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Tıp Öğrencilerinde Ekolojik Ayak İzi Farkındalığı: Cinsiyet Farklılıkları ve Davranışsal Bulgular

ABSTRACT

Objective

This study aimed to assess the ecological footprint awareness levels of medical students and to examine whether their environmental attitudes and behaviours differed by gender.

Material and Methods

The study was conducted with medical students from a single university. Data were collected using the Ecological Footprint Awareness Scale. Mean total scores and category-based distributions were analyzed.

Results

The mean total score of participants was 110.45 ± 12.39, with scores ranging from 85 to 136. The highest averages were observed in the categories of energy use and legislation, reflecting students' sensitivity toward renewable energy and compliance with environmental regulations. Conscious behaviours were also noted in food and water consumption, although awareness of water conservation did not reach a fully homogeneous level. Gender comparisons revealed no statistically significant differences ($p > 0.05$); however, women tended to score higher in energy use and water consumption categories. Moreover, two items-preference for clean energy sources ($p = 0.043$, $d = 0.40$) and preference for recyclable packaging ($p = 0.038$, $d = 0.42$)-were significantly higher among female participants. These findings suggest that women demonstrate stronger support for energy policies and ethical consumption behaviours.

Conclusion

Medical students' environmental awareness levels were found to be promising. Nevertheless, efforts are needed to reduce behavioral differences and achieve more homogeneous awareness, particularly in water consumption and energy use. Strengthening environmental education programs and supporting students' sustainability-related knowledge and behaviours are critical for fostering environmentally conscious approaches among future health professionals.

Key Words

Ecological footprint, Environmental awareness, Medical students, Gender differences, Sustainability

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ÖZ

Amaç

Bu araştırmanın amacı, tıp öğrencilerinin ekolojik ayak izi farkındalık düzeylerini belirlemek ve çevresel tutum ile davranışlarının cinsiyet açısından farklılık gösterip göstermediğini incelemektir.

Gereç ve Yöntemler

Araştırma, belirli bir üniversitede öğrenim gören tıp öğrencileri üzerinde yürütülmüştür. Katılımcılardan ekolojik ayak izi farkındalık ölçeği aracılığıyla veriler toplanmış, toplam puan ortalamaları ve kategori bazında dağılımlar incelenmiştir.

Bulgular

Katılımcıların toplam puan ortalaması 110.45±12.39 olarak bulunmuştur. Enerji kullanımı ve yasalar kapsamı kategorilerinde en yüksek ortalamalara ulaşılmış, gıda ve su tüketimi alanlarında da bilinçli davranışlar gözlenmiştir. Ancak su tüketimi farkındalığının homojen bir düzeye ulaşmadığı belirlenmiştir. Cinsiyetler arası karşılaştırmalarda genel farklar istatistiksel olarak anlamlı bulunmamış ($p > 0.05$), fakat enerji kullanımı ve su tüketimi kategorilerinde kadınların puanlarının erkeklere göre daha yüksek olma eğilimi dikkat çekmiştir. Ayrıca iki maddede (temiz enerji tercihi ve geri dönüşüme uygun paket kullanımı) kadınların anlamlı düzeyde daha yüksek puanlar aldığı saptanmıştır.

Sonuç

Tıp öğrencilerinin çevresel farkındalık düzeyleri umut verici bulunmuştur. Bununla birlikte, su tüketimi ve enerji kullanımında farkındalığın daha homojen bir düzeye taşınması gerekmektedir. Çevresel eğitim programlarının güçlendirilmesi, öğrencilerin sürdürülebilirlik konusundaki bilgi ve davranışlarının desteklenmesi açısından kritik öneme sahiptir.

Anahtar Kelimeler

Ekolojik ayak izi, Çevresel farkındalık, Tıp öğrencileri, Cinsiyet farklılıkları, Sürdürülebilirlik

INTRODUCTION

The increasing prevalence of environmental problems exerts direct impacts not only on ecosystems but also on human health. Factors such as air pollution, depletion of water resources, food security, and energy consumption constitute significant environmental risks that threaten public health. Various studies conducted approximately thirty years ago have addressed these risks (1). Therefore, it is critically important for health professionals to possess knowledge regarding environmental sustainability and ecological awareness in order to safeguard public health.

