ORIGINAL RESEARCH

# Sustainable Nutrition Knowledge and Behaviours in Highly Educated Adults: A Cross-Sectional Study

**Aslıhan Atar[1,2]* and Hilal Hızlı Güldemir[3]**

1. Department of Nutrition and Dietetics, Institute of Health Sciences, Istanbul Medipol University, Istanbul, Turkey
2. Department of Nutrition and Dietetics, Faculty of Health Science, Istanbul Beykent University, Istanbul Turkey
3. Department of Nutrition and Dietetics, Faculty of Health Science, Anadolu University, Eskisehir, Turkey

***Corresponding Author:** Aslıhan Atar; **E-mail**: aslihanatar@hotmail.com

## Abstract

### Background

Sustainable nutrition is crucial for addressing malnutrition, food insecurity, and health issues. Studies highlight the importance of education in shaping environmental attitudes. This study aims to assess the knowledge and behaviours related to sustainable nutrition among highly educated adults.

### Methods

This cross-sectional study included 397 highly educated adults who completed an online questionnaire assessing socio-demographics, sustainable nutrition knowledge (SNK), and behaviours (SNB). Construct validity was tested using exploratory factor analysis; internal consistency was evaluated with Cronbach's alpha. Statistical tests included Chi-square, ANOVA, and regression analysis. A medium effect size (f=0.25) was used for power calculation. Post-hoc tests were conducted where applicable to determine specific group differences.

### Results

Among 397 participants (48.6% women, mean age 28.08±6.7), women demonstrated significantly higher levels of both sustainable nutrition knowledge ($p=0.023$) and behaviours ($p<0.001$) compared to men. SNB was significantly associated with age ($p<0.001$), education ($p=0.004$), and marital status ($p<0.001$). Participants with higher SNK scores consumed significantly less red meat ($p=0.028$) and processed meat products ($p=0.046$) than those with lower SNK scores.

### Conclusion

The study found that sustainable nutrition behaviour scores differed significantly across education levels, with higher scores observed among participants with advanced degrees. The perspectives of these adults on sustainable nutrition may also raise awareness of sustainable nutrition in society and serve as a valuable source of information for decision-makers.

**Keywords:** sustainable nutrition, highly educated, food knowledge, dietary behaviours, adult population

## Introduction

In 2050, the global population is anticipated to surpass 10 billion. It is difficult to fulfil the dietary demands of a rising population in a world with limited resources[1]. The requirements and expectations for food worldwide have changed due to population growth and urbanization[2,3]. Recognizing how human nutrition affects the environment and how dietary changes might lead to a more sustainable environment is essential[4]. Sustainable nutrition is becoming increasingly popular to ensure the sustainability of food production and consumption in environmental, social, and economic terms. Sustainable diets, described as "diets with low environmental impacts that contribute to food and nutritional security and wellness for present and future generations," can support population health, planetary health, and global food security[5,6].

Studies that examine the nutritional value and environmental implications of meals on a global scale are available. These studies showed that a plant-based diet is essential for lowering greenhouse gas emissions and enhancing population health. Eating a diet with animal products have the most damaging environmental effects[7–9]. The EAT-Lancet Commission suggests a shift to healthy and sustainable diets to develop sustainable food systems, considering both the environmental sustainability of food and the health implications of food intake3. A key challenge in promoting environmentally responsible consumer behaviours is the lack of accessible information about the environmental impacts of food choices. Today, choosing meals with a high nutritional value and little environmental impact is a desirable eating skill[10]. Enhancing sustainable dietary choices by encouraging healthy nutritional decisions should be possible, given that a nutritionally sound diet's environmental effect substantially matches a sustainable diet's ecological impact[11].

It has been demonstrated that education makes it easier for adults to grasp sustainability on a deeper level, which makes it simpler for them to transform motivation into behaviour[12,13]. Highly educated adults often have better socioeconomic standing, have access to more resources, and are more knowledgeable. In a study examining education and sustainable consumption behaviours, the role of education in environmental attitudes is seen[14]. Therefore, while analysing their knowledge and habits regarding sustainable nutrition, those with a high degree of education should be given special consideration. However, most of the research on sustainable nutrition has focused on average consumers,



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and there is little data on the attitudes and practices of those with higher levels of education toward sustainable nutrition[2,6,11,15]. To address the gaps in the study in this area, it is crucial to give a more thorough understanding of the sustainable nutrition knowledge and practices of those with higher education levels.

