

# Undergraduate Nursing Students' Attitudes, Knowledge, and Skills Related to Children's Environmental Health

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## ABSTRACT

**Background:** Nurses are in a privileged position to detect environmental risks among children. The objective was to determine attitudes, knowledge, and skills related to children's environmental health in undergraduate nursing students. **Method:** A cross-sectional study was designed in eight universities ( $n = 2,462$ ) from September 2017 to June 2018. Descriptive values and multivariate analysis of variance were calculated using three questionnaires. **Results:** Of the total 2,462 students in the sample, 2,155 had a good attitude regarding addressing children's environmental health problems, 501 had good knowledge, and 1,162 had good skills. Students who had attended a session on sustainability more than 3 months prior had a better attitude (9.93%), knowledge (11.16%), and skills (3.82%). Second course students and men had better environmental competency ( $p < .001$ ). **Conclusion:** Undergraduate nursing students have good attitudes; however, they lack knowledge and skills. There is a need to include children's environmental health in nursing curricula. [*J Nurs Educ.* 2019;58(7):401-408.]

frequency of extreme weather events, such as floods, heat or cold waves, reduced rainfall or torrential rain, rising sea levels, ocean acidification, and worsening air quality. Heat-related illnesses, respiratory diseases, infectious diseases, reduced food security, and mental health problems are associated with such events, which are increasing the mortality and morbidity rates of the health conditions with which they are associated (Nicholas & Breakey, 2017; Rice, Thurston, Balmes, & Pinkerton, 2014; Sullivan-Marx & McCauley, 2017).

The World Health Organization (2019) defined environmental health as:

...all the physical, chemical, and biological factors external to a person, and all the related factors impacting behaviors. It encompasses the assessment and control of those environmental factors that can potentially affect health. It is targeted toward preventing disease and creating health-supportive environments. This definition excludes behavior unrelated to environment, as well as behavior related to the social and cultural environment, and genetics. (para. 1)

Thus, this concept includes the direct pathological effects of chemicals, radiation, and certain biological agents on health and well-being, in addition to the physical, psychological, and social effects, including the living environment in general (housing, urban development, land use, and transport) (Jones, 2002; Landrigan et al., 2019; McDermott-Levy, Jackman-Murphy, Leffers, & Jordan, 2019).

In recent years, scientific evidence has shown that climate change is a source of health problems of massive dimensions. The climate is changing, as well as the intensity and

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**TABLE 1****Demographic Characteristics of the Sample**

Characteristic	Value
Mean age (years)	21.57 ( <i>SD</i> = 5.11)
Gender, <i>n</i> (%)	
Male	429 (17.63)
Female	2,004 (82.37)
Year of course, <i>n</i> (%)	
First	745 (30.66)
Second	645 (26.54)
Third	611 (25.14)
Fourth	429 (17.66)
Have attended a session on sustainability and nursing, <i>n</i> (%)	
Yes, within the prior 3 months	127 (5.29)
No	2,083 (86.83)
Yes, more than 3 months prior	189 (7.88)
University, <i>n</i> (%)	
University of Almería	308 (12.51)
University of Cantabria	159 (6.46)
University of Córdoba	271 (11.01)
University of Granada	506 (20.55)
University of Jaén	423 (17.18)
University of Lleida	179 (7.27)
University of Málaga	393 (15.96)
University of Sevilla	223 (9.06)

Progressive and excessive industrialization is generating environmental pollution of the air, land, and aquatic ecosystems. Currently, more than 110,000 chemical compounds pollute natural ecosystems, both locally and globally. These substances pollute the soil and the food, water, and air that we ingest, drink, and breathe daily (Landrigan et al., 2019).

The pediatric population is the most vulnerable to exposure to environmental risk factors due to anatomophysiological immaturity and psychosocial dependence (George, Bruzzese, & Matura, 2017; Landrigan et al., 2019). Environmental quality is a key factor for the survival of children in the first years of life and is determinant of proper physical and mental development. The health of more than two thirds of children is threatened by environmental risks in their homes and in places where they learn and play (Landrigan et al., 2019).

