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Towards a greener future: nursing students' climate consciousness and green purchasing intentions

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Abstract

Background Hospitals generate significant amounts of waste that can harm the environment. Nurses' awareness and positive attitude towards green products drive them to maintain a clean environment and reduce climate change by purchasing eco-friendly products. This study assesses nursing students' awareness and attitudes toward climate change and their correlation with the inclination to purchase green products.

Method A descriptive correlational design was used for the study, covering five geographic areas in Egypt. A total of 1,400 nursing students from public universities were included in a convenience sample. Data were collected using three instruments: awareness towards climate change, attitude towards climate change, and green purchasing intentions.

Results Participants demonstrated high mean scores for climate change awareness, positive attitudes, and green purchasing intentions. Geographic area and education significantly impacted participants' climate change awareness and attitudes. Climate awareness was the strongest predictor of green purchasing intentions, with attitudes serving as a mediating factor.

Conclusion A significant positive correlation exists linking climate change awareness, attitudes, and green purchasing intentions. Awareness and attitudes significantly predict green purchasing intentions. Integrating climate change education into nursing curricula can enhance awareness and sustainability behaviours, contributing to broader environmental sustainability efforts in healthcare.

Practical implications Regular awareness campaigns and the integration of climate change into the university curriculum are essential. Healthcare providers, especially nurses, should promote eco-friendly behaviours, address health effects related to climate change, and educate their patients, families, and communities about climate change and green purchasing intentions.

Keywords Nursing students, Climate awareness, Climate change, Green purchasing intention

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Introduction

Although economic growth has improved the quality of life, it has also led to environmental challenges such as pollution, depletion of natural resources, and increased greenhouse gas emissions. These factors contributed to phenomena like global warming and climate change [1].

Climate change is now recognized as one of the greatest risks to global health in the modern era [2]. As the global climate continues to undergo significant transformation, it poses a substantial threat to human well-being, biodiversity, and the stability of ecosystems [3]. It critically undermines food security, disrupts nutrition, deteriorates air quality, and compromises access to safe drinking water while exacerbating the incidence of food-, water-, and vector-borne diseases [4]. Such changes profoundly impact the physical, social, and psychological dimensions of individual well-being [5].

The healthcare sector, in particular, significantly contributes to environmental degradation, pollution and climate change, imposing substantial public health challenges [6]. Modern health systems are responsible for approximately 5% of global carbon emissions, stemming from their entire supply chain, which encompasses manufacturing, procurement, distribution, and waste management processes. This situation highlights the urgent necessity for comprehensive mitigation and adaptation strategies, as well as the integration of innovative technologies, to improve the sustainability of health systems [4].

In response to the escalating threats of climate change, healthcare professionals, particularly nurses, are urged to take decisive action, as they are ideally positioned to support global initiatives aimed at reducing emissions and protecting communities from climate-related impacts [7, 8]. While nursing organizations have made notable efforts both locally and globally to mitigate these negative impacts [9], there remains insufficient recognition within nursing practice of the role healthcare practices play in climate change [10]. Furthermore, evidence regarding nurses' willingness to engage in climate-related initiatives is lacking, and the potential for nurses to actively contribute to climate mitigation is often overlooked [2, 10]. This gap in both awareness and readiness highlights the critical need for change in nursing education in order to empower nurses to play a more active role in climate action, thereby advancing more effective and sustainable climate action within the healthcare sector [2, 7, 10].

In this context, this research provides a valuable contribution to the growing body of knowledge on the relationship between environmental consciousness and green purchasing intentions, particularly among nursing students, who are poised to influence sustainable practices within the healthcare sector [8]. Grounded in the Attitude Behaviour Context (ABC) Theory and Norm Activation Model (NAM) Theory, which explore the interplay between attitudes, environmental awareness, and consumer behaviour, this study extends the application of these theories to a healthcare-specific population in a developing country, Egypt [11, 12]. By focusing on nursing students in Egypt, the study addresses a gap in the limited literature on green purchasing behaviours within healthcare in developing nations [13]. Exploring these dynamics may help identifying actionable insights and potential pathways to embed environmentally conscious behaviours into the professional practices of healthcare providers, thereby addressing both individual and systemic sustainability challenges [10].

This exploration aligns with broader consumer behaviour trends that are increasingly shifting toward environmental preservation. While personal needs remain central, many consumers are now prioritizing sustainability in their purchasing decisions. Numerous studies have highlighted that growing awareness of environmental issues influences consumers to choose eco-friendly products to benefit future generations [14]. This shift has prompted companies to focus on designing, marketing, pricing, and distributing products that mitigate environmental damage [15]. However, various underlying factors hinder consumers from fully adopting more environmentally friendly purchasing habits, which warrants further exploration [16]. This is especially important given that research on green purchasing behaviour remains particularly scarce in developing nations [13].

Furthermore, the rising digitalization of the world has granted consumers access to more information about product characteristics and their environmental impact, leading to greater awareness of the social and environmental consequences of their consumption habits. Marketing strategies have also evolved to emphasize environmental conservation, ethics, and social responsibility, further encouraging sustainable purchasing decisions [16]. Nonetheless, a significant gap persists between consumers' intentions to buy green products and their actual purchasing behaviour, particularly across different cultural contexts [17].

Nurses, as healthcare providers, play a critical role in bridging the gap between eco-conscious intentions and actions within both healthcare settings and the broader community [10, 18–20]. They influence procurement decisions, advocate for green initiatives, and promote sustainable practices such as active travel, sustainable diets, and green social prescribing [10, 18, 19]. In addition, nurses can contribute to the overarching goal of mitigating climate change and advancing a more sustainable healthcare system by advocating for and implementing policies related to decarbonization. This includes supporting investments in renewable energy, low-carbon technologies, and sustainable waste management [21].