This study aims to assess the sustainable nutrition knowledge and behaviours of highly educated adults (i.e., individuals with a bachelor's degree or higher) and to add to the understanding of this topic. Our secondary goals also include understanding the relationships between sustainable nutrition knowledge, sociodemographic factors, and the attitudes and behaviours associated with sustainable practices. The perspectives of these adults on sustainable nutrition may also raise awareness of sustainable nutrition in society and serve as a valuable source of information for decision-makers.

## Method

### *Location, Time, and Sample Selection of the Research*

This cross-sectional study was conducted in Istanbul with highly educated adults in Istanbul between February 2020 and July 2020. Assuming a medium effect size (f = 0.25), a 95% confidence level, 5% margin of error, and 80% power, the required sample size was calculated as 384 participants using G-Power software16. The sample of the study consisted of a total of 397 adult individuals, 193 women and 204 men, between the ages of 18-65. The inclusion criteria for the study were as follows: being between the ages of 18 and 65, and individuals with at least a Bachelor's degree, not having a health problem that prevents reading comprehension, consenting to participate in the study and answering the questions completely. Exclusion criteria were not meeting the inclusion criteria. A written and verbal consent form was obtained from each participant after they were informed about the study, and the Medipol University Non-Interventional Research Ethics Committee granted permission for the study's conduct under the number 10840098-604.01.01-E.4627. This research was conducted in accordance with the principles outlined in the Helsinki Declaration and adhered to the guidelines of research and publication ethics.

### *Data Collection and Analysis*

The demographics of the participant's knowledge and behaviour regarding sustainable nutrition were assessed by a structured questionnaire. Due to the COVID-19 pandemic, the questionnaire, which was created using a literature review by researchers, was distributed to the participants via an online platform. In the first part of the questionnaire, there are questions about the demographic characteristics of the participants as gender, age, educational status, self-reported height, and body weight. Questions assessing the participants' knowledge, behaviours, and practices related to sustainable nutrition were in the second part of the questionnaire. The frequency of food consumption was examined in the final section.

Body Mass Index (BMI) was calculated using the World Health Organization (WHO) classification system by dividing the body weight (kg) by the square of the height (m). According to the WHO classification, people with a BMI <18.5 kg/m² are 'underweight'; persons with 18.5-24.9 kg/m² are 'normal weight'; persons with 25.0-29.9 kg/m² were classified as 'overweight' and persons with ≥ 30.0 kg/m² were defined as 'obese'[17].

### *Evaluation of sustainable nutrition knowledge levels and behaviours*

Since there is no validated scale that assesses the sustainable eating attitude in Turkish during the study period, the researchers developed the questions through the literature[18–20.]

### *Sustainable Nutrition Knowledge (SNK)*

A total of 12 questions measuring sustainable nutrition knowledge were used. In this test, five questions evaluating misinformation. Participants received one point if they responded: "True" to questions with correct information and "False" to questions with incorrect information. A maximum score of 12 points can be taken in this section. The participant's scores were averaged, and the knowledge of sustainable nutrition was assessed as either below or above the average.

### *Sustainable Nutrition Behaviour (SNB)*

The answers to the 16-question sustainable nutrition behaviours survey are "Yes," "No," and "Sometimes." The options to which the participants responded "Yes" received two points, to which they responded "No" received zero-point, and the options to which they "Sometimes" responded received one point. Participants in this test can be achieved a maximum score of 32 points. The participants were assessed as those below and above the average based on their sustainable eating behaviour scores, which were averaged.

### *Exploratory Factor Analysis (EFA) of Sustainable Nutrition Knowledge and Sustainable Nutrition Behaviour*

First, Kaiser Meyer Olkin (KMO) coefficient and Bartlett Sphericity Test (BST) were examined for the suitability of the data in factor analysis. The KMO sampling adequacy test result was found to be SNK 0.818 and SNB 0.817. As KMO approaches 1, the sample size used in the study reaches perfection[21]. According to these results, it can be said that the sample size of the study is perfect. The BST result of the scale was also significant for factor analysis ($p<0.05$).

