ORIGINAL RESEARCH

The Effect of Bee Products on the Quality of Life, Covid-19 Anxiety, and Disease Prognosis in Young Adolescents with Covid-19

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Abstract
Objective: This study aimed to evaluate the effects of bee products on quality of life, anxiety, and the prognosis of Covid-19 in young adolescents who had contracted the virus.
Material-Method: The population of this cross-sectional descriptive study comprised university students residing in a city center in Eastern Turkey. Data collection was conducted from January 2023 to January 2024, using a convenience sampling method, and included 514 participants. Data collection tools consisted of a sociodemographic characteristics information form, an apitherapy and nutritional supplement use form, the Turkish version of the SF-12 Health Survey, and the Coronavirus Anxiety Scale (CAS). Additionally, a Structural Equation Model was developed and tested to explore the relationship between the use of apitherapy products, fear of Covid-19, and quality of life.
Results: The study found that 25.3% of students used apitherapy methods during their Covid-19 illness, with honey being the most commonly used product (33.8%), and 50% of those who used these methods reported recovery from the disease. A significant difference was observed between the use of apitherapy methods and CAS scores, with those who used pollen reporting higher mean CAS scores. Gender, smoking status, and the use of apitherapy methods during Covid-19 were associated with fear of the virus.
Conclusion: This study highlighted the potential benefits of bee products for young adolescents during and after the Covid-19 pandemic. It is recommended that future studies include larger, multicenter samples and provide comparative results for further validation.
Keywords: Anxiety, Apitherapy, Bee Products, Covid-19

INTRODUCTION

In recent years, the use of natural products for the prevention and treatment of various diseases has risen significantly.[2] Among these natural products, bee products stand out. Apitherapy, which involves the use of bees and their products for the prevention and treatment of illnesses, is recognized as part of complementary and integrative medicine in many countries and is becoming increasingly popular.[3] The health benefits of bee products have been known for thousands of years and have been a cornerstone of traditional medicine across different cultures. Evidence indicates that apitherapy plays a crucial role in maintaining homeostatic balance and enhancing the immune system.[4,5] This treatment has demonstrated its positive effects in areas such as

inflammation, pain management, wound healing, and skin diseases.
Recently, the role of apitherapy in managing pandemic-related health challenges has come into focus.[6] During global health crises such as the Covid-19 pandemic, studies have investigated the potential of bee products to support immune function and boost the body's resilience.[7] Additionally, research is exploring the potential of apitherapy to inhibit viral replication and fortify the body's defenses against infections. While there is optimism about the future role of apitherapy in treatment protocols, further scientific studies and robust clinical data are essential to validate its efficacy and safety.

The Covid-19 pandemic, which began in late 2019, has posed significant challenges to public health. The escalating epidemic threat has led to a decline in the overall quality of life.[8] The pandemic's progression has been marked by various symptoms, including acute respiratory distress, high fever, and gastrointestinal and musculoskeletal issues, all of which have had a significant impact on individuals' quality of life during the illness.[9] Researches indicate that even after recovery, patients often experience a persistent reduction in their quality of life.[10,11] Studies have identified associations between decreased quality of life and factors such as anxiety, depression, and poor disease prognosis.[11] A longitudinal study demonstrated that complications from Covid-19 could persist for up to a year after recovery.[12] Additionally, a systematic review evaluating Covid-19's impact on quality of life reported substantial reductions during infection and ongoing impairment post-recovery.[13] Supporting this, a study conducted in Iran found significantly lower health-related quality of life among Covid-19 patients.[14]

Further research has underscored the continued decline in quality-of-life following Covid-19. A meta-analysis revealed that 59% of patients experienced poor quality of life post-recovery, with 42% reporting pain or discomfort, 38% suffering from anxiety or depression, 36% facing mobility issues, 28% experiencing difficulties with daily activities, and 8% struggling with personal care.[15] In another study assessing quality of life after Covid-19, most participants reported significant physical and emotional limitations that impaired functionality.[16]

The pandemic's impact extended beyond physiological health, significantly affecting psychological well-being.[17] The widespread nature of the virus, rising infection rates, and high mortality contributed to severe psychological issues, with 'fear' emerging as a significant concern.[18] Numerous studies have shown that the fear of Covid-19 is closely associated with physical health problems and related symptoms.[19,20] Research has also indicated that quality of life post-recovery was markedly low, with patients facing challenges in achieving full recovery, which adversely affected their mental health.[21]

This study aimed to evaluate the effects of bee products on quality of life, anxiety, and the prognosis of Covid-19 in young adolescents who had contracted the virus.

Study questions
In this study, answers to the following questions were investigated:
Do the participants experience persistent problems after recovering from Covid-19?
Did the participants use apitherapy methods during their Covid-19 illness?
Do the participants perceive benefits from apitherapy in overcoming the disease?

