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Effect of Youth Empowerment Program About Climate Change

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Abstract: Background: Climate change is one of the most consequential threats facing humanity today. It is not only endangers the sustainability and health of the planet, but also exacerbates social, economic, environmental, and geographic inequality across generations. Especially current generation as they will reach adulthood in the next 10-20 years. Hence, this study aimed to evaluate the effect of youth empowerment program about climate change. Subjects and methods: A quasi-experimental research design with pre-post test was used, where 124 governmental secondary school students were enrolled using a cluster random sampling technique. Two tools were used for data collection: (1) An Interview questionnaire composed of personal and environmental data, (2) Climate Change Survey Questionnaire consisted of three parts (knowledge regarding climate change, attitude towards climate change, and climate change relevant behavior). Results: Studied youth were initially to some extent knowledgeable (66.9%) about climate change, held positive attitude (52.4%) and behaved (24.2%) adequately toward it. Conclusion: Nursing intervention proved to be an adequate tool in empowering youth regarding climate change in terms of knowledge, attitude, and behavior. Recommendations: Health education about climate change ought to be conducted to school students. Moreover, schools must involve students in environmental protection endeavors as forestation, planting of plants, reducing use of firewood, considerate use of non-renewable resource of energy, waste management, etc.

Keywords: Climate change, youth, climate change knowledge, attitude towards climate change, climate change relevant behavior, and empowerment program

Introduction

Climate change is an unavoidable issue that poses a significant hazard and arguably one of the most noteworthy natural challenges facing humankind in the 21st century, it refers to significant changes in worldwide temperature, precipitation, wind patterns and other measures of climate that happen over several decades or longer (University of California, 2023). Climate change poses an escalating threat, and its long-term effects

excessively influence young people who are accounting for 16 percent of the worldwide population, they are becoming a driving force in advocating for a low-carbon and climate-resilient future (**The International Union for Conservation of Nature, 2023**). Youth is a period of maturation and slow move from childhood to adulthood, characterized by a specific disposition for certain areas of learning. Youth hood is the establishment for a sound, educated and affluent adulthood (**Ministry of Foreign Affairs of Denmark, 2023**). Generally Youth are individuals between 15 and 24 years old (**Inter-agency Network for Education in Emergencies, 2023**). They represents to almost one-third of the total Egypt's population (**Organization for Economic Co-operation and Development, 2023**).

Generally, there are fundamentally two climate change causes: natural causes and human intercession causes. In nature: solar output, earth's orbit around the sun, changes in volcanic activity, sea streams, and drifting of continents; while in human: greenhouse effect, transformation of land from forests to agriculture, deforestation, mines, burning fossil fuels such as oil, gas, and coal discharging carbon dioxide into the air, infrastructure or urbanization for economy reasons expanding the production of CO₂ (**The Natural Resources Defense Council, 2022**). Climate change can actually have numerous negative consequences such as rising sea-level, increasing temperatures, more extreme weather events, increased droughts, storms, flooding and wildfires, diminish in water level, negative agricultural impacts, food insufficiency and pressures on the national economy (**Abdallah & Farag, 2022**).

Young individuals are not only victims of climate change; they are also valuable contributors to climate action. They are agents of change, entrepreneurs and innovators whether through education, science or technology (**The United Nations, 2024**). Hence, climate education become the most effective climate action tool that equip the more youthful eras with the knowledge and skills they need to guide their behavior towards concerted improving actions and confront the climate challenges that are inevitable in the years ahead (**Organization for Economic Co-operation and Development, 2022**). Besides, when youth have high levels of awareness of climate change, they are able to teach the citizens of their community and their participation in disaster risk reduction activities could be improved, they will be future decision-makers and be responsible for dealing with serious climate change consequences for the environment, social, and financial conditions (**Ghanem, 2023**). Empowering youth and working together with them presents a historic and transformational opportunity to lay the foundation for a peaceful and sustainable future (**United Nations Development Programme, 2022**). Nurses play an imperative role in helping communities adapt to climate change and advocating on behalf of the individuals and the environment for a more sustainable future and educate the community on how best to plan for climate-induced events (**American Nurses Association, 2023**).

Significance of the study

Climate change awareness starts in school. Schools need new strategies and resources to address young people's lack of knowledge about the world (**Malay, 2019**). Globally, there is a demand for preparing students for handling major environmental, social, and economic impacts caused by climate change (**Shaw et al., 2021**). In this regard, school students can act as "multipliers for climate change awareness" (**Kuthe et al., 2019**). So, Climate change experts declared that increase awareness especially in educational institutions can affect youth perception regarding the causes and effects of Climate change and its related alternative solutions which can minimizing the great environmental and health consequences (**Abdallah & Farag, 2022**).

Aim of the study

This study aimed to evaluate the effect of youth empowerment program about climate change.

Research hypothesis :

Empowerment program can positively promote youth knowledge, attitude, and behaviors regarding climate change.

1. METHOD

1.1. Design

A quasi-experimental design with pre-post test was used to achieve the aim of the present study .