Eigenvalue and explained variance were considered in determining the number of factors in the study. The total variance explained by the SNK in the survey was 55.733% and the SNB was 55.727% in the study. Since the original research did not perform factor analysis, our study named the sub-dimensions appropriately. The main criterion for evaluating factor analysis results is factor loadings, which can be interpreted as the correlations between variables and factors in the scale. The factor loadings explained variances, and Cronbach's Alpha values of the dimensions and the whole scale are presented in Table 1 and Table 2.

### *Food Consumption Preference*

The participants' frequency of food consumption over the previous month was gathered by a registration form comprising the questionnaire's final section with 23 items. Frequency of food consumption was recorded: "daily, 3-5 times per week, 1-2 times per week, 1-2 times per month, or never". The 23 food items included in the food consumption frequency list were selected based on a review of the relevant literature on sustainable nutrition and dietary environmental impact[22,23]. Priority was given to food groups frequently consumed in Turkey and known to vary in sustainability characteristics, such as red meat, legumes, poultry, dairy,

processed meat, and plant-based foods. National dietary surveys and previous academic studies were also consulted to ensure cultural relevance and completeness of the list.

### *Statistical Analysis*

The data obtained with the questionnaires were evaluated in the SPSS 22.0 package programme. Exploratory Factor Analysis (EFA) was conducted using SPSS to determine construct validity. Internal consistency coefficients (Cronbach Alpha) were calculated to assess the scale's reliability, and necessary evaluations were made. Kolmogorov-Smirnov test was used to determine whether the quantitative variables obtained through measurement conformed to the normal distribution. For quantitative variables with a normal distribution, mean and standard deviation were used as descriptive statistics; median, minimum, and maximum values were used for variables with an abnormal distribution. Numbers and percentages were used to define categorical variables. The chi-square test was used to compare the differences between two categorical variables. The relationship between independent groups was examined using a one-way ANOVA test, and the differences between the groups was investigated using post hoc tests. Standard multiple regression analyses were carried out to ascertain the extent to which independent variables influenced a dependent variable. The study accepted $p<0.05$ as the statistical significance level.

## Results

A total of 397 adults, 193 (48.6%) of whom were women, participated in the study. With a mean age of 28.08±6.7 years, 50.9% of adults fall within the 18–25 age range. Most of the participants are consisting of single adults (83.4%).

According to their educational backgrounds, 72.8% of the participants have bachelor's degrees, and 21.7% have master's degrees (Table 3).

Table 3 shows the results of a one-way ANOVA test and an Independent Samples T-test that were used to determine whether the participants' SNK and SNB varied depending on the demographic factors. The analyses revealed that while there was no significant difference in SNK concerning age, education level, and marital status factors ($p>0.05$), there was a significant difference concerning gender and BMI variables ($p<0.05$). While there was a statistically significant difference with the variables of gender, age, educational level, and marital status with the SNB assessment ($p<0.05$); no statistically significant difference was found with the BMI variable ($p>0.05$).

In Table 3, female participants exhibited a higher degree of SNK and SNB than male participants, according to the analysis of the gender-related difference.

**Table 1. Validity and Reliability Analysis Results of the SNK Scale**

| | | | | | |
|---|---|---|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | | | | 0.817 |
| Bartlett's Test of Sphericity | | Approx. Chi-Square | | | 685.502 |
| | df | | | 66 | |
| | Sig. | | | 0.000 | |
| Total Variance Explained | 55.733 | Cronbach Alpha | | | 0.757 |
| Factors | | Factor Loading | Variance Explained | Cronbach Alpha | $\bar{X}$ | S.D. |
| FACTOR 1 (Value=20.371) | | | 18.630 | 0.708 | .9136 | .20523 |
| SNK2 | | .657 | | | | |
| SNK4 | | .780 | | | | |
| SNK5 | | .775 | | | | |
| SNK12 | | .646 | | | | |
| FACTOR 2 (Value=15.486) | | | 13.306 | 0.788 | .8897 | .20921 |
| SNK6 | | .453 | | | | |
| SNK8 | | .761 | | | | |
| SNK11 | | .657 | | | | |
| FAKTOR 3 (Value=11.147) | | | 12.046 | 0.718 | .6904 | .30598 |
| SNK7 | | .715 | | | | |
| SNK9 | | .762 | | | | |
| SNK10 | | .802 | | | | |
| FACTOR 4 (Value=8.728) | | | 11.752 | 0.804 | .9473 | .18291 |
| SNK1 | | .854 | | | | |
| SNK3 | | .696 | | | | |