Medical students, as future physicians who will guide community health, bear the responsibility of understanding the effects of environmental problems on health and developing awareness in this regard. A high level of environmental awareness contributes to physicians adopting sustainable behaviours both in their personal lives and professional practices. Moreover, such awareness supports the shaping of health policies through environmentally friendly approaches.

In this context, the "Awareness Scale for Reducing Ecological Footprint," adapted into Turkish by Tekindal and colleagues, is a valid and reliable instrument developed to measure individuals' environmental attitudes (2). The scale evaluates awareness levels across sub-dimensions such as energy use, legislation, recycling, transportation, food, and water consumption, thereby enabling comparisons among different demographic groups.

This study aims to examine the awareness levels of fifth-year medical students at Akdeniz University Faculty of Medicine regarding reducing ecological footprint and to conduct comparisons based on gender. In doing so, it seeks to gain insights into the environmental attitudes of future physician candidates and to generate data that may contribute to sustainability policies in the field of health.

MATERIAL and METHODS

Study Design and Participants

This research was conducted in December 2025 among fifth-year medical students at Akdeniz University Faculty of Medicine. The study was designed as a quantitative and comparative investigation, aiming to compare participants' attitudes toward selected environmental and social issues (energy use, legislative scope, recycling, transportation, food, and water consumption) according to gender. Participation was voluntary, and no exclusion criteria were applied.

Data Collection

The data collection process took place between December 20, 2025, and December 30, 2025. Questionnaires were administered in a self-report format, allowing students to complete them independently without supervision.

Instrument

The study employed the "Awareness Scale for Reducing Ecological Footprint," adapted into Turkish by Tekindal and colleagues in 2021. The scale consists of 30 items, each rated on a 5-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree").

The scale comprises six sub-dimensions:

- Energy (items 1–8)
- Under Laws (items 9–12)
- Recycling (items 13–17)
- Transportation (items 18–22)
- Food (items 23–26)
- Water Consumption (items 27–30)

The total score ranges from a minimum of 30 to a maximum of 150. Higher scores in both sub-dimensions and the overall scale indicate greater awareness regarding reducing

ecological footprint. Validity and reliability analyses have demonstrated that the scale is highly valid and reliable (2).

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics version 21. Descriptive statistics were presented in tables and percentages. For each variable, mean scores and standard deviations were calculated separately for male and female groups. Independent samples t-tests were applied to examine differences between groups. A significance level of $p < 0.05$ was adopted. To evaluate effect size, Cohen's d coefficient was calculated, with guideline values interpreted as d = 0.2 (small), d = 0.5 (medium), and d = 0.8 (large).

RESULTS

A total of 90 participants were included in the study. Of these, 47.7% were female (n = 43) and 52.2% were male (n = 47). The mean total score obtained by participants from the Ecological Footprint Awareness Scale was 110.45 ± 12.39.

Regardless of gender, the overall levels of attitudes and behaviours related to environmental categories are summarized in Table I. Participants' environmental attitudes and behaviors generally demonstrated a tendency ranging from moderate to high across all six categories examined. Among the environmental categories, participants achieved mean scores closest to the maximum in the domains of energy and under laws. The categories of food and water consumption also yielded relatively high mean scores.

Notably, the Energy category exhibited the highest standard deviation (SD = 4.16), indicating that participants formed the most heterogeneous (divergent) group in terms of attitudes and practices related to energy policies and behaviours. In contrast, the categories of food (SD = 1.84) and under laws (SD = 1.88) had the lowest standard deviation values. The water consumption category also showed a relatively high standard deviation (SD = 3.03).

Gender Comparisons

The mean scores and standard deviations of participants' ratings in the domains of energy, under the laws, recycling, transportation, food and water consumption were calculated separately for gender groups. The differences between male and female participants across environmental categories, as well as the results of effect size analyses, are presented in Table II. Item-level gender differences in environmental awareness are presented in Table III.