1.2. Setting

The current study was conducted at three governmental secondary schools affiliated to Hehya district, Sharkia Governorate, Egypt. Sharkia Governorate is the 3rd most populous of the governorates of Egypt. Located in the northern part of the country. Sharkia Governorate is mainly agricultural and industrial based area.

1.3. sampling

The study sample involved 124 governmental secondary school students from both sexes, aged 15 to <24 years and free from mental and physical disability or chronic disease.

1.4. Sample size

In post intervention phase the awareness of energy saving in every day activates among studied group was 84.1% compared to 66.1% in pre intervention phase (Mikami et al, 2022). Confidence level is 95% with power of study 90%. Sample size was calculated to be 124 participants. Sample size calculated using the Open-Epi, version 3.0 software package.

1.5. Tools of data collection: The following two tools were used for data collection :

Tool I: A structured Interview questionnaire

A structured Interview questionnaire was developed by the researchers after reviewing the related literature to collect the necessary data for the study. It composed of three parts:

Part I: Personal data as age, sex, residence and academic year

Part II: This part includes questions such as Have you heard about “climate change”? and the sources of information about climate change.

Part III: Environmental data as being a member of any association that carries out activities related to environmental conservation and environmental exposure to pollutants: This part included 10 questions distributed on three main pollutants as air pollutants (eg: burning wood and other materials for heating or household purposes, dust resulting from vehicle exhaust), water pollutants (eg: throwing waste in canals and water drains, using canals and waterways as a means of collecting waste), and soil pollutants (eg: excessive use of agricultural pesticides and insecticides).

Scoring system: Environmental exposures

Each item checked was scored one. For the total exposure, the scores of the items were summed-up and mean, standard deviation, and median were calculated. Total score of environmental exposures was 10 and classified as follows: no exposure (score zero), and exposure (score 1-10).

Tool II: Climate Change Survey Questionnaire

The questionnaire was developed by the researchers guided by current related literature and it consisted of three parts:

Part 1: Knowledge Regarding Climate Change guided by Whitmarsh (2003), Cacundangan and Garcia (2017), Jamshidi et al. (2018), Lopez and Malay (2019), and Abd Hamid et al. (2021): categorized mainly into five domains as: Definition of Climate Change, Source of knowledge about Climate Change, Features of Climate Change, Causes of Climate Change, and Facts related to Climate Change .

Scoring system

For the knowledge items, a correct response was scored one and the incorrect Zero. For each domain and for the total questionnaire the scores of the items were summed-up and the total divided by the number of corresponding items, giving mean scores. Total score for knowledge items was 40, which were converted into percentage scores :

♣Satisfactory: 60% or more (24-40 point).

♣Unsatisfactory: less than 60% (0-23 point).

Part 2: Attitude towards climate change guided by Whitmarsh (2003), and Lopez and Malay (2019): this part composed of questions which measures youth response towards climate change such as; I believe climate change is a very big problem; I always ask questions about climate change; I am preparing myself for the effects of climate change.....ect. The response answers were agree, disagree, uncertain and don't know .

Scoring system

The responses "agree", "uncertain", "disagree" and "don't know" were respectively scored 3, 2, 1 and 0. The scoring was reversed for negative statements. The scores of the items were summed-up and the total divided by the number of the items, giving a mean score. Total score for attitude was 117, which was converted into a percentage score:

♣Positive: 60% or more (70-117 point).

♣Negative: less than 60% (39-69point).

Part 3: Climate Change Relevant Behavior guided by Whitmarsh (2003), Cacundangan and Garcia (2017), and Jamshidi et al. (2018): this part included activities that have an indirect or direct effect on climate change; student's behavior as Turning off lights; Walking for short distances rather than vehicles; Use stair instead of elevatorect.

Scoring system

The items "not done" and "done" were scored "0" and "1", respectively. The items "not applicable" were not scored and were discounted from the totals. The scores of the items were summed-up and the total divided by the number of the items, giving a mean score. Total score for behavior was 16, which was converted into a percentage score:

•Adequate: 60% or more (9.6-16 point).

•Inadequate: less than 60% (0-9.5 point).

1.6. Pilot study

A pilot study was carried out on 13 secondary school students (10 % of the total studied sample), to test the feasibility, clarity, comprehensiveness and applicability of the study tools. The students enrolled in the pilot, were included in the main study sample as there was no modifications done.

1.7. Field work

Once permission was granted to proceed with the study, the researcher started to prepare a schedule for collecting the data. The fieldwork was carried out within the period of four months, starting from the beginning of February 2023 to the end of May 2023. The youth empowerment program was carried out on 8 sessions. The researchers utilized various teaching methods as lectures with group discussions, brain storming, mind mapping and problem based learning. Diverse teaching materials were used as power-point presentations, videos and pictures .

Nursing intervention

The intervention was executed through the phases of assessment, planning, implementation, and evaluation.