$\bar{X}$: mean

S.D.: standard deviation

SNK: Sustainable nutrition knowledge

**Table 2. Validity and Reliability Analysis Results of the SNB Scale**

| | | | | | | |
|---|---|---|---|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | | | | | 0.818 |
| Bartlett's Test of Sphericity | | Approx. Chi-Square | | | | 1758.426 |
| | df | | | | 120 | |
| | Sig. | | | | 0.000 | |
| Total Variance Explained | 55.727 | Cronbach Alpha | | | | 0.817 |
| Factors | | Factor Loading | Variance Explained | Cronbach Alpha | X̄ | S.D. |
| FACTOR 1 (Value=27.758) | | | 19.123 | 0.784 | 1.2412 | .58083 |
| SNB1 | | .632 | | | | |
| SNB2 | | .772 | | | | |
| SNB3 | | .792 | | | | |
| SNB4 | | .780 | | | | |
| SNB6 | | .599 | | | | |
| FACTOR 2 (Value =11.552) | | | 14.916 | 0.663 | .5484 | .52746 |
| SNB7 | | .411 | | | | |
| SNB12 | | .734 | | | | |
| SNB13 | | .768 | | | | |
| SNB14 | | .789 | | | | |
| FACTOR 3 (Value =9.309) | | | 13.114 | 0.670 | 1.0980 | .55519 |
| SNB8 | | .825 | | | | |
| SNB9 | | .835 | | | | |
| SNB10 | | .526 | | | | |
| SNB11 | | .429 | | | | |
| FACTOR (Value =7.107) | | | 8.574 | 0.495 | 1.2802 | .56677 |
| SNB5 | | .507 | | | | |
| SNB15 | | .737 | | | | |
| SNB16 | | .336 | | | | |

X̄: mean

S.D.: standard deviation

SNB: Sustainable nutrition behaviours

**Table 3. Sociodemographic Characteristics of the Participants and Results of SNK and SNB Scales with Sociodemographic Characteristics (n=397)**

| Variable | | n | % |
|---|---|---|---|
| Gender | | | |
| | Female | 193 | 48.6 |
| | Male | 204 | 51.4 |
| Age group | | | |
| | 18-25 | 202 | 50.9 |
| | 26-35 | 148 | 37.3 |
| | 36-45 | 47 | 11.8 |
| Marital status | | | |
| | Single | 331 | 83.4 |
| | Married | 66 | 16.6 |
| Education level | | | |
| | Bachelor's degree | 289 | 72.8 |
| | Master's degree | 86 | 21.7 |
| | PhD | 22 | 5.5 |
| BMI | | | |

Individuals in the 18–25 age group displayed fewer examples of SNB than those in the 26–35 and 36–and-over age groups, according to the difference associated with the age variable. When the differences in education levels were compared, participants with doctoral degrees had significantly higher SNB scores than those with only a bachelor's degree. However, no statistically significant difference was observed between participants with master's and doctoral degrees. Married adults showed more sustainable eating habits than single adults, according to marital status. Individuals with BMIs in the normal range showed higher levels of SNK, according to BMI classifications of individuals.

In Table 4, the analysis employed the One-Way ANOVA test to examine whether there were variations in the participants' SNK and SNB assessments based on their food consumption frequency. No statistically significant differences were found in the frequency of consumption of vegetables (p=0.137; 0.512), salad (p=0.137;0.305), grains (p=0.270; 0.481), eggs (p=0.586; 0.305), and oil (p=0.995; 0.246) with respect to both SNK and SNB scores.