More than 40% of the global disease burden attributed to environmental risk factors affects children under the age of 5 years, who represent only approximately 10% of the world's population (Leffers, Distelhorst, & McDermott-Levy, 2016). Every day, more than 40,000 children die from malnutrition and infectious and contagious diseases, and each year, more than 150 million children survive with diseases that irreversibly

compromise their physical and mental development. Emerging diseases include respiratory, asthmatic, or allergic diseases and neurological and neoplastic pathologies. The pediatric population comprises 40% to 45% of all asthma cases (George et al., 2017; Landrigan et al., 2019).

Nurses are in a strategic and privileged position to detect families at risk. Nurses take care of children's illnesses, educate parents and family members, raise awareness of health and well-being, and act as trusted professionals to successfully advocate for and support changes in health policy (Leffers & Butterfield, 2018). Universities play a leading role in the development of educational approaches to solving problems related to sustainable development (Álvarez-Nieto et al., 2017); however, nursing students are poorly prepared to understand the connections among climate change, sustainability, and health (Bellack, Musham, Hainer, Graber, & Holmes, 1996; Kirk, 2002). Thus, there is a growing demand from different sectors to include sustainability and climate change issues in nursing curricula (Goodman & Richardson, 2010; Lilienfeld, Nicholas, Breakey, & Corless, 2018). Accordingly, nursing students improve their children's health environmental competency, defined as a set of related attitudes, knowledge, and skills.

Based on this previously discussed research, one hypothesis should be tested. The children's health environmental competency among undergraduate nursing students is insufficient. The objective of the current study was to determine the attitudes, knowledge, and skills related to children's environmental health in undergraduate nursing students. As a result, strategies can be developed to include competencies on these issues that are deficient in nursing curricula.

## METHOD

### Design

A multicenter cross-sectional study was designed.

### Participants

A convenience sample of 2,462 undergraduate nursing students was taken from classes at eight universities. **Table 1** details the sample demographic characteristics.

### Data Collection

The data were collected from students in each of the 4 study years of the nursing program at the eight universities from September 2017 to June 2018, in 15- to 20-minute sessions during large group classes by individuals trained in data collection. The instruments were self-administered in a paper-based or online format depending on the availability at each university. The instruments included the following:

- Sustainability Attitudes in Nursing Survey (SANS\_2), which was designed to evaluate nursing students' attitudes toward sustainability and climate change. It is composed of five items, for which the response options range from 1 to 7 on a Likert scale, with a maximum score of 35 points. Although the score range was not established by the authors, we calculated the ratio using the total scores and number of items: *excellent attitude* (> 90% perceived attitudes), *very good attitude* (70% to 89%), *good attitude* (50% to 69%), *in-*

TABLE 2

Number of Sample Participants According to the Level of Attitudes, Knowledge, and Skills

Variable	<i>n</i>	Excellent	Very Good	Good	Not Enough	Poor
Attitudes	2,435	293 (12.03%)	977 (40.12%)	885 (36.35%)	265 (10.88%)	15 (0.62%)
Knowledge	2,403	5 (0.21%)	47 (1.96%)	449 (18.68%)	1053 (43.82%)	849 (35.33%)
Skills	2,388	1 (0.04%)	16 (0.67%)	1145 (47.95%)	1214 (50.84%)	12 (0.50%)

sufficient attitude (30% to 49%), and poor attitude (< 29%). Reliability analysis of this tool previously revealed a Cronbach's alpha of .82, and the five items loaded on a single factor explained 58% of the variance (Richardson et al., 2016). In the current study, the Cronbach's alpha was found to be .85.