Assessment phase

This phase involved the pre-program data collection for baseline assessment. The researchers introduced themselves and explained the aim of the study briefly seeking their agreement in the study, and reassured them that information obtained is strictly confidential and would not be used for any purposes other than research. The researchers read and explained each item of the study tools to the students and then recorded his/her response to each item. The time consumed for filling out the study tools ranged from 30 to 45 minutes .

Planning phase

The students' identified needs, requirements and deficiencies were translated into aim and objectives of program and set in the form of an illustrated colored booklet and brochures that was prepared by the researchers and its content was validated by scientific committee and then distributed to each of the studied students as a guide for all of pertinent data related to intervention. Besides some relevant videos and concurrent news and real life situations were prepared as teaching tools .

The Youth Empowerment Program about Climate Change consisted of 8 sessions as follows :

- Session 1: The main objective of this initial session was to explain the aim of the program, Schedule the timetable (twice/week) for each group, clarify the basic roles of the program, and build a positive relationship between the researcher and the students.
- Session 2: In this session the researcher conducted the pre-test using the program data collection tools.
- Session 3: This session was to help the students to identify the meaning of climate change, some terms related to climate change, the difference between the two terms (climate and weather), the components of the climate system, and causes of climate change.

- Session 4: The focus of this session was to realize the relationship between environmental pollution and climate change, and identify examples of some environmental pollutants that have led to climate change.
- Session 5: The main objective of this session was to explore the features of climate change.
- Session 6: This session focused on the global attitude toward climate change, and examples of some behaviors that every person should follow to reduce climate change.
- Session 7: In this session the researcher revised all the information and behaviors learned during the program, and took the feedback about the program from the students
- Session 8: This session was the termination of the program, the researcher conducted the post-test using the same tools of the pre-test to evaluate the effect of the program, and acknowledge the students for their cooperation, good interaction and response, and wished all the best in their life.

Implementation phase

The program was implemented in the study setting twice/week for each group of students. This was intended to give more chance for discussions, and interactions. The total sample was divided into small groups (each group ranged from 4 to 5 students). Also, the researchers ensured that all groups received the same content using the same teaching methods. The sessions took place in specified place equipped with adequate facilities to be held appropriately as good ventilation, comfortable furniture, data show and not noisy.

Evaluation phase

Immediately after each session an oral feedback was taken and post-test was done immediately after completion the program by using the same pretest tools to compare the degree of improvement in student's knowledge, attitude, awareness, and behavior after application of the program sessions .

Validity and reliability

The tools were revised by a panel of three experts in the fields of community health nursing, medical and surgical nursing, and nursing administration who assessed the tools for clarity, relevance, application, and comprehensiveness. Internal consistency of the tools was assessed by calculating Cronbach's Alpha coefficient (knowledge score was 0.95, attitude score was 0.68 and behavior score was 0.80).

1.8. Ethical Considerations

The study proposal was approved by the Research Ethics Committee (REC), Faculty of nursing, Zagazig university, Egypt (approval ID: M.D.ZU.NUR/115/15/11/2022). The students were informed that their involvement in this study is voluntary and they have the right to refuse or withdraw at any time of data collection as well as the confidentiality and anonymity of the collected data. They were also assured that any obtained information would be used only for research purposes.

1.9. Statistical design

Data entry and statistical analysis were done using SPSS 20.0 statistical Data were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables. In order to identify the independent predictors of the scores of knowledge, attitude, awareness, and behavior, multiple linear regression analysis was used and analysis of variance for the full regression models was done. Statistical significance was considered at p-value <0.05.

2. RESULTS

As to personal characteristics of the students in the study sample, 50.8% of students aged 17 years and also were females. Concerning residence, 66.1% of them belonged to rural areas. Considering the source of information about climate change as reported by students, 55.6% of students heard about climate change, and the most common source of their information was social media, TV and the school (45.2%, 29%, 21%) respectively.

Regarding activities related to climate change and environmental protection, the current study showed that only 16.1% of students follow environmental protection activities, meanwhile only 2.4% of them are members of environmental NGOs. Also, the study results displays that agricultural activities were the most common practiced school activity to help protect the environment. Totally, 56.5% of students participated in these activities.

Concerning exposure to surrounding environmental hazards, **figure 1** showed that the most frequent source of air pollution as reported by the students was from burning agricultural waste (71.0%). Moreover, Waste disposal in canals was the mainly reported water pollutant (87.1%). Meanwhile, the soil was polluted mainly from Pesticides (60.5%). Ultimately, students reported exposure to 1 to 10 environmental hazards. The study demonstrated that 96.8% of students reported environmental exposure to hazards

Table 1 indicates marked improvement in total students' knowledge, attitude and reported behavior regarding climate change post intervention with presence of statistical significant difference between pre and post intervention ($p < 0.001$).

As to the correlation between students' knowledge, attitude and behavior regarding climate change, **table 2** indicates statistically significant positive correlation between students' knowledge, attitude and behavior. Also, positive correlation between students' attitude, and behavior regarding climate change. This means that improved students' knowledge leads to acquiring positive attitude and adequate behavior toward climate change.

