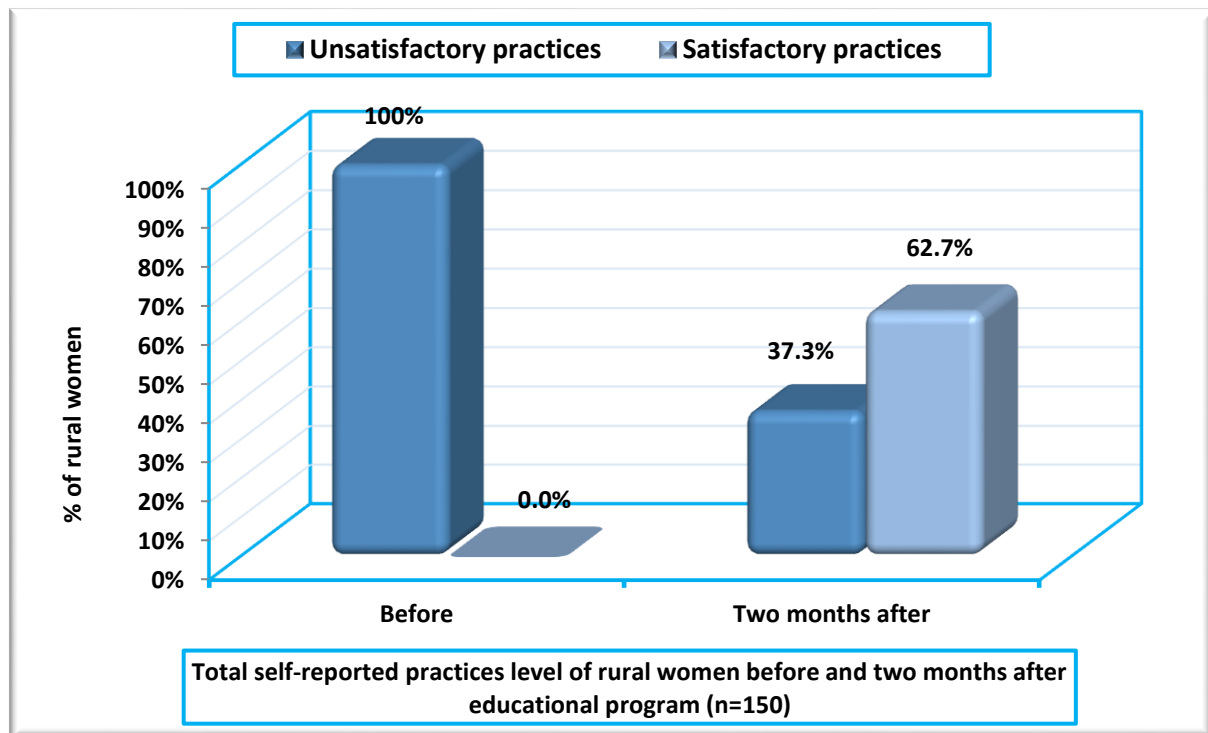


Figure (III): Distribution of the studied rural women according to their total levels of self-reported daily life practices throughout the study period

Table (V): Correlation between total knowledge scores and total scores of self-reported practices and protection motivation scale scores (Threat appraisal, Coping appraisal and Protection motivation intension constructs) of the studied rural women two months after implementation of the educational program

Variables	The studied rural women total scores two months after educational program (n=150)			
	Total knowledge scores		Total self-reported practices scores	
	r	P value	r	P value
Protection motivation scale scores				
A-Threat appraisal construct scores	0.695	0.0001*	0.683	0.0001*
B-Coping appraisal construct scores				
1- Perceived response efficacy	0.749	0.0001*	0.822	0.0001*
2- Perceived self- efficacy	0.758	0.0001*	0.797	0.0001*
3- Perceived response cost	0.601	0.0001*	0.688	0.0001*
Total Coping appraisal construct score	0.773	0.0001*	0.845	0.0001*
C- Protection motivation intention	0.696	0.0001*	0.862	0.0001*
Total protection motivation scale score	0.790	0.0001*	0.887	0.0001*
Total self-reported practices scores	0.669	0.0001*	-	-

r=Correlation Coefficient

*Statistically significant (P<0.05)

Table (VI): Relationship between total mean score of knowledge and socio-demographic characteristics among the studied rural women throughout the study period