Literature review

Human activities have undeniably contributed to climate warming, with recent changes occurring at an accelerated pace, intensity, and scale not witnessed in centuries or even millennia. As global temperatures continue to rise, the consequences of these changes are expected to grow more severe, leading to lasting and potentially irreversible effects on our planet [22]. The decade from 2010 to 2019 was the warmest on record, resulting in an increased frequency and severity of extreme weather events that pose significant threats to human health and well-being, including wildfires, droughts, heat waves, hurricanes, and floods [23]. Global warming is also driving rising sea levels, accelerating the transmission of infectious diseases, and contributing to food and water shortages, which can result in political conflict, mass migration, and economic decline, adversely impacting the physical, mental, and social well-being of individuals and communities [24–26]. These examples underscore the strong interconnection between planetary health and public health, emphasising the need for integrated approaches to address these pressing global challenges [23].

A key strategy to mitigate these challenges lies in the growing trend toward eco-friendly consumer behaviour. The rising preference for "green" products is largely driven by increased environmental concerns; however, evidence indicates substantial variation in such behaviours across different countries and cultures [27]. According to the WHO Health and Climate Change Survey Report (2018), while many countries are making strides in national health and climate change planning, there remains a pressing need for more comprehensive strategies. Approximately half of the countries surveyed (51 out of 101) have developed a national health and climate change plan, yet notable differences exist in their scope and focus. Furthermore, most countries have subsequently updated their plans, reflecting a growing awareness of the need to protect public health from climate-related impacts and establish resilient health systems [28].

In today's world, environmental consciousness is not merely a lifestyle choice but a necessity, prompted by the increasing awareness that traditional energy resources are finite [29]. Consequently, the number of environmentally conscious consumers, particularly those purchasing green products, has grown substantially [30]. Green products, which are recyclable, renewable, reusable, and/or decomposable, provide an opportunity to improve both individual living standards while minimizing environmental harm. Such products have a lower environmental footprint compared to conventional alternatives, which makes them integral to sustainable consumption [31, 32].

The literature identifies several key factors that enhance green purchase intentions, including collectivism, green perceived value, attitudes, and trust in eco-friendly products [31]. Environmental knowledge and green advertising further strengthen these intentions, underscoring the importance of promoting environmental awareness across all educational levels [1, 33]. This is particularly relevant in the context of healthcare education, where nursing students support the integration of sustainability and climate change education into their programs, recognising its significance for future healthcare practices [34]. However, despite nursing students increasing support, more efforts are still required to embed sustainability competencies within health-care educational frameworks, not only to raise awareness but also to shift attitudes and behaviours in support of long-term environmental progress [34, 35]. Incorporating sustainability education is essential for achieving broader environmental goals, such as the Paris Agreement's target of limiting global warming to 1.5 °C and attaining net-zero emissions by 2050 [23, 34].

In the digital age, consumers have unprecedented access to information, enabling them to make more informed decisions regarding eco-friendly products and personal consumption patterns [16]. Social media plays an important role in shaping the purchasing intentions and behaviours of younger generations, fostering greater awareness of sustainability, and encouraging reduced carbon footprints. This contributes to the adoption of more sustainable consumption practices [36]. Driven by environmental concerns and increased knowledge, younger consumers demonstrate a stronger intention to purchase eco-friendly products, making consumer awareness a vital factor in promoting sustainable consumption [37].

In Egypt, longstanding environmental challenges such as rising temperatures and unpredictable rainfall patterns are intensified by climate change [38], highlighting the need for coordinated, society-wide efforts to mitigate these effects. Effective public engagement within this framework requires active involvement from key stakeholders—such as organizations, policymakers, and university students—who play influential roles in advancing climate-focused initiatives [39]. As educational institutions, universities serve as vital platforms for cultivating sustainability-conscious future professionals whose knowledge, values, and attitudes will shape environmental outcomes [34].

However, despite a general awareness of climate change among Egyptian university students and a willingness to support mitigation efforts, many still lack sufficient depth of knowledge and demonstrate limited sustainable habits. Bridging this gap requires educational programs that place a focused emphasis on climate change, addressing its root causes, societal implications, and relevance

to daily life. Such programs should aim not only to enhance theoretical understanding but also to foster the adoption of environmentally sustainable practices, encouraging students to contribute meaningfully to environmental resilience [39]. Consequently, comparative research examining nursing students' attitudes toward climate change and sustainability across different countries could inform the development of globally applicable educational materials to support sustainable healthcare practices [34].

In 2022, the American Nurses Association (ANA) reaffirmed its commitment to addressing the health impacts of climate change by revising its 2008 statement. This commitment includes initiatives aimed at expanding nursing knowledge on climate-related health issues, encouraging climate-conscious practices through the Healthy Nurse, Healthy Nation™ initiative, and integrating climate change health impacts into nursing education curricula [40].

These professional and educational shifts conjointly highlight the alignment of this study with key Sustainable Development Goals (SDGs) for 2030. Specifically, Goal 3 (promoting health and well-being for all), Goal 4 (ensuring equitable and inclusive quality education), Goal 12 (fostering sustainable consumption and production), Goal 13 (urgent action on climate change and its impacts), Goal 15 (protecting terrestrial ecosystems), and Goal 17 (strengthening global partnerships for sustainability) [41]. This alignment with the SDGs not only underscores the relevance of the study but also highlights its potential contributions to global sustainability efforts and educational reforms in nursing.

The Theory of Planned Behaviour (TPB)

Understanding human behaviour in its full complexity presents significant challenges [42]. To address these complexities, the Theory of Planned Behaviour (TPB), an extension of Fishbein and Ajzen's original Theory of Reasoned Action (TRA), provides a robust framework. This expectancy-value model examines how attitudes, subjective norms, and perceived behavioural control influence intentions and actual behaviour [42–46]. TPB posits that prior purchasing experiences positively impact attitudes and ecological consciousness, which, in turn, shape subsequent purchasing intentions [47]. This model is underpinned by a framework of deliberative processing, where individuals incorporate all available information to form behavioural judgments. TPB has been widely applied in diverse fields such as marketing, consumer behaviour, and health psychology, with research indicating robust predictive ability in explaining behavioural variance. Within both TRA and TPB, intention emerges as a central determinant of behaviour, a concept especially pertinent in healthcare and environmental contexts where individual actions can have broad social and ecological impacts [46].

