

## ORIGINAL RESEARCH

# Evaluation of Knowledge and Opinions on Apitherapy Products Among 1st and 4th Year Nutrition and Dietetics Department Students

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### Abstract

**Objective:** Apitherapy is a traditional treatment method in which honey bee products are used for therapeutic purposes. Students studying in the Department of Nutrition and Dietetics are not heavily involved in the application of apitherapy.

**Material-Method:** This study investigates the knowledge and opinions of 1st- and 4th-year students studying in the Department of Nutrition and Dietetics regarding apitherapy. A survey was administered to students who were randomly selected from the 1<sup>st</sup>-year (n=168) and 4<sup>th</sup>-year (n=241) students. The survey addressed descriptive characteristics of the students, their knowledge, experience, and expectations regarding apitherapy, as well as the use and frequency of apitherapy products.

**Results:** The most preferred bee product among both 1st- and 4th-year students was honey, followed by bee pollen. The primary source of information about apitherapy for 1st-year students was the internet (63.5%), while for 4th-year students, it was the media (46.1%). When asked who should be the source of information about apitherapy, the majority of 1st-year students (64.0%) and 4th-year students (67.2%) responded that dietitians should be the source. The majority of students in both groups reported not having sufficient knowledge or opinions about bee products.

**Conclusion:** This study shows that knowledge and opinions about apitherapy among future dietitians are limited. Including apitherapy in the curriculum and creating and promoting the identity of the "apitherapist dietitian" will increase the likelihood of dietitians using apitherapy.

**Keywords:** Apitherapy, Nutrition, Dietitian, Curriculum

### INTRODUCTION

Apitherapy is a traditional treatment method that uses honey bee (*Apis mellifera*) products (such as pollen, royal jelly, propolis, honey, bee bread, bee venom, etc.). It can be applied in both acute and chronic conditions and has been practiced since the ancient Indian, Sumerian, Egyptian, Greek, and Chinese periods. It is still widely used around the world, from Germany to India and from Venezuela to Nigeria.<sup>1,2</sup>

Apitherapy has two distinct aspects. One is holistic apitherapy, which is a part of alternative medicine and is widely discussed at congresses. Personal experience and treatment methods serve as a guide for other practitioners. The other is scientific apitherapy, which focuses on the medical value of bee products.<sup>3</sup> Apitherapy has also been extensively used in Islamic medicine and Anatolian history. The healing properties of honey were mentioned in medical texts from the Ottoman period.<sup>4</sup>

In 2014, Turkey enacted traditional and

complementary medicine legislation, which regulates the use of these practices in clinics. Apitherapy is one of these practices and can be applied in certified centers. Currently, approved apitherapy products in Turkey, such as honey, bee venom, royal jelly, propolis, and bee pollen, are used following the Traditional, Complementary, and Integrative Medicine (TCIM) regulation.<sup>5</sup> Other hive products, such as apiar (the use of hive air) and drone larvae (apilarnil), are considered potential apitherapy products that may be approved in the future.<sup>6</sup>

The nutritional, digestive, anti-inflammatory, antimicrobial, and antitumor properties of honey; the immunostimulating, antiallergic, antioxidant, antiulcer, and antidepressant properties of bee pollen; the cell-protective, antioxidant, antimicrobial, anti-inflammatory, hypoglycemic, and liver-protective properties of royal jelly; the antioxidant, neuroprotective, and hypoglycemic

properties of propolis; and the analgesic, immunomodulatory, neuroprotective, and antirheumatic properties of bee venom are the prominent features of these products. In addition, it is reported that all hive products have positive healing effects on wounds and burns.<sup>7,8</sup>

People who are allergic to bees and their products, as well as babies under one year of age, should avoid apitherapy applications.<sup>5</sup> Although the ready-made drugs used in apitherapy are approved by the U.S. Food and Drug Administration (FDA),<sup>9</sup> it is recommended to perform an allergy test before application and adjust the dose according to the patient's age, weight, application time, and condition.<sup>10</sup>

There is currently insufficient education in apitherapy within the field of Health Sciences. Nutrition and Dietetics students learn about this discipline with special efforts, mainly through the internet, media, and their environment. This study aimed to investigate the knowledge and opinions of first-year and fourth-year students who have just entered the Faculty of Health Sciences regarding apitherapy and to bridge the gap between clinical research, apitherapists, and nutritionists.