Socio-demographic characteristics	N	Total knowledge mean scores of the studied rural women before and two months after educational program (n=150)			
		Before		Two months after	
		Mean±SD	Z value or χ^2 value P value	Mean±SD	Z value or χ^2 value P value
Age years					
23-30	69	19.43±11.01	0.354	44.80±10.53	4.785
>30-43	81	20.36±12.89	0.723	46.91±8.73	0.074
Occupation					
Housewife	79	14.44±6.78	91.866	42.34±9.97	16.387
Employee	71	31.92±10.24	0.0001*	51.70±4.88	0.0001*
Educational level					
Primary education	3	9.67±5.77	0.508	41.33±12.66	13.913
Secondary	83	13.43±6.72	0.479	42.90±10.16	0.001*
High education	54	31.70±10.27		51.425±5.23	
Number of family member					
Three	6	19.33±7.74	7.719	44.83±12.25	3.087
Four	75	17.72±11.45	0.021*	45.04±9.99	0.213
Five	69	22.39±12.58		47.01±9.01	
Number of rooms in the house					
Two	92	17.28±10.38	3.353	45.03±10.18	1.616
Three	58	24.14±13.30	0.001*	47.38±8.56	0.106
Family monthly income					
Just enough	138	19.87±12.42	0.918	46.01±9.67	0.164
Enough to be spared	12	20.67±6.17	0.358	51.17±9.53	0.417

Discussion

Climate change is a significant worldwide concern that impacts all communities, especially rural areas. Rural women are among the most vulnerable populations affected. Their knowledge and daily behaviors are critical in addressing the effects of climate change. Using the Protection Motivation Theory (PMT) helps to understand how these women recognize climate threats and

take action to protect themselves and their families by adopting climate-friendly behaviors (**Duru, Aro, and Oladipo, 2022**).

The current study found a statistically significant improvement in overall knowledge scores two months after program implementation compared to before the program. This is reinforced by the findings of **Afifi, Baraia, Abdel-Mordy, and Emam (2024)** in Egypt, who demonstrated

that the majority of women had insufficient total score knowledge on climate change before the program. Meanwhile, the majority of them had a high knowledge score following the educational program. The current study's improvement in knowledge score can be linked to the efficacy of the implemented educational program and supported by the fact that the majority of the studied rural women were either highly educated or secondary- educated, which may have facilitated better knowledge acquisition and retention.

However, these findings contradict those of **Devi et al. (2023)** in India, who discovered that the majority of farm women were well-informed about climate change. From the researcher's perspective, this discrepancy is attributed to the practical exposure of farm women to the environmental changes due to their daily involvement in agricultural activities. This highlights the importance of considering regional and occupational context when designing and interpreting knowledge-based studies.

Protection Motivation Theory (PMT) provides a useful framework for analyzing how individuals, particularly rural women, can be motivated to adopt pro-environmental behaviors in response to this threat (**Maddux & Rogers, 1983**). The current study found a statistically significant improvement in the Mean scores of all protection motivation constructs, including perceived vulnerability, perceived severity, response efficacy, self-efficacy, and perceived costs. Consequently, the

total protection motivation scale mean score two months after the intervention significantly improved. These results match those of **Japalagh, Aghaei, Shakeri, and Azizi (2025)**, who showed a substantial improvement in the Mean scores of perceived severity, vulnerability, response efficacy, and self-efficacy post-intervention, as well as a reduction in perceived barriers and an increase in behavioral intention. From the researcher's point of view, this improvement can be attributed to the effectiveness of the PMT-based program in enhancing awareness, strengthening coping mechanisms, and reducing perceived barriers, which collectively facilitated positive behavioral intentions.

However, the findings of the current study contradict those of **Daraz, Khan, Alsawalqa, Alrawashdeh, and Alnajdawi (2024)** in Pakistan, who reported that the majority of Pakistani women had high perceived severity towards climate change. The authors related this to the fact that Pakistani women were directly exposed to the effects of climate change, which increased their perception of severity. The results of this study demonstrated a highly statistically significant improvement in the protection motivation scale's total level score two months post-intervention, as all the studied rural women exhibited a low level of protection motivation prior to the educational program. However, two months post-intervention, this markedly improved, with most of the women reaching a high level of protection motivation. This result is

in alignment with **Sharifi et al. (2022)**, who found that after the program implementation two thirds of the women had high protection motivation compared to low protection motivation pre intervention. Both studies demonstrated that when women are empowered with knowledge and guided through a motivational framework, their protective behaviors and self-efficacy can be significantly enhanced.

The current study showed that the total Mean scores for all self-reported daily life practices had improved statistically significantly regarding climate change among the studied rural women after program implementation. The Mean scores of energy conservation, water conservation, smart transportation, waste reduction and recycling, and active participation in environmental protection all increased significantly post-program compared to pre-program, reflecting the program's effectiveness in reshaping daily practices towards more sustainable practices. These findings are consistent with those of **Ghazy and Fathy (2023)**, who reported significant post-intervention increases in the Mean scores of energy conservation and sustainable transportation practices among university student participants. The same improvements were reported in the study by **Ibrahim, Abd Elmawla, and Ali (2023)** in Egypt in water conservation practices, and **Abdallah and Farag (2022)** in environmental participation scores of the participants. From the