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**Table 3 Cont...**

| | | | |
|---|---|---|---|
| | Underweight | 16 | 4.0 |
| | Normal weight | 257 | 64.7 |
| | Overweight | 103 | 25.9 |
| | Obese | 21 | 5.3 |
| | Total | 397 | 100 |
| | X̄±S.D. | | |
| Age | 21.7±6.4 | | |
| BMI | 23.5±3.8 | | |

| Variables | SNK | | SNB | |
|---|---|---|---|---|
| | X̄ | S.D. | X̄ | S.D. |
| Gender | | | | |
| Female | .87 | .12 | 1.15 | .36 |
| Male | .84 | .14 | .92 | .40 |
| | t=2.287 | | t=5.978 | |
| | p=.023* | | p<0.001** | |
| Age | | | | |
| 18-25 | .86 | .13 | .95[a] | .39 |
| 26-35 | .84 | .14 | 1.09[ab] | .41 |
| 36 and above | .84 | .13 | 1.19[b] | .33 |
| | f=1.445 | | f=10.309 | |
| | p=.237 | | p<0.001** | |
| Education Level | | | | |
| Bachelor's degree | .86 | .13 | 1.00[a] | .40 |
| Master's degree | .85 | .14 | 1.09[ab] | .37 |
| PhD | .83 | .15 | 1.26[b] | .37 |
| | f=.337 | | f=5.516 | |
| | p=.714 | | p=.004* | |
| Marital Status | | | | |
| Single | .86 | .13 | .99 | .38 |
| Married | .84 | .14 | 1.25 | .40 |
| | t=.962 | | t=-5.299 | |
| | p=.337 | | p<0.001** | |
| BKI | | | | |
| Normal | .86 | .13 | 1.05 | .38 |
| Overweight | .83 | .14 | .99 | .43 |
| | t=2.427 | | t=1.435 | |
| | p=.016* | | p=.152 | |

SNK: Sustainable nutrition knowledge; SNB: Sustainable nutrition behaviours

X̄: mean; S.D.: standard deviation

T-test and One-Way ANOVA

* Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed).
The difference between means without a common letter was significant

**Table 4. One-Way ANOVA Results of Food Consumption Information of SNK and SNB Scales (n=397)**

| Variables | SNK | | SNB | |
|---|---|---|---|---|
| | X̄ | S.D. | X̄ | S.D. |
| Vegetable | | | | |
| Daily | 1.05 | .48 | .83 | .13 |
| 3-5 times a week | 1.03 | .37 | .85 | .14 |
| 1-2 times a week | 1.02 | .39 | .88 | .10 |
| 1-2 times a month | .95 | .50 | .84 | .13 |
| Never | 1.35 | .20 | .83 | .28 |
| | f=1.757 | | f=822 | |
| | p=.137 | | p=.512 | |
| Salad | | | | |
| Daily | .98 | .44 | .83 | .14 |
| 3-5 times a week | 1.08 | .40 | .86 | .12 |
| 1-2 times a week | 1.02 | .37 | .85 | .15 |
| 1-2 times a month | .98 | .35 | .85 | .12 |
| Never | 1.09 | .36 | .95 | .06 |
| | f=1.753 | | f=1.213 | |
| | p=.137 | | p=.305 | |
| Grains | | | | |
| Daily | 1.11 | .47 | .82 | .17 |
| 3-5 times a week | 1.03 | .37 | .86 | .13 |
| 1-2 times a week | 1.02 | .40 | .86 | .12 |
| 1-2 times a month | 1.00 | .45 | .84 | .13 |
| Never | 1.26 | .62 | .79 | .10 |
| | f=1.298 | | f=872 | |
| | p=.270 | | p=.481 | |
| Legume | | | | |
| Daily | 1.07[ab] | .53 | .78 | .21 |
| 3-5 times a week | 1.29[b] | .42 | .86 | .13 |
| 1-2 times a week | 1.05[ab] | .37 | .86 | .12 |
| 1-2 times a month | 1.01[ab] | .41 | .83 | .14 |
| Never | .99[a] | .43 | .74 | .21 |
| | f=3.307 | | f=1.381 | |
| | p=.011* | | p=.240 | |
| Eggs | | | | |
| Daily | .99 | .37 | .85 | .14 |
| 3-5 times a week | 1.06 | .42 | .86 | .12 |
| 1-2 times a week | 1.08 | .40 | .84 | .14 |
| 1-2 times a month | .91 | .35 | .81 | .19 |