Concerning the best fitting multiple linear regression model for student's total knowledge score, **table 3** affirms that empowerment program and hearing about climate change were statistically significant independent positive predictors of total knowledge score. The model explains 77% of the variation in this score as the value of r-square indicates.

As to the best fitting multiple linear regression model for the attitude score **Table 4** illustrates that empowerment program, hearing about climate change and total knowledge score were statistically significant independent positive predictors for attitude score. The model explains 78% of the variation in this score as the value of r-square indicates.

According to the best fitting multiple linear regression model for the behavior score, **table 5** clarifies that intervention, school year, hearing about climate change and knowledge score were independent positive predictors for behavior score with no statistically significant relation. The model explains 35% of the variation in this score as the value of r-square indicates.

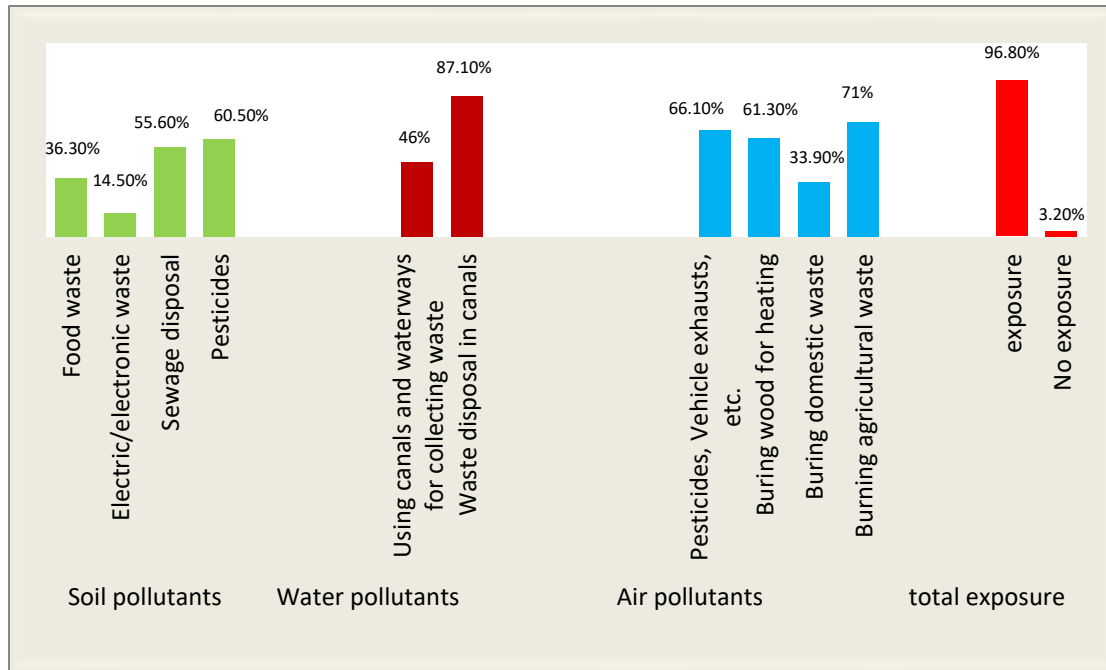


Figure 1. Exposure to surrounding environmental hazards

Table 1: P re-post students' knowledge, attitude, and behavior regarding climate change.

Items	TIME				X ² test	p-value
	Pre (n=124)		Post (n=124)			
	No.	%	No.	%		
Total knowledge:						
Satisfactory	83	66.9	124	100.0	49.12	<0.001*
Unsatisfactory	41	33.1	0	0.0		
Total attitude:						
Positive	65	52.4	124	100.0	77.42	<0.001*
Negative	59	47.6	0	0.0		
Total behavior:						
Inadequate	94	75.8	35	28.2	56.24	<0.001*
Adequate	30	24.2	89	71.8		

Statistically significant at $p < 0.05$

Table 2: Correlation matrix of students' knowledge, attitude, and behavior scores

Items	Spearman's rank correlation coefficient		
	Knowledge	Attitude	Behavior
Knowledge	1.000		
Attitude	.804**	1.000	
Behavior	.489**	.484**	1.000

Statistically significant at $p < 0.01$

Table 3: Best fitting multiple linear regression model for the knowledge score

Items	Unstandardized Coefficients		Standardized Coefficients	t-test	p-value	95% Confidence Interval for B	
	B	Std. Error				Lower	Upper
Constant	10.42	4.02		2.594	0.010	2.51	18.34
Intervention	33.62	1.78	0.69	18.857	<0.001	30.11	37.13
Heard about climate change	12.86	2.61	0.22	4.923	<0.001	7.71	18.00

r-square=0.77

Model ANOVA: F=162.18, $p < 0.001$

Variables entered and excluded: age, year, SES, NGO membership, active follow-up/participation in activities, environmental exposures

Table 4: Best fitting multiple linear regression model for the attitude score.