researcher's perspective, the consistent improvement in mean scores across all domains of the present study highlights the effectiveness of structured, culturally sensitive educational interventions in transforming climate-related practices. Such programs not only enhance awareness but also successfully translate knowledge into practical, cost-saving, and environmentally responsible actions. The present study showed a statistically significant improvement in the total practice level scores of the studied rural women two months after the program implementation compared to pre-program. Before the intervention, all the studied women reported unsatisfactory total practice levels. However, about two-thirds of the participants achieved satisfactory practice level post-program. This is in harmony with the results of **Abdallah and Farag (2022)**, who found that only a small proportion of participants demonstrated adequate practice score before intervention, while post-intervention, the majority were more likely to report satisfactory levels of environmentally conscious practices. This can be linked to the efficiency of the implemented educational program. in transforming knowledge into daily practices that contribute to climate change mitigation and positioning participants as pivotal agents in advancing climate change mitigation within their daily contexts. Knowledge plays a critical role in initiating cognitive and motivational shifts that influence behavior (**Tapia-Echanove, Bloch-Atefi, Hanson-**

Easey, Oswald, & Eliott, 2025). This was proven by the current study, which found a statistically significant positive correlation between total knowledge, total scores of all protection motivation constructs, and total self-reported practice score. This was supported by **Elgzar, Sayed, Hussein, and Allam (2023)**, who reported that educational content structured around the PMT framework significantly enhanced women's knowledge about COVID-19 and led to improvements in self-protective behaviors. The study also found positive correlations between knowledge levels and constructs of PMT, mirroring the pattern observed in the present research.

Socio-demographic characteristics are key determinants that critically shape individuals' capacity to receive, process, and apply knowledge gained from educational interventions (**Simpson et al., 2021**). This was evidenced by the current study, which indicated that there was a statistically significant relationship between the Mean of the overall knowledge score and socioeconomic characteristics, including occupation, number of family members, and number of rooms before the program was implemented. There was a significant relationship between the total Mean score of knowledge and occupation as well as the educational level of the studied women, where employees and highly educated women gained higher Mean scores than others after program implementation. These results align with those of **Zhang et al. (2021)**,

who concluded that educational attainment and occupation were significant predictors of knowledge and behavioral intentions.

Understanding the relationship between socio-demographic characteristics and protection motivation is essential for identifying the factors that influence individuals' readiness to engage in climate-related protective behaviors (**Sarmin, Shahin, & Hasan, 2024**). In alignment with this, the present study verified a statistically significant relationship between the Mean total protection motivation scale scores and socio-demographic characteristics, where there was a statistically significant relationship between protection motivation and occupation (employed women) as well as educational level (highly educated women) two months after program implementation. The findings of **Sahari, Salo, and Sandman (2024)**, which emphasized the significance of age, education, and employment in influencing people's motivation to engage in climate action, are in line with those of the present study. They noted that younger individuals and those with higher educational attainment were more likely to perceive climate change as a severe threat and demonstrated stronger intentions to engage in both individual and collective protective behaviors. These findings underline the need to personalize climate programs to accommodate socio-demographic variations within target populations to enhance protection motivation and

ensure the sustainability of protective behaviors.

The present study demonstrated also that age, educational level, and number of family members were statistically significant determinants of women's practice scores before the program implementation, where young age, high education, and having a smaller number of family members gained higher Mean scores of self-reported practices. However, family monthly income was the only statistically significant determinant after the program implementation ($p < 0.05$), as those with enough monthly income gained higher mean scores. These results are aligned with those reported by **Afifi et al. (2024)**, who found that educational level was positively associated with higher baseline knowledge and adaptive health behaviors before intervention. Meanwhile, income and employment played a key role in shaping participants' ability to adopt recommended behaviors post intervention. This is explained by the fact that the majority of the rural women in the present study were educated and between 23 and 43 years old, a stage of life often associated with greater adaptability, openness to innovation, and receptiveness to new information.

In addition, the current findings align with those of **Piao and Managi (2024)**, who confirmed that both education and income were significant predictors of environmental behavior. This suggests that while demographic factors influence baseline behavior, socioeconomic resources are crucial

for maintaining behavioral change post-intervention.

Therefore, integrating educational and economic support is essential for effective climate change mitigation among vulnerable rural populations.

Finally, the findings of this study demonstrate the tremendous positive influence of an educational program based on protection motivation theory on improving the knowledge and daily life practices of rural women concerning climate change.

Conclusion:

The results of the present study concluded that the educational program on climate change, based on the Protection Motivation Theory, was effective in improving rural women's knowledge and daily life practices. The overall level of protection motivation among rural women to engage in climate-friendly practices improved significantly.

Recommendations:

- Rural health services need to implement climate change health education initiatives for rural communities, by adopting culturally sensitive and socially relevant communication strategies.
- Community health nurses should implement continuous awareness campaigns aimed at raising environmental consciousness about the significance and impacts of climate change, while addressing barriers that limit education, community engagement, and the adoption of sustainable practices.

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