## MATERIALS AND METHODS

### Study population

This cross-sectional and descriptive study included 409 students: 168 first-year students and 241 fourth-year students, all studying in the Department of Nutrition and Dietetics at Firat University in Elazig, Turkey. All students who volunteered to participate in the study were included by signing the "Voluntary Consent Form" without the need for a sample selection method. The research was conducted between September 2022 and May 2024. The ethical compliance of the study was approved by the Firat University Non-Interventional Research Ethics Committee under decision number 2022/03-38. Volunteer participants who were 18 years of age or older, open to communication, and enrolled in either the first or fourth year were included in the study.

### Data collection tools

The survey was developed based on a literature review and consists of three sections. The first section includes information on the students' descriptive characteristics (grade, gender, age, body weight, height, and place of residence). Body weight and height measurements were based on self-reported statements. The second section assessed the

students' knowledge, experience, and expectations regarding apitherapy. This section evaluated whether certain information was correctly known and for which disease apitherapy products could be used. Additionally, students were asked to respond to statements regarding apitherapy products and their applications using the following Likert scale options: "strongly agree," "agree," "undecided," "disagree," and "strongly disagree." The third section addressed the status and frequency of use of apitherapy products. Previous articles were used to prepare the information and opinion questions.<sup>11,12</sup> No special training was provided on apitherapy before or after the survey. During the survey, students were instructed not to communicate with each other to avoid influencing one another's responses.

### Statistical analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 25.0. Descriptive data were presented as frequency and percentage distributions. Normally distributed data were expressed as mean  $\pm$  standard deviation ( $X \pm SD$ ). The Mann-Whitney U test was used to compare the measurement values of two independent groups. Statistically significant results were considered at  $p < 0.05$ .

## RESULTS

The participants in the study consisted of 89.5% female and 10.5% male. The average age was  $21.5 \pm 2.95$  years. The study included 409 participants, 168 (41.1%) of whom were first-year students and 241 (58.9%) of whom were fourth-year students. Of the participants, 84.4% lived in urban areas, while 15.6% lived in rural areas. Additionally, 14.2% of the participants had someone in their family involved in beekeeping, and 4.2% expressed an interest in working in beekeeping in the future. The average body weight of the participants was  $58.9 \pm 10.53$  kg, and the average height was  $165.5 \pm 6.89$  cm.

The daily consumption of bee products by students is shown in Table 1. No significant differences were found between the classes in terms of the consumption of honey, bee pollen, propolis, bee bread, and royal jelly ( $p > 0.05$ ). The most preferred bee product among both first-year and fourth-year students was honey ( $5.48 \pm 7.06$  g and  $4.61 \pm 9.31$  g, respectively), followed by bee pollen ( $0.26 \pm 1.88$  g and  $0.05 \pm 0.29$  g, respectively).

**Table 1.** Daily usage amount of bee products (g)

Bee Product	First-Year students	Fourth-Year students	p-value
Honey	5.48 ± 7.06	4.61 ± 9.31	0.308
Bee Pollen	0.26 ± 1.88	0.05 ± 0.29	0.095
Propolis	0.22 ± 0.98	0.24 ± 1.08	0.895
Bee Bread	0.09 ± 0.60	0.06 ± 0.60	0.070
Royal Jelly	0.13 ± 0.78	0.03 ± 0.23	0.536

The students' knowledge and opinions about apitherapy are presented in Table 2. The primary source of information about apitherapy for first-year students was mostly internet sources (63.5%), while fourth-year students primarily used media (46.1%). When asked who should be the source of information about apitherapy, the majority of both first-year (64.0%) and fourth-year (67.2%) students responded that dietitians should be the source.