Items	Unstandardized Coefficients		Standardized Coefficients	t-test	p-value	95% Confidence Interval for B	
	B	Std. Error				Lower	Upper
Constant	27.64	2.13		12.956	<0.001	23.44	31.84
Intervention	10.85	1.78	0.34	6.112	<0.001	7.36	14.35
Active participation in school activities	2.81	1.31	0.07	2.140	0.033	0.22	5.40
Heard about climate change	8.60	1.56	0.22	5.503	<0.001	5.52	11.68
Knowledge score	0.27	0.04	0.41	6.632	<0.001	0.19	0.35

r-square=0.78

Model ANOVA: F=173.17, $p < 0.001$

Variables entered and excluded: age, year, SES, NGO membership, active follow-up of activities, environmental exposures, number of information sources

Table 5: Best fitting multiple linear regression model for the behavior score.

Items	Unstandardized Coefficients		Standardized Coefficients	t-test	p-value	95% Confidence Interval for B	
	B	Std. Error				Lower	Upper
Constant	.50	.24		2.076	.039	.03	.98
Intervention	.29	.13	.21	2.261	.025	.04	.54
School year	.18	.07	.13	2.494	.013	.04	.32
Heard about climate change	.21	.11	.13	1.845	.066	-.01	.44
Knowledge score	.01	.00	.18	1.655	.099	.00	.01

r-square=0.35

Model ANOVA: F=25.66, p<0.001

Variables entered and excluded: age, gender, SES, NGO membership, active participation/follow-up of activities, environmental exposures, number of information sources

3. Discussion:

Climate change has emerged as one of the biggest environmental problems facing the world. It refers to the shift in climate patterns mainly caused by Greenhouse gases emissions (**Fawzy et al., 2020**). Climate change leads to a cascade of side effects that impact the life of plants, animals, and humans (**Heshmati, 2020**).

As to student's characteristics, the current study results revealed that more than half of both study and control groups were females aged 17 years old, belonged to rural areas. In the same stream, **Femi (2023)** implied that 59% of the students at secondary schools in Osun state in Nigeria were females. Also, **Tolppanen and Aksela (2018)** demonstrated that 51% of secondary school students in the study sample were female (with a mean age of 17.6 years). This result finding could be attributed to the fact that there is a relative increase in the number of girls over boys according to the population census, and that girls are more committed and keen to go and attend school than boys.

Regarding Pre-intervention students' knowledge about climate change in the study and control group, more than two thirds of students had satisfactory knowledge. This result can be explained by the fact that second and third year secondary school students are already studying the topic of climate change within their academic subjects in the Egyptian education system. Congruently, in Canada a study conducted by **Baldwina et al. (2023)** demonstrated that 85% of secondary school students generally had good knowledge about the causes and impacts of climate change. This result resonates with the study of **Tunji-Olayeni et al. (2021)** in Nigeria who indicated that all secondary school students were knowledgeable about climate change. Possible explanation of such discrepancy in the result findings is that the topic of climate change is one of the modern topics that have not been addressed in academic curricula until recently. Also, most of the students explained that knowledge about climate change was through social media, and this source may not be available to some students. In contrast, the study of **Ratinen (2021)** in Finland concluded that the secondary school students' knowledge about climate change was moderate.

Regarding post-intervention students' knowledge about climate change in the study and control group, the present study revealed that all students had satisfactory knowledge about climate change. This result equipping to that the intervention had significant positive effect on student's knowledge about climate change and its effect on health. This finding is similar to Italian study (**Mebane et al., 2023**) revealed that post intervention there was a highly significant improvement of the high school student's knowledge on climate change.

Regarding Pre-intervention students' attitudes toward climate change, the present study revealed that about half of students had positive attitude. This result might be attributed to student's knowledge related to climate change, where this amount of knowledge can help in shaping their thoughts and beliefs towards some environmental issues, the most important of which is the issue of climate change. Besides, the positive messages sent by the media regarding preserving the environment to reduce climate change. In the same vein, a study conducted in Indonesia by **Deshiana et al. (2022)** indicated that about two thirds of high school students agree that climate change is a threat to humans and the natural world and must be taken seriously.

As anticipated, post-intervention all students in the study sample developed positive attitude toward climate change. In the same vein, in Frankfurt, in Germany **Braun and Darmstadt (2018)** demonstrated that after the intervention, secondary school student's attitude became more positive toward climate change than before the intervention.

Regarding pre-intervention students behavior related to climate change, the existing study explained that about two third of the students had inadequate behavior. Possible explanation of this result is that knowledge alone is not enough to change an individual's behavior. Knowledge gives the person understanding and awareness of concepts and information related to correct behavior, but the ability to change behavior depends on several other factors such as will, emotions, personal motivators, social relationships, and the circumstances surrounding it. Therefore, it is not easy for students to translate what has not been learned into relevant situations.

Conversely post-intervention, approximately more than two thirds of students showed adequate behavior. This result is related to the fact that students' behavior in preventing climate change occurs when their awareness increases about potential threats of climate change, in addition to holding a positive attitude, which contributes greatly to what a person will do regarding a particular topic. In addition, the empowerment program has an important role in empowering students with experiences dedicated to introducing the behaviors that must be followed to reduce climate change. In the same line, a study conducted in Czech Republic by **Kolenatý et al. (2022)** stated that the program most likely improved high schools student's behavior and motivated them to engage in climate action. Moreover, the findings of a study conducted in Malaysia by **Abd Hamid et al. (2021)** revealed that after intervention secondary school student's behavior had changed positively.