As healthcare providers and educators, nurses occupy a pivotal position in influencing both their own behaviours and those of their patients. Through their understanding of the TPB, nurses can promote sustainable practices and advocate for environmental consciousness within healthcare settings and in the broader community, establishing themselves as key contributors to environmental sustainability [34, 48]. By leveraging the unique opportunities inherent in their role, nurses can extend the scope of their influence beyond clinical settings through targeted patient education on issues such as safe medication disposal, sustainable lifestyle choices, and the environmental impacts of healthcare decisions. This approach empowers individuals in the community to adopt greener, health-conscious behaviours. Integrating sustainability into nursing practice is essential for advancing a healthcare sector that is both resilient and ecologically accountable, ultimately contributing to the goal of a healthier planet for all [48]. With their significant representation within the healthcare workforce, nurses' collective commitment to sustainability can substantially reduce the sector's environmental footprint [34].

Aim and Hypotheses Development

This study aims to assess the relationship between nursing students' awareness of climate change, their attitudes toward the issue, and their green purchasing intentions. The research is grounded in the theoretical framework of the Theory of Planned Behaviour.

H1: Awareness and Attitudes Toward Climate Change

Nursing students with higher levels of climate change awareness exhibit more positive attitudes toward the issue. Research by Tiitta et al. (2024) underscores this relationship, revealing that nursing practices are increasingly aligning with goals of environmental preservation and public health. This alignment reflects students' growing awareness of their responsibility to adopt sustainable healthcare practices [49]. Students actively engaged in environmental organizations show heightened awareness, sensitivity, and proactive attitudes toward mitigating climate change compared to their peers. To sustain this progress, educational institutions should update nursing curricula to include comprehensive, climate-focused content, ensuring the continuation of these positive developments [49, 50].

H2: Attitudes and Green Purchasing Intentions

Nursing students' positive attitudes toward climate change significantly influence their intention to engage in green purchasing behaviours. Evidence highlights the value students place on integrating sustainability and

climate change into their education, reflecting their recognition of the nursing role in addressing climate-related health impacts. Incorporating sustainability and climate change topics into undergraduate nursing curricula can strengthen these positive attitudes, fostering environmentally conscious behaviours such as green purchasing. This approach aligns with broader efforts to promote sustainability [18, 35, 51].

H3: Interconnections Between Awareness, Attitudes, and Intentions

There are positive correlations between nursing students' awareness of climate change, their attitudes toward the issue, and their intention to purchase green products (Fig. 1). Literature highlights the significance of embedding climate change awareness into nursing curricula to develop environmentally conscious practices [52]. Studies demonstrate strong correlations between nursing students' knowledge of climate issues, their attitudes toward sustainability, and their adoption of eco-friendly behaviours [51]. These findings support the need for targeted educational interventions that foster a comprehensive understanding of climate change among nursing students and equip them to advocate for and implement sustainable practices in their professional and personal lives [52].

By exploring these hypotheses, the study aims to provide actionable insights for integrating sustainability into nursing education, equipping future nurses to play an active role in addressing climate change and promoting environmental health.

Methodology

Study Setting and Design

This study employed a descriptive correlational design, adhering to the guidelines outlined in the "Improving the Reporting of Observational Studies in Epidemiology" (STROBE) checklist. It covered five geographic areas in Egypt, including Canal Cities, Upper Egypt, Delta, Northern Egypt, and Central Egypt.

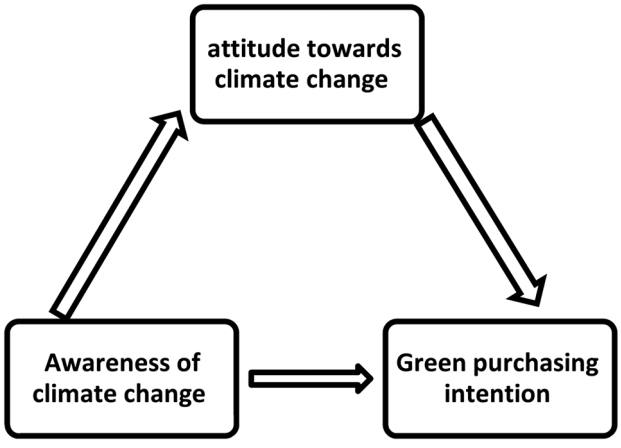

Fig. 1 A conceptual model

Participants and Sampling

A convenience sample of nursing students was recruited from nursing faculties and institutions across the study sites, resulting in a total of 1,400 participants. The sample size was calculated using G*Power software, employing the point biserial model statistical test with an effect size of $dz = 0.12$, to ensure a power of 99% and a significance level (alpha) of 0.03.

Instruments of the Study

The data collection process involved three instruments:

Tool I. Awareness of Climate Change

This tool, developed by Lopez and Malay (2019) based on Ezeudu (2016) [53, 54] and translated into Arabic by the researchers, assessed participants' awareness of climate change using 15 questions on a four-point Likert scale. Response options were scored as follows: 4 = strongly agree, 3 = agree, 2 = disagree, and 1 = strongly disagree. Mean scores were interpreted as follows: 1.00–1.75 indicated "not at all aware," 1.76–2.50 "slightly aware," 2.51–3.25 "moderately aware," and 3.26–4.00 "extremely aware".