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**Table 4 Cont...**

| | | | | |
|---|---|---|---|---|
| Never | 1.06 | .44 | .88 | .13 |
| | f=.709 p=.586 | | f=1.213 p=.305 | |
| Red Meat | | | | |
| Daily | 1.00[ab] | .61 | .71 | .19 |
| 3-5 times a week | .99[a] | .42 | .86 | .13 |
| 1-2 times a week | 1.05[ab] | .39 | .85 | .14 |
| 1-2 times a month | 1.06[b] | .35 | .88 | .12 |
| Never | 1.07[b] | .46 | .84 | .12 |
| | f=2.745 p=.028* | | f=.428 p=.788 | |
| Poultry | | | | |
| Daily | 1.16 | .39 | .76[a] | .14 |
| 3-5 times a week | 1.12 | .41 | .86[b] | .15 |
| 1-2 times a week | .99 | .40 | .85[b] | .13 |
| 1-2 times a month | 1.01 | .37 | .85[b] | .14 |
| Never | 1.22 | .42 | .86[b] | .11 |
| | f=1.180 p=.319 | | f=2.997 p=.019* | |
| Processed meat | | | | |
| Daily | .96[a] | .14 | .84[a] | .15 |
| 3-5 times a week | .97[a] | .41 | .83[a] | .11 |
| 1-2 times a week | 1.09[b] | .39 | .84[a] | .14 |
| 1-2 times a month | .99[ab] | .41 | .86[ab] | .13 |
| Never | 1.11[b] | .40 | .90[b] | .13 |
| | f=2.135 p=.046* | | f=2.034 p=.039* | |
| Dairy products | | | | |
| Daily | 1.08 | .41 | .83 | .14 |
| 3-5 times a week | 1.04 | .39 | .86 | .13 |
| 1-2 times a week | 1.02 | .38 | .87 | .12 |
| 1-2 times a month | .87 | .42 | .83 | .15 |
| Never | .84 | .34 | .87 | .10 |
| | f=1.645 p=.162 | | f=2.232 p=.053 | |
| Oils | | | | |
| Daily | 1.05 | .41 | .85 | .13 |
| 3-5 times a week | .96 | .35 | .85 | .14 |
| 1-2 times a week | .98 | .41 | .86 | .14 |
| 1-2 times a month | 1.23 | .44 | .85 | .16 |
| Never | 1.08 | .30 | .84 | .10 |
| | f=.050 p=.995 | | f=1.356 p=.249 | |
| Sugar. candy | | | | |
| Daily | .93 | .37 | .88[a] | .12 |
| 3-5 times a week | 1.17 | .38 | .87[ab] | .13 |
| 1-2 times a week | 1.02 | .41 | .87[ab] | .13 |
| 1-2 times a month | 1.05 | .41 | .85[ab] | .14 |
| Never | 1.32 | .37 | .84[b] | .13 |
| | f=1.468 p=.211 | | f=2.672 p=.032* | |
| Alcohol | | | | |
| Daily | .76 | .39 | .86[ab] | .15 |
| 3-5 times a week | 1.15 | .42 | .85[ab] | .11 |
| 1-2 times a week | 1.13 | .36 | .84[a] | .14 |
| 1-2 times a month | .98 | .38 | .87[b] | .13 |
| Never | 1.04 | .43 | .84[a] | .14 |
| | f=1.044 p=.384 | | f=3.707 p=.006* | |

SNK: Sustainable nutrition knowledge; SNB: Sustainable nutrition behaviours

X̄: mean

S.D.: standard deviation

One-Way ANOVA

* Correlation is significant at the 0.05 level (2-tailed).

The difference between means without a common letter was significant

However, a statistically significant difference was found between the SNK level and the variables of legumes, red meat, and processed meat products. In addition, a statistically significant difference in SNB scores was observed for poultry (p=0.041), processed meat products (p=0.037), and alcohol (p=0.048). No significant differences were found for dairy products or sugar, candy consumption (p>0.05).