Regarding which groups should not use bee products, both first-year and fourth-year students most commonly selected allergic diseases (75.3% and 74.0%, respectively), followed by diabetes patients (53.8% and 58.1%, respectively). When asked about the possible side effects of bee products, the majority of both first-year (98.8%) and fourth-year (95.1%) students identified allergies as a possible side effect.

**Table 2.** Students' knowledge and opinions about apitherapy

	First-Year Students (%)	Fourth-Year Students (%)	Total (%)
<b>Source of Information about Apitherapy*</b>			
Parents/grandparents	21.5	15.5	18.1
Friends/community members	14.4	11.8	12.9
Magazines	8.4	12.6	11.0
Internet sources	63.5	37.4	65.2
Other healthcare professionals	10.8	10.1	10.8
Media	41.2	46.1	44.3
Training	18.0	16.8	17.9
I do not know	1.8	2.5	2.2
<b>Who Should Be Your Source of Information about Apitherapy*</b>			
Doctor	53.1	45.2	50.1
Pharmacist	22.2	30.8	27.4
Dietitian	64.0	67.2	64.8
Apitherapists	55.5	71.4	68.5
Beekeepers	33.2	27.9	31.8
Traditional healers	10.2	6.5	8.3
Scientists	19.2	25.5	23.7
<b>Which Groups Should Not Use Bee Products*</b>			
Diabetes patients	53.8	58.1	57.0
Pregnant women	27.0	31.2	29.8
Children under 4 years old	38.8	56.9	51.8
Oncology patients	25.8	32.7	30.1
Teenagers	16.8	11.9	13.2
Allergic diseases	75.3	74.0	74.8
Individuals aged 65 and over	24.0	17.1	20.0
I do not know	0.6	1.2	1.0
<b>Possible Side Effects Of Bee Products*</b>			
Allergy	98.8	95.1	96.5
Bleeding	7.8	6.8	7.3
Headache	27.5	23.7	25.4
Unintentional weight loss	8.4	8.0	8.3
Body weight gain	22.1	24.3	23.5
Vomiting	38.8	41.2	40.3
Visual impairment	14.4	14.8	14.7
I do not know	0.0	0.8	0.5

\* More than one option was selected.

The level of knowledge of students about apitherapy is presented in Table 3. The questions "There is no genetic difference between queen bees and worker bees" and "Bees fed too much royal jelly turn into queen bees" were answered "true" more frequently by first-year students (33.3% and 72.6%) than by fourth-year students (26.6% and 58.1%). The

questions "Due to hormonal properties, royal jelly is not recommended during adolescence" and "Honey is not recommended for babies under one year of age due to botulism" were answered "true" more frequently by first-year students (59.5% and 90.5%) than by fourth-year students (55.6% and 88.8%). The questions "There is no need to assess the risk of

allergy to bee products before using apitherapy", "There is an inverse relationship between the amount of fructose and the glycemic index", and "80% of honey is glucose" were answered incorrectly most often by fourth-year students

(89.6%, 61.8%, and 39.4%, respectively). The question "The science of apitherapy dates back to 4000 BC" was answered incorrectly most often by first-year students (84.5%).