Tool II. Attitude Towards Climate Change

This tool was also developed by Lopez and Malay (2019) based on Ezeudu (2016) [53, 54] and translated into Arabic by the researchers to assess the participants' attitudes toward climate change. It comprised 10 questions rated on a four-point Likert scale ranging from "strongly disagree" to "strongly agree". Responses were scored as follows: 4 = strongly agree, 3 = agree, 2 = disagree, and 1 = strongly disagree. Mean scores were used for interpretation, as follows: 1.00–1.75 "strongly disagree," 1.76–2.50 "disagree," 2.51–3.25 "agree," and 3.26–4.00 "strongly agree."

Tool III. Green Purchasing Intentions

To evaluate participants' intentions to purchase eco-friendly products, this tool was developed by Maichum et al. (2016) [55] and subsequently translated into Arabic by the researchers. The questionnaire consisted of 20 items across six domains: attitudes towards green products (3 items), subjective norms (3 items), perceived behavioural control (4 items), environmental concern (4 items), environmental knowledge (3 items), and green products purchase intention (3 items). Using a Likert-type scale ranging from 1 to 5, students indicated their level of agreement with each statement.

Additionally, demographic information was collected via a questionnaire that included variables such as age, gender, academic level, and place of residence.

Validity and Reliability of Instruments

The study instruments were translated into Arabic and meticulously adapted to ensure suitability for Arabic-speaking participants. The initial translation process was overseen by the researchers to maintain conceptual fidelity with the original versions. A bilingual translator then conducted a back-translation, and any inconsistencies were addressed through iterative revisions to ensure the scales' equivalence with the source versions. Five nursing professors evaluated the instruments for clarity and relevance, leading to further refinements based on their feedback. The revised questionnaires were subsequently validated and approved by experts.

To assess internal consistency, Cronbach's alpha coefficients for the original Green Purchasing Intentions Questionnaire were calculated and ranged from 0.808 to 0.943. Composite reliability (CR) values were between 0.812 and 0.946, while the average variance extracted (AVE) values spanned 0.591 to 0.856, all exceeding the recommended thresholds of 0.700 for CR and 0.500 for AVE [55].

The climate change awareness and attitude scales, initially developed by Ezeudu (2016), were reviewed and refined by three experts to ensure face validity. These scales were trial-tested on 40 senior secondary school students from a population similar to the study sample, yielding Cronbach's alpha coefficients of 0.89 for the awareness scale and 0.97 for the attitude scale, indicating high reliability [54].

A pilot study was conducted with 40 nursing students not included in the main sample to evaluate the clarity and estimated completion time of the instruments, which averaged 15–20 minutes. Based on the findings, minor adjustments were made to enhance the tools' quality and effectiveness. The results of the pilot study indicated that the tools were generally well-understood and demonstrated high reliability, with Cronbach's alpha scores of 0.920 for the Green Purchasing Intentions Questionnaire, 0.828 for the Attitude towards Climate Change Questionnaire, and 0.839 for the Awareness towards Climate Change Questionnaire.

Bias

To minimize sampling bias, a diverse group of nursing students was selected to ensure a representative sample, reducing the impact of individual differences and random variation. To prevent information bias, participants' names were encrypted, and data were collected online for most participants, while students in northern Egypt completed paper-based questionnaires due to internet connectivity issues. Online questionnaires were designed to allow only one response per participant, effectively addressing potential selection bias and ensuring the representativeness of the sample.

Data Collection Process

The data collection phase was conducted from early March to late April 2024. Researchers approached nursing students during their breaks at the university, explaining the significance of the study and inviting them to participate. In northern Egypt, data were collected using individually distributed and collected sealed envelopes containing the questionnaires, as internet connectivity issues were prevalent in the region. To avoid sample duplication, specific measures were implemented. For online participants, Google Forms were utilized, requiring sign-in with a Google account to restrict responses to one per participant. Questionnaires were shared via Telegram and WhatsApp groups to maximize reach and accessibility.

Both the online and paper-based questionnaires included an introductory page that outlined the study's objectives and addressed ethical considerations, ensuring that participants were fully informed about their rights. This approach enhanced the transparency of the research process and promoted participant trust.

Statistical Analysis

Data analysis was performed using SPSS 26.0 (IBM Inc., Chicago, IL, USA) to examine the responses from 1,400 participants. Descriptive statistics, including frequencies (percentages) and mean ± standard deviations (SD), were employed to summarize the participants' general characteristics. ANOVA test utilized for relation between variables and personal data. Pearson's correlation analysis was used to evaluate the relationships between nursing students' levels of awareness, attitudes toward climate change, and their intention to purchase green products. Additionally, mediation analysis and confirmatory factor analysis (CFA) were performed using JASP version 0.14.1.

Ethical Considerations

The study was approved by the Ethics Committee of Assiut University's Faculty of Nursing (approval number: 1120240784) prior to its commencement. Informed consent was obtained from each participant after they were provided with a detailed document explaining the study's objectives and their rights. Participants confirmed their voluntary participation by signing the informed consent statement, which included assurances of anonymity and data confidentiality. They were also informed of their right to withdraw from the study at any time without facing any consequences.

Table 1 Measurement model fit indices for tools

Fit Indices	Criteria	Indicators		
		Awareness of climate change	Attitude towards climate change	Green purchasing intentions
Chi-square	$p > 0.050$	293.692 ($p < 0.000$)	171.327 ($p < 0.00$)	261.507 ($p < 0.001$)
Chi-square/ DF (degree of freedom)	>0.9000	0.823	0.876	0.939
Goodness of Fit Index (GFI)	>0.9000	0.878	0.9167	0.918
Adjusted Goodness of Fit Index (AGFI)	>0.9000	0.758	0.903	0.969
Relative Fit Index (RFI)	>0.9000	0.952	0.876	0.963
Normed Fit Index (NFI)	>0.9000	0.971	0.971	0.971
Comparative Fit Index (CFI)	<0.080	0.073	0.051	0.068
Root Mean Square Error of Approximation (RMSEA)	<0.050	0.0341	0.0437	0.039

Results

Table 1 illustrates the fit indices for the measurement models related to study variables. Generally, the models exhibit acceptable fit. The Goodness of Fit Index (GFI) exceeds 0.9000 for attitudes (0.9167) and green purchasing intentions (0.918), indicating good model fit for these variables, though awareness of climate change falls slightly below the threshold (0.878). The Comparative Fit Index (CFI) values, all below the preferred <0.080 threshold, range from 0.051 to 0.073, suggesting good comparative fit across the models. Root Mean Square Error of Approximation (RMSEA) values are also favourable, remaining below 0.050 for all three variables, supporting strong model fit and suggesting that each model adequately represents the data.