As shown as a Table 4, when the variable of legume consumption was examined, it was found that individuals who consumed legumes 3-5 days a week had higher levels of SNK than those who did not consume legumes at all (p=0.011). Individuals who consumed red meat 3–5 times a week had significantly lower SNK scores than those who either never consumed red meat or consumed it rarely (1–2 times per month) (p=0.028). Similarly, those who frequently consumed processed meat products scored lower on SNK (p=0.046). No statistically significant differences in SNK were found regarding the frequency of consumption of poultry (p=0.319), dairy products (p=0.162), sugar-candy (p=0.211), or alcohol (p=0.384). In contrast, SNB scores differed significantly according to sugar-candy (p=0.032)

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**Tablo 5. Regression Results of SNK and SNB Scales**

| Regression | | | | | | |
|---|---|---|---|---|---|---|
| Dependent variable | SNB | B | S.H. | β | T | P |
| Independent variable | Constant | 1.268 | .126 | | 10,085 | <0.001* |
| | SNK | -.266 | .145 | -,165 | -1.867 | .037** |
| Model Summary | $R^2$ | 0.018 | | | | |
| | F | 6.375 | | | | |
| | P | 0.037 | | | | |

SNK: Sustainable nutrition knowledge; SNB: Sustainable nutrition behaviours

* Correlation is significant at the 0.01 level (2-tailed).
** Correlation is significant at the 0.05 level (2-tailed).

and alcohol consumption (p=0.006), with lower scores observed among participants who consumed these products more frequently.

Based on the outcomes of the linear regression analysis presented in Table 5, it is observed that the regression model yields a statistically significant result (F=6.375; p=0.037). The analysis indicates that the independent variable, SNK, accounts for 18% of the variability in the dependent variable, SNB. However, the remaining 82% of the variance in SNB is unexplained and requires further investigation.

Furthermore, the regression analysis provides an equation to predict SNB, which is as follows:

SNK = 1.268 - 0.266 * X1 or alternatively, SNB = 1.268 - 0.266 * SNK.

## Discussion

Sustainability entails maintaining resources that are needed now and into the foreseeable future. The idea of sustainability has recently been linked to nutrition, which is crucial to the continuation of life. Awareness of the environmental impacts of food is increasing, and new nutrition policies and recommendations are being discussed in consideration of these impacts. These conversations have given sustainable food and nutrition more significance today. As a result of these discussions, sustainable nutrition and diet concepts have gained importance today[24]. In this study, the knowledge, and behaviours of individuals on sustainable nutrition were investigated; age, educational status, nutritional status, sustainable nutrition knowledge and behaviours scores, and food consumption frequencies of the participants were examined. It is important to note that this study was conducted among highly educated adults, specifically individuals with at least a bachelor's degree. This characteristic of the sample should be considered when interpreting the results and considering their generalisability to broader populations.

In terms of gender, a statistically significant difference in SNK and SNB scores between genders were observed (p=0.023; p<0.001). The results of the analysis indicated that gender significantly influenced sustainable eating behaviours, with women scoring higher in sustainable nutrition behaviour and exhibiting greater knowledge levels compared to men. Prior research examining gender differences in environmental awareness has attributed these disparities to culturally based social status levels and gender roles within society. However, recent studies suggest that this gender difference cannot be explained solely by gender-based social roles[25]. A study on plant-based protein discovered that women were substantially more informed and more likely to perceive the benefits of plant-based diets than men[26]. Another study found that females related all environmental benefits with suggestions for sustainable diets to a higher degree[15]. In a survey involving adult Spanish participants, women showed greater interest in sustainability than men did[27]. Women are often more active in food preparation and purchase, which may increase their awareness of issues relating to food. These gender differences transcend traditional gender roles and reflect a deeper understanding and concern for ecological issues among women. This fact may account for women's greater interest in eating sustainably and in food security.

Education plays a crucial role in raising awareness and promoting environmental consciousness, particularly in the context of developing sustainable eating practices. Research examining the relationship between education and environmentally friendly consumption patterns has consistently demonstrated the influence of education on environmental attitudes. A study found that as education level increases, there is an enhancement in knowledge about environmental issues and plant-based protein consumption[26]. Some research also supports the positive association between higher education, sustainable eating habits, and resource preservation[14,15]. However, Rejman et al.'s study, in contrast to other findings, did not find a significant relationship between education level and sustainable eating behaviours or food preferences[28]. Our study discovered that participants exhibited greater adherence to sustainable nutritional behaviours as their education level increased. However, there was no significant difference in SNK according to education level. Our study highlights the critical role of education in promoting environmental awareness and the development of sustainable nutrition practices. The importance of education in promoting sustainable dietary practices should be emphasized and education-oriented approaches should be emphasized in sustainability awareness-raising efforts.