Table I. Descriptive Statistics of Participants' Environmental Awareness Scores

Category	Item Range	Maximum Score	Mean ($\bar{X}$) ± SD
Energy	1–8	40	33.37 ±4.16
Under the Laws	9–12	20	17.88±1.88
Recycling	13–17	25	15.76±2.56
Transportation	18–22	25	15.38±2.47
Food	23–26	20	13.95±1.84
Water Consumption	27–30	20	14.11±3.03

Table II. Results by Gender in Environmental Categories

Category	Gender	N (sample size)	Mean ($\bar{X}$) ± Standard Deviation (SD)	t-value	p-value	Cohen's d
Energy	Female	43	34.19±3.59	1.73	0.087	0.36
	Male	47	32.49±4.52			
Water Consumption	Female	43	14.62±2.70	1.55	0.124	0.32
	Male	47	13.56±3.37			
Food	Female	43	14.22±1.80	1.41	0.161	0.29
	Male	47	13.67±1.92			
Transportation	Female	43	15.70±2.31	1.45	0.150	0.31
	Male	47	15.02±2.65			
Category	**Gender**	**N (sample size)**	**Mean ($\bar{X}$) ± Standard Deviation (SD)**	**t-value**	**p-value**	**Cohen's d**
Under the Laws	Female	43	18.15±1.76	1.41	0.162	0.30
	Male	47	17.58±1.99			
Recycling	Female	43	15.58±2.69	0.78	0.439	0.16
	Male	47	14.18±1.76			

Table III. Item-Level Gender Differences in Environmental Awareness

Category	Item No	Female Mean ($\bar{X} \pm SD$)	Male Mean ($\bar{X} \pm SD$)	p-Value	Cohen's d
Energy	1	4.57 (0.50)	4.30 (0.75)	0.043	0.40
Recycling	17	4.13 (0.83)	3.70 (1.07)	0.038	0.42

The analysis revealed that none of the six environmental category scores showed a statistically significant difference between genders ($p > 0.05$). This finding indicates that, overall, there is no marked distinction between women and men in terms of environmental attitudes and behaviours.
Although statistical significance was not observed, Cohen's d values provide insight into the practical importance of the differences in means. In the categories of Energy ($d = 0.36$) and Water Consumption ($d = 0.32$), the effect sizes fall between small and medium according to Cohen's guidelines. In both cases, female participants had slightly higher mean scores than male participants. While these differences did not reach statistical significance ($p > 0.05$), they suggest a tendency for women to score somewhat higher in these two domains.

For the remaining categories (Food, transportation, and under the laws), the effect sizes were small ($d \approx 0.30$), further supporting the conclusion that gender differences in environmental attitudes are minimal.

Item-Level Gender Differences

Although no statistically significant differences were observed between genders across the overall categories, analysis of the 30 individual items revealed two items with significant differences at the $p < 0.05$ level. These were Item 1 in the Energy Use category ("Clean and least environmentally damaging energy sources are my preference for heating") and Item 17 in the Recycling category ("I prefer to use recyclable packages when shopping"). In both cases, female participants reported higher mean scores than male participants.

DISCUSSION

With the rapidly increasing population and consumption rates, vital resources have come under threat. Environmental problems, one of the most widely debated issues in today's modern world, have prompted a reconsideration of both individual and societal behaviours, while simultaneously increasing interest in understanding these challenges. Sustainability has emerged as a central theme in these discussions. Sustainability refers to the capacity to ensure the continuity of resources over the long term (3).

Moreover, major changes in climate are now clearly observable and are accompanied by various health problems. For instance, heat waves not only cause loss of life but also reduce the productivity of agricultural areas. Currently, approximately one-quarter of deaths worldwide are linked to environmental factors (4).