Table 2 presents a comparison of climate change awareness, attitudes, and green purchasing intentions across demographic groups. Among the 1,400 participants, 70.1% were under 20 years of age, and 67.4% were enrolled in a Faculty of Nursing. Additionally, 64.8% were first-year students, and 30.9% resided in Canal Cities.

Regarding the awareness of climate change, regional differences were significant ($p = 0.000$), with participants from Central Egypt (47.44 ± 6.61) and Canal Cities (47.29 ± 5.80) showing the highest awareness levels.

Attitude towards climate change differed significantly by educational background and geographical region (both $p = 0.000$), with Faculty of Nursing students (31.89 ± 4.45) and participants from Central Egypt (34.18 ± 4.53) scoring the highest. Green purchasing intentions exhibited significant differences across all demographic groups (all $p < 0.001$), with the highest mean scores observed in participants aged 25 years and older (80.01 ± 10.95), Faculty of Nursing students (80.65 ± 11.18), fourth-year students (80.31 ± 11.01), and respondents from Central Egypt (90.85 ± 8.87).

Table 3 shows that participants demonstrated the highest awareness level for the item, "Damage to the ozone layer causes climate change," with a mean score of 3.3821 ± 0.699. Conversely, the lowest awareness scores were observed for the items, "People can help stop climate change by using more electricity" (2.3829 ± 0.909) and "Climate does not mean the same thing as weather" (2.6621 ± 0.842).

Table 2 Relationship between study variables and personal characteristics (n = 1400)

Personal Characteristics		No. (%)	Awareness of climate change		Attitude towards climate change		Green purchasing intention	
			Mean ± SD	*p*	Mean ± SD	*p*	Mean ± SD	*p*
Age	<20 years	981 (70.1)	46.28 ± 6.52	0.304	31.55 ± 4.48	4.228	77.82 ± 10.26	6.477
	20 - < 25 years	395 (28.2)	46.09 ± 5.93	0.738	31.22 ± 3.72	0.015	76.95 ± 6.82	0.000**
	≥25 years	24 (1.7)	47.00 ± 4.293		29.16 ± 3.23		80.01 ± 10.95	
Education	Faculty of Nursing	944 (67.4)	46.51 ± 5.607	1.113	31.89 ± 4.45	6.092	80.65 ± 11.183	6.666
	Technical nursing institute	456 (32.6)	46.11 ± 6.654	0.266	30.42 ± 3.69	0.000**	76.62 ± 9.21	0.000**
Academic level	First	907 (64.8)	44.35 ± 3.92	1.022	31.51 ± 4.53	0.961	75.05 ± 8.32	7.682
	Second	448 (32.0)	45.23 ± 4.657	0.382	31.30 ± 3.79	0.410	76.00 ± 13.87	0.000**
	Third	28 (2.0)	46.23 ± 5.951		30.92 ± 3.45		77.74 ± 9.77	
	Fourth	17 (1.2)	46.32 ± 6.59		30.05 ± 3.00		80.31 ± 11.01	
Geographical area	Canal Cities	432 (30.9)	47.29 ± 5.802	9.942	29.40 ± 4.37	90.154	70.43 ± 10.48	274.39
	Upper Egypt	226 (16.1)	45.80 ± 5.650	0.000**	30.10 ± 3.26	0.000**	77.35 ± 6.84	0.000**
	Delta	211 (15.1)	45.52 ± 6.097		30.94 ± 2.60		80.69 ± 2.40	
	Northern Egypt	324 (23.1)	44.85 ± 7.04		33.55 ± 3.52		84.35 ± 6.81	
	Central Egypt	207 (14.8)	47.44 ± 6.613		34.18 ± 4.53		90.85 ± 8.87	

p values marked with ** indicate statistical significance at specified thresholds

Table 3 Descriptive analyses of awareness towards climate change (n = 1400)

Items	Mean ± SD
The climate is dynamic and is always changing through time	3.0821 ± 0.672
The climate in weather conditions over an extended period is climate change	3.0193 ± 0.679
Climate does not mean the same thing as weather	**2.6621 ± 0.842**
Climate change comes with the rise in sea level	2.9593 ± 0.781
Climate has changed for millions of years	3.2479 ± 0.708
Cutting down trees causes climate change	3.2671 ± 0.774
Acid rain causes climate change	2.9479 ± 0.773
More garbage/waste causes climate change	3.0764 ± 0.835
Burning fossil fuels causes climate change	3.2643 ± 0.710
Damage to the ozone layer causes climate change	**3.3821 ± 0.699**
Climate change can cause more floods and drought	3.3057 ± 0.692
Climate change can cause polar ice caps and glaciers to melt	3.3793 ± 0.695
People can help stop climate change by using more renewable energy resources	3.0850 ± 0.820
People can help stop climate change by planting more trees	3.1829 ± 0.772
People can help stop climate change by using more electricity	**2.3829 ± 0.909**

Table 4 Descriptive analyses of attitude towards climate change (n = 1400)

Items	Mean ± SD
I believe climate change is a huge problem.	3.2907 ± 0.724
I believe climate change is real.	**3.3707 ± 0.599**
There is still time to prepare for climate change problems.	**2.8693 ± 0.730**
I believe that immediate actions should be taken about climate change.	**3.3421 ± 0.669**
I am preparing myself for the effects of climate change.	3.1043 ± 0.663
I always ask questions about climate change	3.0836 ± 0.650
I read news and updates about climate change.	3.2007 ± 0.646
I am spreading information about climate change.	3.0079 ± 0.705
I am seriously concerned about climate change.	3.0664 ± 0.701
I will participate in climate change-related activities.	3.0829 ± 0.722

Table 4 reveals that participants expressed the strongest agreement with the statements "I believe climate change is real" (3.3707 ± 0.599) and "I believe immediate actions should be taken regarding climate change" (3.3421 ± 0.669). The lowest mean score was found for the item "There is still time to prepare for climate change problems" (2.8693 ± 0.730).