Regarding Correlation matrix of students' knowledge, attitude, and behavior scores regarding climate change, the current study demonstrated a statistically significant positive correlation between students' knowledge, attitude and behavior. In the same line, a study carried out in Egypt by **Ghazy and Fathy (2023)** indicated a highly positive correlation between the post-program total knowledge score, and total daily life practices, and attitudes toward climate change. Possible explanation of this result is that when the students become more knowledgeable about climate change and aware of its health effects, they will in turn become more aware of the environmental related issues and, thus, be more motivated to act toward the environment in a more responsible ways.

Concerning the best fitting multiple linear regression for the knowledge score, the present study revealed that empowerment program and hearing about climate change were statistically significant independent positive predictors of total knowledge score. Similarly, a study conducted in United States of America by **Carman et al. (2020)** and a study conducted in Egypt by **Moustafa et al. (2015)** clarified that the intervention was a statistically significant independent positive predictor of student's knowledge score about climate change.

The best fitting multiple linear regression for the attitude score illustrated that empowerment program, hearing about climate change and total knowledge score were statistically significant independent positive predictors for attitude score. This could be attributed to the nature of the empowerment program and the

process of teaching which depended on interactions. It also introducing facts on applied knowledge. These results are congruent with a study conducted in Egypt by **Gida et al. (2022)** who reported that the intervention and knowledge score were statistically significant independent positive predictors of attitude score. Likewise, in Egypt **Moustafa et al. (2015)** demonstrated that knowledge score was statistically significant independent positive predictor of attitude score.

According to the best fitting multiple linear regression for the behavior score, the current study clarified that intervention and knowledge were independent positive predictors of behavior score with no statistically significant relation. In this context, **Baraka and Maklad (2023)** in Egypt demonstrated that knowledge score was statistically significant independent positive predictor of climate change behavior score.

Concerning the best fitting multiple logistic regression for the positive behavior change, the present study demonstrated that empowerment program is a statistically significant independent positive predictor of positive behavior change. This result can be explained by the fact that empowerment can contribute to an increased sense of control, coping skills, and the individual's ability to achieve behavior changes **Barbosa et al. (2021)**. In the same line, **Ghonem (2023)** in Egypt and **Jafari et al. (2021)** in Iran clarified that positive empowerment leads to positive behavior change.

Finally, Climate change is one of the most urgent issues facing the international community. Youth are related to climate change in different ways. On the one hand, their security, well-being, and even mental health, will be negatively affected by climate change; On the other hand, they can be seen as environmental stewards for the future through education which helps them understand and tackle the global warming consequences, motivates them to modify their behavior and helps them to adapt to what is already a global threat (**Han & Ahn, 2020**). Hence, the present study results support the alternate hypothesis that; implementation of empowerment program improved youth knowledge, attitude, behavior and awareness about climate change and its effect on health.

4. CONCLUSION

The current study results bring about the conclusion that the studied youth were initially to some extent knowledgeable about climate change, held positive attitude and behaved adequately toward it. Meanwhile, nursing intervention proved to be adequate tool in empowering secondary school students regarding climate change in terms of knowledge, attitude and behavior.

Relevance for Clinical Practice

Based on the finding of this study, education is a critical agent in addressing the issue of climate change. It can encourage people to change their attitudes and behavior; it also helps them to make informed decisions. In the classroom, young people can be taught the effects of global warming and learn how to adapt to climate change. Education empowers all people, but especially motivates the young to take action. Knowing the facts helps eliminate the fear of an issue which is frequently colored by doom and gloom in the public arena.

On the basis of the current study findings, the study recommended that climate change literacy interventions must be directed to school students. Also, involving students in environmental endeavors as forestation, planting of plants, reducing use of firewood, considerate use of non-renewable resource of energy, waste management, etc. moreover, awareness programs should seek to improve the student's sense of self-efficacy in undertaking mitigation behaviors, thereby potentially increasing the likelihood of widespread low-carbon lifestyles within and beyond the school community. In addition, booklet contains information about climate change and its consequences on health should be available on all school based clinics.