- Children's Environmental Health Knowledge Questionnaire (ChEHK-Q), which measures the knowledge of children's environmental health in nursing students. It is composed of 26 items, with *true*, *false*, and *I do not know* answer options, and a maximum score of 26 points. The score range is: *excellent knowledge* (> 90% correct answers), *very good knowledge* (80% to 89%), *good knowledge* (60% to 79%), *insufficient knowledge* (40% to 59%), and *poor knowledge* (< 39%). This tool has previously shown a good fit and reliability of .87 for items and .76 for people, based on the Rash Model (Álvarez-García, Álvarez-Nieto, Pancorbo-Hidalgo, Sanz-Martos, & López-Medina, 2018). In the current study, the Cronbach's alpha was found to be .75.
- Children's Environmental Health Skills Questionnaire (ChEHS-Q), which measures children's environmental health skills in nursing students. It is composed of 12 items, for which the response options range from 1 to 5 on a Likert scale, with a maximum score of 60 points. The score range is: *excellent skills* (> 90% perceived skills), *very good skills* (80% to 90%), *good skills* (70% to 80%), *insufficient skills* (50% to 70%), and *poor skills* (< 50%). This tool has previously shown a good fit and reliability of .87 for items and .76 for people, based on Andrich's rating scale model (Álvarez-García et al., 2018). In the current study, the Cronbach's alpha was found to be .88.

### Data Analysis

Descriptive statistics of the demographic data and questionnaire scores were calculated. To contrast the hypothesis, a multivariate test of mean differences was used (multivariate analysis of variance to simultaneously contrast the differences in the scores of all tests together) to examine how different demographic variables may affect the management of environmental problems. The *p* values of the post hoc analysis were Bonferroni-adjusted within the multivariate analysis of variance, which was followed by discriminant analysis. The punctuation variables were expressed as histograms to check for normality. The multivariate homogeneity of covariance matrices was tested using Box's M in every case, and no significant values were found. In addition, Levene's test of variables was not statistically significant, indicating that the group variances

are equal. Significance was estimated at  $p < .05$ . The missing data were random and thus ignored by performing data imputation to replace them. Analyses were performed using SPSS® version 24 and jMetrik™.

### Ethical Considerations

The current study was approved by the Institutional Review Board of the University of Jaén. The objectives of the research and the nonobligatory nature of participation were explained to the students. In addition, students were asked for verbal consent to participate, and all their questions were answered. Students were not obliged to fill out the questionnaires, and participation did not affect the evaluation in any subject. Confidentiality of personal data was guaranteed.

### RESULTS

A total of 2,155 (87.50%) students had at least a good attitude regarding addressing children's health environmental problems, whereas 280 (11.50%) participants had an insufficient or poor attitude. With respect to knowledge, 501 (20.85%) participants had at least good knowledge, whereas 1,902 (79.15%) had insufficient or poor knowledge. For skills, 1,162 (48.66%) students had at least good skills, whereas 1,226 (51.34%) had insufficient or poor skills (Table 2).

The mean score for attitude was 24.56 (5-35,  $SD = 5.67$ ). Item one ("Climate change is an important issue for nursing") had the highest perceived attitude ( $5.45 \pm 1.40$ ), and item two ("Issues about climate change should be included in the nursing curriculum") had the lowest perceived attitude ( $4.29 \pm 1.57$ ). The mean score for knowledge was 12.14 (0-26,  $SD = 4.17$ ). Item one ("The pediatric population is more susceptible to environmental threats due to their biological immaturity") had the highest percentage of correct answers (87.50%), whereas item five ("Nitrogen oxide from fossil fuels in the home and tobacco smoke causes redness and burns on the skin") had the lowest (10.80%). The item most unknown was 22 ("Food colorings and preservatives are associated with central nervous system problems"), with an ignorance index of 51.40%. The mean score for skills was 35.14 (12-55,  $SD = 4.15$ ). Item two ("I am able to identify the environmental risks that can cause respiratory diseases in a child") had the highest perceived skills ( $3.39 \pm 1.01$ ), and item three ("I am able to identify the environmental risks that can cause neoplastic diseases in a child") had the lowest perceived skills ( $2.82 \pm 1.03$ ). All item values are shown in Table 3.