As a response to these changes, the concept of the ecological footprint was developed to quantitatively assess individuals' impacts on the environment. This approach measures levels of resource consumption and waste production in comparison with the Earth's capacity to regenerate resources, thereby providing concrete evidence of the pressure human activities place on ecological sustainability (5, 6). Consequently, the ecological footprint serves a critical function in evaluating the environmental impacts of human activities and is regarded as one of the fundamental indicators in sustainability studies.

In our study, the mean total score obtained by participants from the Ecological Footprint Awareness Scale was 110.45 ± 12.39. The highest score recorded was 136, while the lowest was 85. According to the scoring system of the scale, these results indicate that participants generally demonstrated a moderate-to-high level of awareness regarding environmental responsibilities.

Furthermore, the findings revealed statistically significant relationships between ecological footprint awareness levels and certain variables. Despite the considerable variability observed in category-level means, the overall distribution of total scores was more homogeneous. This suggests that the majority of participants clustered within the moderate-to-high score range, reflecting a consistent tendency toward heightened ecological awareness.

Participants achieved mean scores closest to the maximum in the categories of energy and under the laws. This finding indicates that students demonstrated a high level of individual awareness and responsibility regarding issues such as energy conservation and support for renewable energy. It further suggests that societal awareness of environmental issues is strongly directed toward both institutional and individual support mechanisms. The categories of food and water consumption also yielded relatively high mean scores. These results confirm that participants are conscious of everyday and household behaviors such as avoiding food waste and practicing water conservation. Although these findings are more favorable compared to those reported in other studies, it remains evident that awareness regarding water consumption should be further strengthened as a general approach (5, 7). A noteworthy observation is that the energy category exhibited the highest standard deviation (SD = 4.16). This indicates that participants formed the most heterogeneous group in terms of attitudes and behaviors related to energy policies and practices. The wide gap between participants with high motivation for energy conservation and those with lower levels of interest highlights the diversity of perspectives within this category.

In contrast, the categories of food (SD = 1.84) and under the laws (SD = 1.88) exhibited the lowest standard deviation values. This indicates that participants reached the greatest consensus and demonstrated the most homogeneous behavioural patterns in avoiding food waste and supporting environmental legislation.

By comparison, the water consumption category showed a relatively high standard deviation (SD = 3.03). This finding suggests that water conservation behaviours-such as turning off the tap while brushing teeth or seeking efficient ways of water use-were adopted at varying levels among participants. Consequently, societal awareness regarding water conservation has not yet translated into a uniform behavioural pattern.

An analysis was conducted to determine whether participants' scores in environmental categories differed by gender, and effect size calculations were performed. Although female participants obtained higher mean scores across all six categories, no statistically significant differences were found between genders ($p > 0.05$). This finding suggests that, overall, there is no marked distinction between women and men in terms of environmental attitudes and behaviours. Previous studies have reported that female participants scored significantly higher in environmental awareness; however, in the present study, no statistically significant differences were observed (3, 6, 8, 9). This discrepancy may reflect contextual or sample-specific factors, underscoring the importance of further research to clarify the role of gender in shaping ecological attitudes.

Although statistical significance was not observed, examination of the practical importance of mean differences revealed that the categories of energy ($d = 0.36$) and water consumption ($d = 0.32$) demonstrated effect sizes between small and medium according to Cohen's guidelines. In both cases, female participants had higher mean scores than male participants. While these differences did not reach statistical significance ($p > 0.05$), they suggest a tendency for women to score slightly higher in these two domains. In the remaining categories (Food, transportation, and under the laws), effect sizes were smaller, indicating minimal practical differences. This pattern reinforces the conclusion that there are no statistically significant gender differences in environmental attitudes and behaviours overall, but that small practical tendencies exist in favor of women in the domains of energy use and water consumption. Although these differences were not statistically significant in the present sample, they may become meaningful in larger samples or across different populations. Thus, while the hypotheses were not supported in this study, the observed small effect sizes highlight areas where gender-related differences in ecological awareness could emerge more clearly in future research.