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References:

- Abd Hamid, I., Yahaya, W., & Rahim, H. (2021). Assessment of Awareness and Behaviour Among Secondary School Students on Climate Change. *Malaysian Journal of Social Sciences and Humanities*, 6(6), 259-264.
- Abdallah, Z. A., & Farag, A.W. (2022). Impact of Awareness Program Regarding Health Consequences of Climate Change on Knowledge, Perception and Daily Life practices among Nursing Students. *Egyptian Journal of Nursing & Health Sciences*, 3(1),367-390.
- American Nurses Association. Nurses' Role in Addressing Global Climate Change, Climate Justice, and Health. [Online]. 2023 [Cited 2023 December 29]; Retrieved from: https://www.nursingworld.org/~4a64ad/globalassets/practiceandpolicy/nursing-excellence/ana-position-statements/social-causes-and-health-care/nursesroleinaddressingglobalclimatechangeclimatejusticeandhealth_bod-approved.pdf.
- Baldwina, C., Pickeringa, G., & Dale, G. (2023). Knowledge and self-efficacy of youth to take action on climate change. *Environmental Education Research*, 29(11), 1597–1616.
- Baraka, S.I., & Maklad, S.A. (2023). Effect of Educational Program Regarding Greenhouse and Global Warming Consequences on Knowledge and Daily Life Practices among University Nursing Students. *Tanta Scientific Nursing Journal* , 31(4), 340-365.
- Barbosa, H.C., de Queiroz Oliveira, J.A., da Costa, J.M., Santos, R.P., Miranda, L.J., Torres, H., Pagano, A.S., & Martins, M.A. (2021). Empowerment-oriented strategies to identify behavior change in patients with chronic diseases: An integrative review of the literature. *Patient Education and Counseling*, 104(4), 689-702.
- Braun, V., & Darmstadt, A. (2018). Efficacy of Outdoor Environmental Education- A Cross-National Comparative Research Study Investigating Nature Connectedness, Environmental Attitudes, Knowledge and Behavior. <https://d-nb.info/1178726061/34#page=72>.
- Cacundangan, K.L., & Garcia, M. (2017). Students " Climate Change Literacy: Implication for Climate Change Education in Public Secondary Schools in Kabacan , North Cotabato, 187-193.
- Carman, j., Zint, m., Burkett, E., & Ibáñez, I. (2020). The role of interest in climate change instruction, 105,309-352.
- Carter, J., Koman, P., Cameron, L., Ferguson, A., Jacuzzo, P., & Duvall, J. (2021). Assessing perceptions and priorities for health impacts of climate change within local Michigan health departments. *Journal of Environmental Studies and Sciences*, 11,595-609.
- Deshiana, A., Sriyanti, I., & Ismet, I. (2022). High school students' awareness and attitudes toward climate change. *Berkala Ilmiah Pendidikan Fisika*, 10(3), 255-239.
- Erhabora, N., & Dona, J. (2016). Impact of Environmental Education on the Knowledge and Attitude of Students towards the Environment. *International Journal of Environmental & Science Education*,11(12), 5367-5375.
- Fahmy, S.I., Nofal, L.M., Shehata, S.F., El Kady, H.M., & Ibrahim. H.K. (2015). Updating indicators for scaling the socioeconomic level of families for health research. *Journal of the Egyptian Public Health Association*, 90(1), 1-7.
- Fawzy, S., Osman, A.I., Doran, J., & Rooney, D.W. (2020). Strategies for mitigation of climate change: a review. *Environmental Chemistry Letters*, 18,2069–2094.
- Femi, O. (2023). Assessment of the Perception of Senior Secondary School Students on Climate Change in Osun State. *International Journal of Educational Spectrum*, 5(1), 11-18.
- Ghanem, A., (2023). Assessment Knowledge, Perception, and Behaviors towards Climate Change among Universities Youth in Egypt. *Athens Journal of Mediterranean Studies*, 9(1),69-84.
- Ghazy, H.K., & Fathy, D.M. (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.
- Ghonem, N.M. (2023). Job Involvement as a Mediating Factor between Empowerment and Organizational Citizenship Behavior among Clinical Instructors at Nursing Technical Institutes. *SAGE Open Nursing*, 9,1-9.
- Gida, N.I., Mahmoud, S.F., Abd El-Ghany, G.M., & Alhanafy, S. (2022). Effect of Nutrition Education Intervention about Iodine Deficiency Disorders and Iodized Salt Intake on Mothers performance. *Egyptian Journal of Health Care*, 13(3),60-75.