Statistical differences in attitude, knowledge, and skills were found among the course years ( $\lambda = 0.962$ ,  $F[12, 6281.31] =$

**TABLE 3**  
**Values of Attitudes, Knowledge, and Skills Items on Children's Environmental Health**

Variable	<i>n</i>	<i>M</i>
Attitudes		
1. Climate change is an important issue for nursing.	2,435	5.45 ± 1.40
2. Issues about climate change should be included in the nursing curriculum.	2,431	4.29 ± 1.57
3. Sustainability is an important issue for nursing.	2,417	5.27 ± 1.35
4. Sustainability should be included in the nursing curriculum.	2,427	4.55 ± 1.51
5. I apply sustainability principles at home.	2,431	5.06 ± 1.35
Knowledge		
1. The pediatric population is more susceptible to environmental threats due to their biological immaturity.	2,404	0.90 ± 0.31
2. The increased energy and metabolic consumption of the pediatric population protects children from environmental hazards.	2,398	0.49 ± 0.50
3. The higher rate of cell growth during the pediatric age increases the risk of health effects caused by environmental factors.	2,399	0.59 ± 0.49
4. Environmental factors do not influence hormonal secretion during puberty.	2,389	0.80 ± 0.40
5. Nitrogen oxide from fossil fuels in the home and tobacco smoke causes redness and burns on the skin.	2,398	0.11 ± 0.31
6. Particles from animals exacerbate the asthma crisis.	2,393	0.65 ± 0.48
7. Increased humidity at home improves respiratory diseases in children.	2,393	0.49 ± 0.50
8. Passive smoking is associated with the development of acute leukemia in children.	2,396	0.42 ± 0.49
9. Childhood leukemia incidence rates are higher in the areas most exposed to radon.	2,389	0.54 ± 0.50
10. Overexposure to solar ultraviolet radiations can damage the skin of adults more severely than that of children.	2,400	0.66 ± 0.47
11. During childhood more than half of the expected lifetime solar ultraviolet radiation is absorbed.	2,400	0.44 ± 0.50
12. Lead accumulates in the body, thus affecting the nervous system.	2,401	0.73 ± 0.44
13. Chronic dietary exposure to mercury (fish and shellfish) is less toxic to children's central nervous system than to adults.	2,401	0.60 ± 0.49
14. Exposure to pesticides increases the risk of developing attention deficit problems in school-aged children.	2,401	0.45 ± 0.50
15. Children born to smoking mothers during pregnancy are at risk of lower intellectual capacity.	2,401	0.69 ± 0.46
16. Exposure to organic solvents during fetal development can cause learning disabilities in children.	2,399	0.60 ± 0.49
17. Water containing nitrates can only cause intoxication during childhood.	2,400	0.60 ± 0.49
18. Chlorination of water forms sub-products from the disinfection process that have been classified as carcinogenic.	2,392	0.39 ± 0.49
19. The major source of childhood exposure to pesticides is through ambient air.	2,398	0.16 ± 0.36
20. The main route of exposure to mercury is through cereal intake.	2,394	0.46 ± 0.50
21. Exposure to lead through diet occurs mainly through fish intake.	2,399	0.17 ± 0.38
22. Food colorings and preservatives are associated with central nervous system problems.	2,399	0.34 ± 0.47
23. Genetically modified foods cause fewer allergic reactions in children.	2,394	0.55 ± 0.50
24. Schools and nurseries are environmentally safe places.	2,391	0.84 ± 0.37
25. Children are exposed to higher concentrations of air pollutants at home than outdoors.	2,400	0.57 ± 0.50
26. Parks and gardens are the areas with the least environmental pollutants where children can play.	2,402	0.50 ± 0.50

7.72,  $p < .001$ ,  $\eta^2 = 0.013$ ). Bonferroni's *post hoc* test highlighted the statistical differences (**Table 4**).