This study, focused on evaluating the knowledge and behaviours of highly educated adults regarding sustainable nutrition. A similar study conducted by Ahamad and Ariffin assessed sustainable nutrition knowledge and behaviour among university students. The findings indicated that 74.1% of the participants had high sustainable nutrition knowledge. In terms of behaviours, 65.6% of the participants demonstrated a moderate atmosphere toward sustainable consumption, 49.2% had a moderate level of behaviours, and 41.0% exhibited a low level of behaviours[29]. In the study conducted in Turkey to assess the knowledge of sustainable nutrition, it was observed that participants obtained an average score of 8.96±2.62 out of 15 questions. According to the same study, adults who are more knowledgeable about sustainable nutrition tend to follow more sustainable dietary patterns[30]. According to studies of the adult population in Spain, there may be a lot of interest in eating sustainably and healthfully. Although there is increasing public interest in sustainable diets, recent research has shown that this interest is often superficial and accompanied by significant misconceptions regarding the key components of a sustainable diet[27]. This finding may help explain why even highly educated individuals in our study did not always

achieve high SNK scores, despite overall awareness.

In a study with university students, those who said they were knowledgeable about how climate change affects health said they were more willing to adopt a carbon-reduction lifestyle, and their desire to act sustainably was also demonstrated in their behaviours[31]. Although, a different study found that the university community under investigation had low knowledge of the more technical aspects of food sustainability, especially among students[32]. Interestingly, in our study, SNK negatively correlates with SNB. Although individuals exhibit sustainable nutritional behaviours, we can say that they do not do these behaviours consciously.

Experts advise limiting meat consumption and increasing consumption of plant-based foods to support a healthy and sustainable diet[33]. However, an analysis of 34 articles examining the relationship between environmental concerns and meat consumption found that those who reduced meat consumption due to environmental concerns represent a very small proportion of the overall population[34]. In a study conducted by Clonan et al. that specifically investigated the consumption of red meat and processed meat products, it was found that 26.2% of the participants consumed red meat daily, 3% consumed processed meat daily, and 77.78% consumed meat once a week or less. The study further highlighted that participants with above-average knowledge levels regarding sustainable nutrition tended to consume less meat. Additionally, individuals who practiced sustainable eating behaviours exhibited higher consumption of plant-based foods and lower consumption of processed meats[35]. In our study according to the ANOVA and post-hoc results, participants who consumed red meat and processed meat more frequently had significantly lower sustainable nutrition knowledge (SNK) scores ($p=0.028$ and $p=0.046$, respectively). In addition, sustainable nutrition behaviour (SNB) scores were significantly lower among participants who consumed poultry and processed meat more frequently ($p=0.041$ and $p=0.037$, respectively). These findings are consistent with previous literature showing that lower meat consumption is often associated with more sustainable dietary patterns.

One of the limitations of our study is the use of statements created under the current literature because there isn't a legitimate and reliable tool designed to assess the level of knowledge about sustainable nutrition in our country's literature. The fact that the data was gathered through an online survey during the Covid-19 pandemic, which affected the entire world, is another limitation of the study. Additionally, since the study's sample was made up of highly educated individuals, it's possible that the influence of education on participants' knowledge of sustainable nutrition and behaviours was not fully captured. For the sample to adequately reflect the population, it is advised for future study to ensure a homogeneous distribution of the different age groups and educational levels. Although the regression model predicting sustainable nutrition behaviour (SNB) was statistically significant, it explained only a limited proportion of the variance ($R^2 = 0.18$). This suggests that other influential factors, such as psychological, cultural, or environmental variables, may not have been captured in the current model.

## Conclusions

The findings of this study indicate that sustainable nutrition behaviour (SNB) scores significantly differed by education level, with participants holding higher academic degrees demonstrating more sustainable dietary behaviours. Additionally, women scored higher than men on both sustainable nutrition knowledge (SNK) and behaviour assessments.

In the context of modern dietary recommendations, it is important to emphasise that, beyond meeting nutritional adequacy, adopting a sustainable nutrition model is essential for ensuring the continuity of life and protecting planetary health. To support this, it is imperative to develop comprehensive dietary guidelines that include specific recommendations for sustainable food choices. Moreover, integrating sustainable nutrition into the training of health professionals could play a key role in raising awareness among both individuals and communities.

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## Data Availability Statement

The data that support the findings of this study are available from the corresponding authors upon reasonable request.

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