**Table 3.** Daily usage amount of bee products (g)

Statement	First-Year Students		Fourth-Year Students	
	True (%)	False (%)	True (%)	False (%)
There is no genetic difference between queen bees and worker bees. (T)	33.3	66.7	26.6	73.4
Bees fed too much royal jelly turn into queen bees. (T)	72.6	27.4	58.1	41.9
Apitherapy science dates back to 4000 BC. (F)	84.5	15.5	85.1	14.9
There is no need to evaluate the risk of allergy to bee products before using apitherapy. (F)	12.5	87.5	10.4	89.6
There is an inverse relationship between the amount of fructose and the glycemic index. (F)	61.3	38.7	38.2	61.8
80% of honey is glucose. (F)	64.9	35.1	60.6	39.4
Royal jelly is not recommended for adolescents due to its hormonal properties. (F)	59.5	40.5	55.6	44.4
Honey is not recommended for babies under one year of age due to botulism. (F)	90.5	9.5	88.8	11.2

\*T: True; F: False

The students' views on apitherapy are presented in Table 4. The majority of first-year students (42.9%, 47.0%, and 58.3%, respectively) and fourth-year students (43.2%, 45.6%, and 58.5%, respectively) responded "undecided" to the statements: "Apitherapy use is very popular in our country today," "Healthcare professionals have sufficient knowledge about apitherapy," and "Apitherapy has fewer side effects than other drugs".

Additionally, the majority of first-year students (40.5% and 40.5%, respectively) and fourth-year students (52.3% and 44.8%, respectively) responded

"undecided" to the statements: "Apitherapy products should be encouraged" and "I use apitherapy products because they are good for me/my health.

Regarding the opinion that "Apitherapy is a part of traditional medicine," the majority of first-year students (44.6%) and fourth-year students (45.6%) agreed. However, regarding the statement "Apitherapy products should be available in every pharmacy," the majority of first-year students (33.3%) were undecided, while the majority of fourth-year students (37.8%) disagreed.

**Table 4.** Daily usage amount of bee products (g)

Grade	I strongly agree (%)		I agree (%)		Undecided (%)		I disagree (%)		I strongly disagree (%)	
	1 <sup>st</sup>	4 <sup>th</sup>	1 <sup>st</sup>	4 <sup>th</sup>	1 <sup>st</sup>	4 <sup>th</sup>	1 <sup>st</sup>	4 <sup>th</sup>	1 <sup>st</sup>	4 <sup>th</sup>
Apitherapy is a part of traditional medicine.	23.8	22.0	44.6	45.6	28.6	29.0	3.0	2.1	0.0	1.2
The use of apitherapy is very popular in our country today.	8.3	7.9	28.0	31.5	42.9	43.2	18.5	14.9	2.4	2.5
Healthcare workers have sufficient knowledge about apitherapy.	7.7	4.6	19.6	14.1	47.0	45.6	22.0	29.5	3.7	6.2
As a future healthcare professional, I have sufficient knowledge about apitherapy.	7.7	5.8	10.7	8.7	33.3	32.8	24.4	37.8	23.8	14.9
Apitherapy has fewer side effects than other drugs.	11.9	5.8	23.2	23.2	58.3	58.5	4.8	10.8	1.8	1.7
The use of apitherapy products should be encouraged.	19.0	10.4	39.3	29.9	40.5	52.3	1.2	6.6	0.0	0.8
Apitherapy products should be available in every pharmacy.	23.2	11.6	39.3	32.0	32.7	46.1	4.8	8.7	0.0	1.7
I use apitherapy products because they are good for me/my health.	13.1	7.1	28.6	26.1	40.5	44.8	8.9	12.9	8.9	9.1

\*1<sup>st</sup>: First-year students, 4<sup>th</sup>: Fourth-year students

## DISCUSSION

This study aims to investigate the knowledge levels of 1st- and 4th-year students who have just started at the Faculty of Health Sciences regarding apitherapy, their views on apitherapy, the use of apitherapy

products, and their inclusion in the education and training curriculum. Honey has been described as safe, natural, and traditional among complementary traditional approaches.<sup>13,14</sup> In a study conducted in



Turkey on bee products, it was found that 39.6% of participants consumed 0–500 grams of honey per month.<sup>15</sup> Furthermore, studies have shown that the most well-known bee product in Turkey is honey.<sup>16,17</sup> Additionally, a study found a significant relationship between honey consumption and education level.<sup>18</sup> In this study, the most consumed bee product among 1st- and 4th-year students is honey. Although honey is preferred as a source of health and energy due to its composition<sup>19</sup>, caution should be exercised when using it for apitherapy purposes.