Moreover, the mean of the sum of the three children's health environmental competencies was significantly different among

students who had attended a session on sustainability and nursing within the previous 3 months, students who had attended but earlier than 3 months prior, and those who had not attended ( $\lambda = 0.968$ ,  $F[6, 4642] = 12.806$ ,  $p < .001$ ,  $\eta^2 = 0.016$ ). Students

**TABLE 3 (Cont.)**  
**Values of Attitudes, Knowledge, and Skills Items on Children's Environmental Health**

Variable	<i>n</i>	<i>M</i>
Skills		
1. I am able to assess the main environmental risks to which a child is exposed.	2,391	3.22 ± 0.94
2. I am NOT able to identify the environmental risks that can cause respiratory diseases in a child.	2,388	3.39 ± 1.01
3. I am able to identify the environmental risks that can cause neoplastic diseases in a child.	2,374	2.82 ± 1.03
4. I am NOT able to identify the environmental risks that can cause neurological disorders in a child.	2,382	2.97 ± 1.07
5. I am able to provide health education to parents about the main contaminants in their child's food.	2,371	2.99 ± 1.13
6. I am NOT able to identify the environmental risks in playgrounds.	2,382	3.20 ± 1.08
7. I am able to provide health education to parents about actions to minimize environmental risks to which a child is exposed when playing outdoors.	2,379	3.11 ± 1.03
8. I am NOT able to identify the environmental risks in a child's home.	2,378	3.29 ± 1.03
9. I am able to provide health promotion to parents about environmental risks at home.	2,375	3.21 ± 1.01
10. I am able to identify the environmental risks in a child's school.	2,378	3.22 ± 0.94
11. I am NOT able to identify the actions needed to combat environmental risks in a child's school.	2,376	3.23 ± 1.01
12. I do NOT feel able to do my job as a nurse in a Pediatric Environmental Health Specialty Unit.	2,373	3.18 ± 1.20

who had attended a session on sustainability and nursing within the previous 3 months attained 6.11% better attitude scores than students who had not attended any session. Furthermore, students who had attended a session on sustainability and nursing earlier than 3 months prior attained 9.93% better attitude scores, 11.16% better knowledge scores, and 3.82% better skill scores than students who had not attended any session. Bonferroni's *post hoc* test highlighted the statistical differences (Table 4).

In addition, the mean of the sum of the three children's health environmental competencies was different according to attendance at sessions on sustainability and nursing in the different courses ( $\lambda = 0.986$ ,  $F[18, 6,536.98] = 1.754$ ,  $p = .025$ ,  $\eta^2 = 0.005$ ). Bonferroni's *post hoc* test highlighted the statistical differences (Table 5).

Finally, gender was studied as an independent variable, and statistical differences were found between males and females in children's health environmental competency ( $\lambda = 0.992$ ,  $F[3, 2,356] = 6.24$ ,  $p < .001$ ,  $\eta^2 = 0.008$ ). The means are shown in Table 4.

## DISCUSSION

The hypothesis is partly supported by the results. Nursing students have a positive attitude toward coping with environmental problems; however, they lack the related knowledge and skills. Thus, the environmental competencies among nursing students are insufficient, but there exists a positive attitude toward the necessity to manage environmental health problems.

Generally, the problem is greater in the case of knowledge, suggesting that inclusion of topics related to the manner by which environment affects child health is imperative, given that nursing students have a sufficiently positive attitude regarding the importance of these topics but require a deeper knowledge to develop skills in this field. Most nursing students scored high

on the item "Climate change is an important issue for nursing"; in contrast, they scored low on the item "Issues about climate change should be included in the nursing curriculum," perhaps due to the fact that they thought it would add more content to their curriculum. Nevertheless, the future objective should focus on adapting the content to our present reality. Moreover, we found that nursing students know that the pediatric population is more susceptible to environmental threats due to their biological immaturity, but they do not have sufficient knowledge regarding the pollutants that cause neurological diseases. Verification of these combined knowledge results with the perceived skills shows that students are able to identify the environmental risks that can cause respiratory diseases in children but are unable to identify those that can cause neoplastic diseases.