Table 5 indicates that the highest mean scores for green purchasing intention were for the statements "I think that purchasing green products is a good idea" (4.1550 ± 0.808) and "I prefer to check the eco-labels and certifications on green products before purchase" (4.1286 ± 0.819). By contrast, the lowest mean scores were reported for "My close friends think I should purchase green products rather than normal products" (3.5629 ± 0.948) and "Most people important to me believe I should purchase green products rather than normal products" (3.7021 ± 0.933).

Table 5 Descriptive analyses of green purchasing intention (n = 1400)

Items	Mean ± SD
I think that purchasing green products is favorable	3.9750 ± 0.845
I think that purchasing green products is a good idea	**4.1550 ± 0.808**
I think that purchasing green products is safe	4.1257 ± 0.834
My family thinks that I should purchase green products rather than normal products	3.8343 ± 0.921
My close friends think that I should purchase green products rather than normal products	**3.5629 ± 0.948**
Most people who are important to me think I should purchase green products rather than normal products	**3.7021 ± 0.933**
I am confident that I can purchase green products rather than normal products when I want	4.0050 ± 0.806
I see myself as capable of purchasing green products in the future	3.9921 ± 0.796
I have the resources, time, and willingness to purchase green products	3.7200 ± 0.886
There are likely to be plenty of opportunities for me to purchase green products	3.8236 ± 0.769
I am very concerned about the state of the world's environment	4.0921 ± 0.864
I am willing to reduce my consumption to help protect the environment sustainability	4.1214 ± 0.897
Major social changes are necessary to protect the natural environment	4.1136 ± 0.807
Major political change is necessary to protect the natural environment	3.8671 ± 0.912
I prefer to check the eco-labels and certifications on green products before purchase	**4.1286 ± 0.819**
I want to have a deeper insight into the inputs, processes, and impacts of products before purchase	4.0521 ± 0.82
I would prefer to gain substantial information on green products before purchase	4.0779 ± 0.830
I intend to purchase green products next time because of their positive environmental contribution	4.0379 ± 0.814
I plan to purchase more green products rather than normal products	3.8986 ± 0.864
I will consider switching to eco-friendly brands for ecological reasons	4.0571 ± 0.811

Table 6 demonstrates statistically significant positive correlations among study variables, along with the reliability of each measure. Awareness of climate change and attitude towards climate change show a statistically significant positive correlation ($r = 0.084$, $p = 0.002$), indicating that increased awareness can improve attitude towards climate action. Similarly, a statistically significant correlation exists between awareness of climate change and green purchasing intention ($r = 0.073$, $p = 0.006$), suggesting that those more aware of climate issues may show more inclination to purchase green products. The strongest correlation observed is between attitude towards climate change and green purchasing intention ($r = 0.576$,

Table 6 Descriptive analyses and correlation between study variables (n = 1400)

Variables		1	2	3
1- Awareness of climate change	r			
	p			
2- Attitude towards climate change	r	0.084**		
	p	0.002		
3- Green purchasing intention	r	0.073**	0.576**	
	p	0.006	0.000	
α		0.839	0.828	0.920

r=Pearson Correlation; **α**=Cronbach's Alpha; ***p***=significance level. **. Correlation is significant at the 0.01 level (2-tailed)

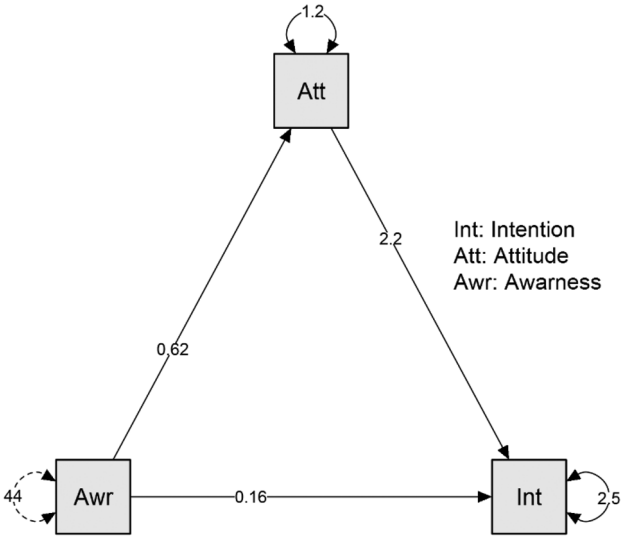

Fig. 2 Mediation model

$p < 0.001$), suggesting that a favourable attitude towards climate issues is strongly associated with a higher intention to make environmentally friendly purchases. The reliability scores (Cronbach's Alpha), are high across all variables, indicating a strong internal consistency.

Table 7 investigates the mediating effect of attitude toward climate change on the relationship between awareness of climate change and green purchasing intention. The analysis reveals significant direct and indirect effects. Firstly, awareness of climate change has a direct positive effect on green purchasing intention (B = 0.162, $p = 0.000$), suggesting that higher awareness independently increases green purchasing intention. Secondly, awareness significantly influences attitude toward climate change (B = 0.8878, $p = 0.000$). Furthermore, attitude toward climate change strongly impacts green purchasing intention (B = 2.1677, $p = 0.000$). The significant indirect effect (B = 2.321, $p = 0.016$) indicates that the relationship between awareness of climate change and green purchasing intention is partially mediated by attitude. This finding indicates that awareness not only directly enhances green purchasing intention but also does so indirectly by positively influencing attitudes toward climate change as a mediator variable (Fig. 2).