- Han, H., & Ahn, S.W. (2020). Youth Mobilization to Stop Global Climate Change:Narratives and Impact. *Sustainability*, 12(10).
- Heshmati, H. (2020). Impact of Climate Change on Life. Retrieved from: <https://www.intechopen.com/chapters/74077>.
- Inter-agency Network for Education in Emergencies (INEE). Youth and adolescents. [Online]. 2023 [Cited 2023 August 30th]; Retrieved from: <https://inee.org/eie-glossary/youth-and-adolescents>.
- Jafari, F., Salari, N., Hosseinian-Far, A., Abdi,A., & Ezatizadeh. N. (2021). Predicting positive organizational behavior based on structural and psychological empowerment among nurses. *Cost Effectiveness and Resource Allocation*, 19(38).
- Jamshidi,O., Asadi, A., Kalantari, K.H., & Azadi, H. (2018). Perception, Knowledge, and Behavior towards Climate Change: A Survey among Agricultural Professionals in Hamadan Province, Iran. *Journal of Agricultural Science and Technology*, 20,1369-1382.
- Kolenatý, M., Kroufek, R., & Cinčera, J. (2022). What Triggers ClimateAction: The Impact of a Climate Change Education Program on Students' Climate Literacy and Their Willingness to Act. *Sustainability*, 14, 10365.
- Kotcher, J., Maibach, E., Miller, J., Campbell, E., Alqodmani, L., Maiero, M., & Wyns, A. (2021). Views of health professionals on climate change and health: a multinational survey study, 5,316-323.
- Kuthe, A., Keller, L., Körfgen, A., Stötter, H., Oberrauch, A., Höferl, K. M. (2019). How many young generations are there?—A typology of teenagers' climate change awareness in Germany and Austria. *Journal of Environment and Education*, 50, 172-182.
- Lopez, J.J., & Malay, C.A. (2019). Awareness and Attitude Towards Climate Change of Selected Senior High Students in Cavite, Philippines. *Asia Pacific Journal of Multidisciplinary Research*, 7(2),56-62.
- Malay, C. (2019). Awareness and Attitude towards Climate Change of Selected Senior High Students in Cavite, Philippines. *Asia pacific journal of multidisciplinary research*, 7(2), 56-62.
- Mebane, M.E., Benedetti, M., Barni, D., Francescato, D. (2023). Promoting Climate Change Awareness with High School Students for a Sustainable Community.*Sustainability*.15(14),11260.
- Ministry of Foreign Affairs of Denmark. Youthhood - A Period of Personal and Social Development. [Online]. 2023 [Cited 2023 August 30th]; Retrieved from: <https://amg.um.dk/tools/youth-in-development/youthhood-a-period-of-personal-and-social-development>.
- Moustafa, D.G., Abd-Allah, E.S., & Taha, N.M. (2015). Effect of a Breast-Self Examination (BSE) Educational Intervention among Female University Students. *American Journal of Nursing Science*, 4(4), 159-165.
- Organization for Economic Co-operation and Development. Agro-food Jobs for Youth in Egypt, Morocco and Tunisia. [Online]. 2023 [Cited 2023 November 30th]; Retrieved from: <https://www.oecd.org/dev/Agro-food-jobs-youth-Egypt-Morocco-Tunisia-Development-centre.pdf>
- Organization for Economic Co-operation and Development. Can teaching young children about climate change and sustainability actually motivate climate action?. [Online]. 2022 [Cited 2023 November 30th]; Retrieved from: <https://www.oecd-forum.org/posts/can-teaching-young-children-about-climate-change-and-sustainability-actually-motivate-climate-action-the-importance-of-equipping-younger-generations-with-adequate-climate-education>.
- Ratinen, I. (2021). Students' Knowledge of Climate Change, Mitigation and Adaptation in the Context of Constructive Hope. *Educational Science*, 11(103).
- Shaw,E., Walpole,S., McLean,M., Alvarez-Nieto,C., Barna,S., Bazin,K., & Woollard,R. (2021). AMEE Consensus Statement: Planetary Health and Education for Sustainable Healthcare. *Medical Teacher*,43(3), 1-15.
- The International Union for Conservation of Nature (IUCN). Youth as Agents of Change for a Sustainable Future. [Online]. 2023 [Cited 2023 November 27th]; Retrieved from: <https://www.iucn.org/blog/202308/youth-agents-change-sustainable-future>.
- The Natural Resources Defense Council. What Are the Causes of Climate Change?. [Online]. 2022 [Cited 2023 August 30th]; Retrieved from: <https://www.nrdc.org/stories/what-are-causes-climate-change#natural>.
- The United Nations. Youth in Action. [Online]. 2024 [Cited 2024 February 12th]; Retrieved from: <https://www.un.org/en/climatechange/youth-in-action>.
- Tolppanen , S., & Aksela , M. K. (2018) . Identifying and addressing students' questions on climate change. *Journal of Environmental Education*, 49 (5),375-389.
- Tunji-Olayeni, P.F., Adegboye, F., Oluwatobi, A., Adeyemi, G., Olagunju, O., Okoro, A., & Osabuohien, E.S. (2021). Accelerating progress on sustainable development goals: Assessing secondary school students' knowledge of climate change actions. *IOP Conference Series: Earth and Environmental Science*. International Conference on Energy and Sustainable Environment, 665.
- United Nations Development Programme (UNDP). Elevating Meaningful Youth Engagement for Climate Action. [Online]. 2022 [Cited 2023 December 29]; Retrieved from: <https://www.undp.org/sites/g/files/zskgke326/files/2022-05/UNDP-Elevating-Meaningful-Youth-Engagement-for-Climate-Action-2.pdf>.
- University of California. UC Accountability Report 2023. [Online]. 2023 [Cited 2024 February 13th]; Retrieved from: <https://accountability.universityofcalifornia.edu/2023/2023-acct-exec-summ.pdf>.
- Whitmarsh, L. (2003). SURVEY QUESTIONNAIRE ('CLIMATE CHANGE' VERSION). University of Bath letterhead. Retrieved from: <https://doc.ukdataservice.ac.uk/doc/5345/mrdoc/pdf/5345userguide.pdf>