Third-year students had higher attitude and skill scores and second-year students had higher knowledge scores, whereas first-year students had lower children's health environmental competencies. These data show that students gain higher competencies to manage children's health environmental problems as the program years progress; thus, it is important to include environmental topics progressively, starting in the first year, as is supported by several previous studies (Erdogan, 2013; Felicilda-Reynaldo et al., 2018).

Attendance at sessions on sustainability and nursing has generally been shown to improve attitude, knowledge, and skills in children's environmental health; however, the results are statistically significant in the areas of knowledge and skills 3 months after the sessions, when students have been able to practice what they have learned. These results are similar to those found previously during skills sessions in Plymouth, United Kingdom (Grose, Doman, Kelsey, Richardson, & Woods, 2015; Richardson, Grose, Doman, & Kelsey, 2014; Richardson, Grose, Jackson, et al., 2014; Richardson, Grose, Bradbury, & Kelsey, 2017) and in Arabic countries (Cruz Alshammari, &

**TABLE 4**  
**Means of Attitudes, Knowledge, and Skills According to Gender, Year of Course, and Attending a Session on Sustainability and Nursing**

Variable	n	M		
		Attitudes	Knowledge	Skills
Year of course				
First	721	23.87 ± 5.62 <sup>a,b*</sup>	11.52 ± 4.18 <sup>a**,b**</sup>	34.49 ± 4.49 <sup>b**,c*</sup>
Second	636	24.99 ± 5.59 <sup>d*</sup>	12.82 ± 4.04 <sup>d**,c*</sup>	35.06 ± 3.67 <sup>b</sup>
Third	600	25.05 ± 5.49 <sup>d*</sup>	12.55 ± 4.09 <sup>d**</sup>	35.81 ± 4.14 <sup>d**,a</sup>
Fourth	400	24.34 ± 5.97	11.77 ± 4.24 <sup>a*</sup>	35.47 ± 4.01 <sup>d*</sup>
Have attended a session on sustainability and nursing				
Yes, within the prior 3 months	121	25.88 ± 5.51 <sup>e*</sup>	12.83 ± 4.49	35.64 ± 3.99
No	2,022	24.30 ± 5.64 <sup>f*,g**</sup>	12.02 ± 4.16 <sup>g**</sup>	35.00 ± 4.09 <sup>g**</sup>
Yes, more than 3 months prior	183	26.98 ± 5.24 <sup>e**</sup>	13.53 ± 3.62 <sup>e**</sup>	36.39 ± 4.65 <sup>e**</sup>
Gender				
Men	416	24.97 ± 5.54	12.40 ± 4.13	35.87 ± 4.25 <sup>h**</sup>
Women	1,994	24.46 ± 5.69	12.11 ± 4.17	34.98 ± 4.11 <sup>h**</sup>

<sup>a</sup> Indicates significant difference with second-year students.

<sup>b</sup> Indicates significant difference with third-year students.

<sup>c</sup> Indicates significant difference with fourth-year students.

<sup>d</sup> Indicates significant difference with first-year students.

<sup>e</sup> Indicates significant difference with students who have not attended a session on sustainability and nursing.

<sup>f</sup> Indicates significant difference with students who have attended a session on sustainability and nursing within the prior 3 months.

<sup>g</sup> Indicates significant difference with students who have attended a session on sustainability and nursing more than 3 months prior.

<sup>h</sup> Indicates significant difference with men.

<sup>i</sup> Indicates significant difference with women.

\* p < .01. \*\* p < .001.

Felicilda-Reynaldo, 2018; Felicilda-Reynaldo et al., 2018); however, these results differ from those found by Richardson et al. (2015), in which no statistical differences were found, likely due to the small sample size.