Discussion

In the present study, a geographic area consistently emerged as a significant factor influencing climate change awareness, attitudes, and green purchasing intentions. Regional influences and educational background were found to shape environmental attitudes. Green purchasing intentions also showed statistically significant differences across all demographic factors, underscoring the influential role of geographic context and education in shaping environmental perspectives and behaviours.

Regarding the observed pattern of regional influences, researchers suggest that this may be attributed to the low-income levels and modest living standards in certain regions of Egypt, which influence purchasing intentions, awareness, and attitudes. In contrast, Witek and Kuźniar (2020) found that all socio-demographic factors, including income, significantly impact both awareness and purchasing behaviours related to green products [56]. In terms of educational influence, the study's findings support recommendations to integrate climate change and sustainability content into youth education curricula, including nursing programs, to enhance public understanding and engagement with climate action [6, 34, 40, 49, 51, 52, 57, 58]. This is particularly relevant given the strong evidence in the literature showing that nursing students increasingly hold positive attitudes supporting the incorporation of sustainability and climate change topics into their nursing curricula [34].

Participants in this study demonstrated high awareness of issues such as ozone layer depletion, the melting of polar ice caps and glaciers, natural disasters (e.g., flooding and drought), and deforestation, recognizing

Table 7 Mediating effect of attitude towards climate change between awareness of climate change and green purchasing intention (n = 1400)

Direct effect	(B)	SE.	t	p	LLCI	ULCI
Awareness of climate change → green purchasing intention	0.162	0.0367	12.8471	0.000	0.1600	0.1543
Awareness of climate change → Attitude towards climate change	0.8878	0.067	11.102	0.000	0.1248	0.0607
Attitude towards climate change → green purchasing intention	2.1677	0.0125	7.172	0.000	0.1714	0.0639
Indirect effect						
Awareness of climate change →, attitude towards climate change →, green purchasing intention	2.321	0.0226	3.734	0.016	0.0847	0.0073

B: Estimated effect size; **SE**: Standard error; **t**: t-statistic; **p**: *p*-value; **LLCI**: Lower limit of confidence interval; **ULCI**: Upper limit of confidence interval

their direct connections to climate change. This finding is consistent with previous studies that reported high levels of climate change awareness among nursing students [59, 60]. These environmental concerns have long been acknowledged in academic literature for their association with climate change [61, 62]. The literature also underscores the pivotal role of media in shaping public perceptions of climate change. With emotionally charged images and reports, media provides indirect exposure to distant environmental events, thereby amplifying the perceived salience of climate change as a global threat [63]. In addition, electronic mass media has been identified as a primary source of climate change information for students [64]. Consequently, the widespread coverage of these issues in social media and news outlets likely plays a crucial role in shaping public perceptions of climate change and its related risks [65].

Regarding attitude towards climate issues, the results reveal that participants strongly recognized that climate change is a real, urgent, and major concern. This aligns with the literature with reported strongly favorable attitudes toward climate change and global warming among students [66].

A strong green purchasing intention was reflected in high mean scores, with respondents showing strong agreement that purchasing eco-products is a good idea, a high preference for checking eco-labels and certifications before purchase, and a clear willingness to reduce consumption and adopt more sustainable behaviours. These findings align with previous studies that highlight a growing trend of consumers increasingly favouring environmentally friendly products [36, 67].

Environmental awareness is integral to promoting sustainability, which supports a balanced ecosystem and enhances societal well-being [67]. This study identified a significant positive correlation among key variables, showing that awareness of climate change is positively associated with both climate change attitude and green purchasing intention; this indicates that increased awareness can enhance both pro-climate attitudes and a stronger inclination to purchase eco-friendly products. Similarly, research suggests that higher levels of environmental awareness increase consumers' intent to choose eco-friendly products, often driven by a sense of responsibility to contribute positively to environmental protection [67]. Additionally, previous studies demonstrate a positive correlation between climate change awareness and pro-sustainability attitudes, suggesting that as individuals become more informed about climate issues, their commitment to sustainable practices also strengthens [12, 52].

The study's findings also underscore that attitude toward climate change holds the strongest correlation with green purchasing intention, indicating that positive climate attitudes are a powerful driver of environmentally friendly purchasing intention. In the same context, studies show that consumers' environmentally conscious attitudes and awareness significantly shape their preference for sustainable products [68, 69]. Additionally, environmental awareness significantly influences the relationship between pro-environmental attitudes and purchasing behaviour [68]. Similarly, a study by Kolenatý et al., (2022) identified the acquisition of knowledge about climate issues as a direct and effective method to encourage individual engagement in climate actions. their findings also indicated that a heightened willingness to act frequently resulted in the implementation of concrete climate initiatives [70].

The findings from this study highlight a significant direct impact of climate change awareness and attitudes on green purchasing intention, with awareness also exerting a positive influence on attitudes toward climate change. Furthermore, climate awareness exerts an indirect effect on green purchasing intention through attitudes, emphasizing the role of attitudes as a mediating variable. This indicates that individuals with greater climate awareness are likely to develop supportive attitudes towards environmental protection, thereby reinforcing their intention to purchase eco-friendly products. Consequently, these results imply that interventions aiming to boost green purchasing intentions among nursing students should prioritise enhancing both awareness and positive attitudes toward climate change. This is consistent with studies that emphasise awareness as a fundamental starting point for climate action and green purchase intention [70, 71].