One study found that propolis and bee venom were the least known apitherapy products, while honey, beeswax, royal jelly, and pollen were the most recognized.<sup>20</sup> Another study also reported that propolis (8.9%) and bee venom (16.3%) were less known.<sup>16</sup> Sener and Karaca (2020) determined that the sources of information affecting the use of alternative and complementary medicine were friends/neighbors and family members.<sup>21</sup> Another study stated that consumers were most influenced by “Promotional Sales,” “Friends/Relatives/Neighbors,” and “Discount Days,” and least influenced by “Newspaper/Magazine Advertisements” when choosing apitherapy products.<sup>22</sup> In this study, most students were aware of apitherapy products. The majority of 4th-year students reported that they received information from the media, while the majority of 1st-year students stated they obtained information from internet sources. The minimal difference in the responses of 1st- and 4th-year students to many of the questions suggests that apitherapy may not have been included in the curriculum.

Honey should not be given to babies due to the risk of botulism.<sup>23,24</sup> In this study, most of the 1st- and 4th-year students knew that this information was correct. Royal jelly and propolis should also be used with caution, considering their daily doses and allergenic effects.<sup>25</sup> In this study, the majority of participants believed that the risk of allergy should be evaluated before using apitherapy products. While foods with allergenic effects are known, nutrition and dietetics students need to be more comprehensively informed.

Therapeutically, honey is used in the treatment of bedsores, ulcers, and skin infections.<sup>26</sup> It also has protective properties against cancer and metastasis and activates the immune system.<sup>27</sup> Royal jelly has properties such as antioxidative,<sup>28</sup> antihypertensive,<sup>29</sup> antidiabetic,<sup>30</sup> and cell-renewing

effects.<sup>31</sup> Propolis has antioxidant<sup>32</sup> and immune-boosting effects.<sup>33</sup> Pollen<sup>34</sup> and bee bread<sup>35</sup> also have antioxidant properties. When the knowledge (Table 3) and opinions (Table 4) of the students about apitherapy were examined in this study, it was found that most of the information about apitherapy was not well known, and most of the opinions were undecided.

Informing the public about the health benefits of apitherapy products is important for both public health and the bee economy.<sup>20</sup> In the United States, alternative and complementary medicine education is provided for reasons such as being safer than other chemicals, its increasing use, growing clinical research, and government support.<sup>36</sup> In Germany, it has been included in medical education since 2003.<sup>37</sup> In Turkey, the title of apitherapist can only be obtained by doctors, and the number of apitherapists is very low.<sup>11</sup> Dietitians need to be given more space in the educational curriculum. Additionally, dietitians, apitherapists, and beekeepers need to find common ground and raise public awareness on this issue.

#### Limitations

Apitherapy is not taught in many universities in the Nutrition and Dietetics department. An attempt was made to reach all students without calculating the sample size, and the study could have been applied to a larger sample. The fact that this survey was conducted at only one university is a limitation. However, the study is significant because it shows that this topic is not included in the curriculum and that students obtain information from unreliable sources.

#### CONCLUSION

Dietitians need to understand evidence-based apitherapy products, be involved in interdisciplinary collaboration, and make public recommendations. This study has shown that future dietitians have insufficient experience and knowledge of apitherapy. The widespread use of bee products among the public and the increase in scientific studies on this topic highlight the need for nutritionists to receive training. It is important to include this subject in the nutrition and dietetics curriculum, to accelerate studies on the topic in our country, to discuss it in national and international congresses, and to raise public awareness to prevent the indiscriminate use of apitherapy products.

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