In the current study, male students in the sample were more able to manage children's health environmental problems; their mean scores for skills were higher than those of the female students. Our results are in accordance with those reported by another study in undergraduate health students (Levine & Strube, 2012); however, this phenomenon has not been evaluated previously in studies conducted in nursing students (Cruz, Alshammari, et al., 2018; Cruz, Felicilda-Reynaldo, et al., 2018; Felicilda-Reynaldo et al., 2018; Richardson et al., 2016), and it is necessary to understand why these gender differences occur in order to implement the required measures for improvement of compliance with environmental principals.

The attitude results are higher than those found by Richardson et al. (2015), who used SANS in the United Kingdom; Richardson et al. (2016), who used SANS\_2 in Spain; and Richardson et al. (2017), who used SANS\_2 in the United Kingdom, in which the scores were 23.45, 22.71, and 24.11, respectively, whereas we found a mean score of 24.56. The scores reported by Cruz, Alshammari, et al. (2018) and Cruz, Felicilda-Reynaldo, et al. (2018) in Arabic countries were higher (25.11 and 32.95,

respectively) than our results. The item "Climate change is an important issue for nursing" was the most highly scored (4.70) in the study by Richardson et al. (2016), as in our study (5.45). In the studies by Richardson et al. (2015, 2017), the most highly scored item was "Sustainability is an important issue for nursing" (4.79 and 5.29, respectively). Accordingly, it is apparent that nursing students in Europe consider environmental topics important. However, this reality is different in Arabic countries, where the items "Climate change is an important issue for nursing" was scored the lowest (4.92), and the item "Issues about climate change should be included in the nursing curriculum" was scored the highest (5.10) (Cruz, Felicilda-Reynaldo, et al., 2018). The latter item had the lowest score in the studies by Richardson et al. (2015), Richardson et al. (2016), and Richardson et al. (2017) (3.96, 3.88, and 4.19, respectively), as in our study (4.29). The highly positive attitude of Arabic nursing students with respect to the inclusion of environmental topics in nursing curricula can be attributed to the recent implementation of the country's Transformation Program as part of its Vision 2030 (Alshuwaikhat & Mohammed, 2017).

The mean score of the respondents with respect to their level of knowledge regarding the potential health-related impact of climate change using a scale of 0 to 10 was 6.23 in a study conducted in Arabic countries, indicating a moderate

**TABLE 5**

**Means of Attitudes, Knowledge, and Skills According to Attendance at Sessions on Sustainability and Nursing per Course**

Attendance at Sessions	n	M		
		Attitudes	Knowledge	Skills
Yes, within the prior 3 months				
First year	61	24.54 ± 5.15	11.70 ± 4.33 <sup>a,b**</sup>	35.77 ± 3.94
Second year	22	27.64 ± 5.51	13.59 ± 4.78	34.91 ± 4.47
Third year	26	28.00 ± 5.28 <sup>c</sup>	15.04 ± 4.33 <sup>c**,d,e*</sup>	35.96 ± 4.20
Fourth year	12	24.83 ± 6.06	12.33 ± 3.28	35.67 ± 3.09
No				
First year	622	23.78 ± 5.63 <sup>a,b,f**</sup>	11.46 ± 4.16 <sup>a*,b**,f,g**,h</sup>	34.25 ± 4.50 <sup>e*,f**,h**,i</sup>
Second year	568	24.73 ± 5.58 <sup>f</sup>	12.62 ± 3.90 <sup>b**,c**,e</sup>	35.00 ± 3.53
Third year	480	24.54 ± 5.44 <sup>f*</sup>	12.31 ± 4.17 <sup>b**,c</sup>	35.68 ± 4.03 <sup>c**</sup>
Fourth year	343	24.21 ± 5.97 <sup>f*</sup>	11.65 ± 4.37 <sup>a*,b**,g</sup>	35.42 ± 4.03 <sup>c*</sup>
Yes, more than 3 months prior				
First year	21	27.38 ± 5.82	12.67 ± 3.89	37.52 ± 5.15 <sup>c</sup>
Second year	35	27.43 ± 5.00 <sup>c</sup>	15.89 ± 3.97 <sup>c**,d**,e**,f,g**,h**</sup>	36.29 ± 5.08
Third year	87	27.11 ± 5.11 <sup>c**,e*,g,h*</sup>	13.10 ± 3.32 <sup>b,c</sup>	36.47 ± 4.71 <sup>c**</sup>
Fourth year	40	26.10 ± 5.52	12.85 ± 3.02	35.70 ± 3.84