In contrast, other studies report a somewhat different dynamic. For example, one study found that environmental knowledge does not directly influence green purchase intention but instead operates through attitudes as a full mediator, positioning attitudes as the critical link between knowledge and green purchasing intention [72]. Another study demonstrated that while environmental knowledge significantly enhances attitudes—which, in turn, affect environmental behavioural intentions and pro-environmental actions—the impact of knowledge on actual behaviours is indirect and fully mediated by attitudes and intentions [73].

Furthermore, prior research indicates that individuals are more likely to engage in sustainable practices when they acquire environmental knowledge [74] and perceive environmentally friendly products to offer high value, premium quality, and competitive pricing [75]. This combination of awareness and product perception highlights the importance of both knowledge and attitudes in driving green purchasing decisions. By integrating climate change education into curricula, particularly in fields like nursing, we can enhance both environmental knowledge

and attitudes. This, in turn, can foster a stronger commitment to sustainability and eco-friendly purchasing behaviours, supporting broader efforts towards environmental protection and responsible consumerism, particularly in healthcare.

Practical implications

This research highlights the critical need to integrate climate change and sustainability topics into nursing curricula. Targeted educational content focusing on eco-friendly practices can equip future healthcare professionals with the knowledge and skills to advocate for and implement sustainable practices in their personal and professional lives. Emphasizing the practical implications of climate change for healthcare, incorporating region-specific interventions, and collaborating with media to raise public awareness can foster a culture of sustainability among nursing students and empower them to address the healthcare sector's environmental challenges effectively.

Nurses, as influential healthcare providers, are well-positioned to lead efforts in reducing the sector's environmental footprint. They can promote sustainable practices, educate patients and communities, and advocate for policies that align with eco-conscious principles. Encouraging nursing students to engage in extracurricular activities and awareness campaigns can strengthen their roles as environmental advocates, enabling them to influence behaviours such as sustainable diets and green social prescribing, which benefit both health and the environment.

Additionally, this research underscores the importance of healthcare systems adopting sustainable decarbonization strategies, including renewable energy, low-carbon technologies, and sustainable waste management. By integrating sustainability concepts into nursing education and practice, nursing educators and policymakers can prepare future nurses to drive meaningful change, influence procurement decisions, and promote green initiatives, contributing to a healthier, more sustainable future within healthcare settings and beyond.

Theoretical implications

This study highlights the pivotal role of awareness in shaping pro-environmental attitudes and eco-conscious purchasing decisions, aligning with environmental psychology theories such as the ABC and the NAM [12]. The findings underscore the transformative potential of targeted educational interventions to enhance climate change awareness and foster sustainable practices among nursing students and professionals. Integrating sustainability into healthcare and educational institutions can equip providers with essential knowledge and skills, promoting resource conservation, upholding ethical standards, and driving proactive climate action to mitigate the healthcare sector's ecological footprint.

Future research is needed to evaluate the effectiveness of specific educational programs designed to increase nursing students' climate change awareness and encourage sustainable practices. Longitudinal studies are particularly important to assess the long-term impact of climate change education on attitudes and behaviours, providing insights into how these evolve and influence professional practice. This evidence can guide the development of effective, evidence-based strategies for embedding sustainability across the healthcare sector, amplifying its positive impact on the wider community.

Limitation of the study

One study limitation was the reliance on online data collection methods, which may have introduced selection bias. Some students preferred paper-based methods or have not responded to the online links. To address this limitation, the researchers provided alternative paper-based surveys to nursing students who preferred or did not respond to online surveys, ensuring inclusivity and capturing a broader range of perspectives. The researcher distributed the questionnaire through WhatsApp, Facebook, and Telegram groups used for communication between faculty members and students. Due to this method, it was challenging to determine the exact number of students who agreed to participate in the study from different academic levels.

Furthermore, social desirability may influence participants' answers; thus, attitudes may be overestimated. The relationship between environmental knowledge and attitudes is influenced by the geographical distribution of colleges and the difference between urban and rural areas. The researchers collected data from several colleges and more participants to address this limitation.

Conclusions

The study concluded that participants exhibited a high level of awareness towards climate change and held positive attitudes towards it. Additionally, they demonstrated a solid intention to purchase green products. A statistically significant positive correlation existed between participants' awareness of climate change, attitude towards climate change, and green purchasing intention. The participants' awareness and attitudes towards climate change significantly predict their green purchasing intentions. The mediation analysis indicates that higher awareness and positive attitudes towards climate change are associated with more excellent intentions to purchase green products. The analysis reveals that climate change awareness directly enhances green purchasing intention and also indirectly influences it through attitudes toward

climate change, with attitude serving as a partial mediator in the relationship.

Originality/Value

This study provides a novel and comprehensive examination of the link between nursing students' awareness and attitudes towards climate change and their green purchasing behaviours. It focuses on nursing students and future healthcare providers to understand how their environmental sustainability perceptions influence consumer behaviour. The research highlights the critical role of education and awareness in fostering eco-friendly behaviours among healthcare students.

Abbreviations

WHO	World Health Organization
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
ANA	American Nurses Association
SDGs	Sustainable Development Goals

Supplementary Information

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Supplementary Material 1

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Author contributions

MMA developed the concept for the article. MMA, RHH, AAO, and MAR designed the study, developed the methodology, and collected and analyzed clinical data. MMA, RHH, AAO, RH, and MAR revised and drafted the manuscript. All authors approved the final version. MMA, RHH, AAO, and RH contributed to critical revisions to enhance the manuscript's intellectual content.

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Data availability

The datasets utilized and analyzed in the present study can be obtained from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

The study adhered to the principles outlined in the Helsinki Declaration. Before commencement, the Ethics Committee of Assiut University's Faculty of Nursing approved the research protocol (approval number:1120240784). Each participant was required to provide informed consent before participating. They carefully read and signed a document outlining the study's objectives, ensuring anonymity, confidentiality, and the freedom to withdraw at any time.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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