Although no statistically significant differences were found across the six environmental categories, analysis of the 30 individual items revealed two items with significant gender differences at the $p < 0.05$ level. These were Item 1 in the Energy Use category ("Clean and least environmentally damaging energy sources are my preference for heating") and Item 17 in the Recycling category ("I prefer to use recyclable packages when shopping"). In both cases, female participants reported higher mean scores than male participants. These differences suggest that, contrary to the overall trend, gender may play a determining role in specific environmental actions or attitudes.

Our findings show that women reported significantly higher agreement with the statement "Clean and least environmentally damaging energy sources are my preference for heating" compared to men ($p = 0.043$). The difference in means corresponds to a medium effect size (Cohen's $d = 0.40$). This result highlights women's stronger support and belief in energy policies and renewable energy technologies. It is consistent with previous studies and reports indicating that women generally exhibit higher levels of environmental concern (10, 11).

The second significant difference emerged in the item "I prefer to use recyclable packages when shopping" ($p = 0.038$). Female participants scored higher, indicating that they engage in this conscious consumption behaviour more frequently than men. This difference also corresponds to a medium practical effect (Cohen's $d = 0.42$). Purchasing recycled or recyclable products is considered an ethical consumption practice, and women have traditionally been found to play a more dominant role in environmentally responsible purchasing behaviours (12).

Study Limitations

This study has several limitations. First, it was conducted only with medical students from a single university, which restricts the generalizability of the findings. Although the sample size was relatively adequate, future studies involving larger and more diverse socio-demographic groups would enhance the validity of the results.

Second, the data were collected through self-report measures, which may have been influenced by participants' social desirability tendencies. While the scales used to assess environmental attitudes and behaviours are reliable, the evaluation was based solely on quantitative data. Incorporating qualitative methods could provide a deeper understanding of the subject matter.

Finally, although gender differences were examined, other variables such as cultural, economic, and political factors were not considered. Therefore, future research is recommended to include a more comprehensive set of variables to better capture the complexity of ecological awareness and behaviour.

CONCLUSION

This study examined the ecological footprint awareness levels of medical students and revealed that participants generally demonstrated a moderate-to-high level of environmental responsibility. High mean scores in the categories of Energy Use and Legislation indicate students' sensitivity toward supporting renewable energy and complying with environmental regulations. Conscious behaviours were also observed in the domains of Food Consumption and Water Consumption, although awareness of water conservation did not reach a fully homogeneous level.

Gender comparisons showed no statistically significant differences overall; however, women tended to score higher in the categories of Energy Use and Water Consumption. Moreover, two items-preference for clean energy sources and preference for recyclable packaging-were found to be significantly higher among female participants. These findings suggest that women demonstrate stronger support for energy policies and ethical consumption behaviours.

In conclusion, while medical students' levels of environmental awareness are promising, efforts are needed to reduce behavioural differences and achieve more homogeneous awareness, particularly in water consumption and energy use. Small gender-based tendencies may become statistically significant in larger samples, highlighting the importance of further research. Strengthening environmental education programs and supporting students' knowledge and behaviours regarding sustainability are therefore critical for fostering environmentally conscious approaches among future health professionals.

Ethics Committee Approval: This retrospective study was conducted in accordance with the ethical standards of the institutional and national research committee and with the principles of the Declaration of Helsinki. Ethics committee approval was obtained from the Akdeniz University Faculty of Medicine Ethics Committee (approval number: TBAEK-1142).

Informed Consent

As this study was retrospective in nature and based on anonymized patient records, informed consent was waived.

Author Contributions

Concept – A.G.Ç., K.Ö.; Design – H.Ç., K.Ö., A.G.Ç.; Supervision –A.G.Ç., H.Ç.; Resources – K.Ö., H.Ç., A.G.Ç.; Materials – H.Ç., K.Ö.; Data Collection and/or Processing – K.Ö., H.Ç., A.G.Ç.; Analysis and/or Interpretation – A.G.Ç., H.Ç., K.Ö.; Literature Search – H.Ç., A.G.Ç.; Writing Manuscript – H.Ç., K.Ö.; Critical Review – A.G.Ç., K.Ö., H.Ç.

Conflict of Interest

The authors declare that they have no conflicts of interest.

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