<sup>a</sup> Indicates significant difference with students who have attended a session within the prior 3 months in the third year.

<sup>b</sup> Indicates significant difference with students who have attended a session more than 3 months prior in the second year.

<sup>c</sup> Indicates significant difference with students who have not attended a session in the first year.

<sup>d</sup> Indicates significant difference with students who have attended a session within the prior 3 months in the first year.

<sup>e</sup> Indicates significant difference with students who have not attended a session in the fourth year.

<sup>f</sup> Indicates significant difference with students who have attended a session more than 3 months prior in the third year.

<sup>g</sup> Indicates significant difference with students who have not attended a session in the second year.

<sup>h</sup> Indicates significant difference with students who have not attended a session in the third year.

<sup>i</sup> Indicates significant difference with students who have attended a session more than 3 months prior in the first year.

\* p < .01. \*\* p < .001.

level of knowledge (Felicilda-Reynaldo et al., 2018), whereas in the current study, the score was lower (4.67), not even reaching the midpoint. This could be because the citizens of Arabic countries have been more affected by climate change, thus their knowledge of its effects is greater. Furthermore, these findings may be related to the presence of environmental legislation, which have become a vital part of the countries' developmental plans. However, we must consider the possibility that the results are higher because the questionnaire used in Arabic countries was more general and did not detail specific health damage.

Studies in RNs (Polivka, Chaudry, & Mac Crawford, 2012b; Xiao, Fan, Deng, Li, & Yan, 2016) have shown a positive attitude toward addressing climate change, but knowledge is limited with respect to the idea that climate change could affect their daily lives and public health, and these nurses do not possess sufficient skills to manage children's environmental health problems. This is because knowledge on climate change is obtained primarily from various social media (Nigatu, Asamoah, & Kloos, 2014; Xiao et al., 2016), indicating the necessity to include this topic in undergraduate nursing education.

Despite the strengths of the current study, certain limitations exist. The first is that social desirability may play a role in shaping participants' answers to the attitude and skill questionnaires, and the second is that the sample was derived in a nonrandom manner, which may account for sampling error.

Future projects should follow the steps taken by Arabic countries, such as changing the legislation, given that these measures have proven to be highly effective (Cruz, Alshammari, et al., 2018; Cruz, Felicilda-Reynaldo, et al., 2018; Felicilda-Reynaldo et al., 2018) in promoting sustainability and environmental research. One such example is the NurSusTOOLKIT: A Teaching and Learning Resource for Sustainability in Nursing (Álvarez-Nieto et al., 2018; NurSus, 2019). This article is part of the Children's Environmental Health project (Nursing and Innovation in Healthcare [CuiDsalud], 2018), which evaluates the attitude, knowledge, and skills with respect to children's environmental health in nursing students from different European universities, with the next phase focused on carrying out educational interventions in deficit areas. The interventions should be focused on e-learning, simulation scenarios, and real patient assessments, since these methodologies provide a broader un-

derstanding of the environmental influences that can affect children's and families' health (Polivka, Chaudry, & Mac Crawford, 2012a; Stanley & Rojas, 2014).

Although further work is required, these findings clearly show the necessity to change nursing curricula and include topics on children's environmental health, given that nursing students agree but lack the knowledge and skills needed to manage problems or illnesses caused by the environment. It is imperative to develop approaches to change this reality—climate change is advancing; thus, nursing must advance with it.

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