MATERIALS AND METHODS
Type of study
This study used a cross-sectional-descriptive design.
Universe and sample
The study was conducted with university students residing in a city center in Eastern Turkey. Research data was collected between January 2023 and January 2024. Data collection took place from January 2023 to January 2024. A convenience sampling method, which relies on volunteer participation, was used for sample selection. Upon completion of the study, power analysis was conducted using G^*Power 3.1 and OpenEpi Version 3. According to the literature, sample size determination for descriptive and cross-sectional studies typically involves an effect size of 0.5, an alpha level (α) of 0.05, and a power range of 0.80 (1-β).[22] The power analysis performed with 514 participants indicated a 95% confidence interval, an alpha level of 5%, and a power of 80%.
Inclusion criteria
The study included all students aged 18 years and above, who were capable of communication, had a confirmed diagnosis of Covid-19, and possessed the ability to complete questionnaires using electronic devices.
Exclusion criteria
Data from students who inconsistently or incompletely filled out the questionnaire were excluded from the analysis.
Data collection tools
The data collection utilized a set of tools including a "Sociodemographic Characteristics Information Form", "Apitherapy Method and Nutritional Supplement Use Form", the "Turkish Version of SF-12 Health Survey", and the "Coronavirus Anxiety Scale" (CAS).
Sociodemographic characteristics information form
Developed by the researchers, this form, drawing from the literature[19,20], encompasses questions aiming to ascertain various characteristics of the students. These include gender, grade, income level,

chronic disease, smoking, Covid-19 vaccination status, number of Covid-19 vaccine doses, frequency of Covid-19 occurrences, symptoms experienced during Covid-19.

Apitherapy method and nutritional supplement use form

This form, developed by researchers, gathers detailed information regarding the use of apitherapy, its application during the Covid-19 period, and the consumption of nutritional supplements during the illness.

Turkish version of Sf-12 health survey

This scale, which developed to assess quality of life comprises 12 questions and eight sub-dimensions: physical functioning (2 items), role-physical (2 items), bodily pain (1 item), general health (1 item), energy (1 item), social functioning (1 item), role-emotional (2 items), and mental health (2 items). Scores ranging from 0 to 100 can be obtained, with higher scores indicating a better quality of life. The scale, whose validity and reliability were confirmed by a study conducted in 2022, calculates physical and mental item scores separately.[23] In this study, Cronbach's alpha coefficient was found to be 0.81 for the physical item score and 0.85 for the mental item score.

Coronavirus anxiety scale (CAS)

This scale was developed to assess individuals' level of fear caused by Covid-19.[24] The scale's items were formulated through a comprehensive review of fear-related scales, expert evaluations, and participant interviews. The Turkish validity and reliability study of the scale was conducted in 2020.[25] Comprising a single dimension and 7 items, the scale does not include reverse items. The total score, ranging from 7 to 35, reflects the individual's level of fear regarding Covid-19. A higher score on the scale indicates a heightened level of fear related to the disease. In our study, Cronbach's alpha coefficient value of the scale was determined as 0.87.

Data collection process

To maximize participant reach, the questionnaire forms were created using Google Forms and adapted for online distribution. The links to the forms were shared with participants through multiple channels, including WhatsApp, Telegram, text messages, and emails. After obtaining consent through a voluntary participation form in the online survey, participants were instructed to complete the data collection tools. The entire questionnaire was designed to take approximately 5 minutes to complete.

Statistical analysis

Data evaluation utilized IBM SPSS Statistics 26.0. After establishing a database, a thorough error analysis was conducted. Descriptive statistics were employed to analyze the data. The normal distributions of variables were assessed using Skewness and Kurtosis tests.[26] Variables meeting the conditions for normal distribution underwent independent groups t-tests, analysis of variance (ANOVA), and correlation analyses. Non-parametric tests, including Mann-Whitney U test, Kruskal-Wallis H analysis, and Spearman tests, were applied to non-normally distributed variables. Additionally, a Structural Equation Model (SEM) was established and tested to discern the relationship between the use of apitherapy products and fear of Covid-19, as well as quality of life. In all analyses, a significant level of $p < 0.05$ was considered statistically significant.

Ethical approval

Prior to initiating the study, approval was obtained from the Bingöl University Health Sciences Scientific Research and Publication Ethics Committee (15.12.2022-E.88524). Additionally, necessary permissions were secured from the relevant institution (23.12.2022-E.89519) for conducting research involving university students. All participants were informed about the study's purpose, and their consent was obtained before their inclusion. The entire study adhered to the principles outlined in the Declaration of Helsinki.

RESULTS

The mean age of the students was 21.01±2.43 years, with 52.5% identifying as male. Regarding education, 86.2% were high school graduates, 30.4% were in their first year of university, and 87.7% reported not having chronic diseases. It was observed that 70.2% of the participants did not smoke, while 76.8% had received the Covid-19 vaccine, and 72.6% had received two doses. Additionally, 80.5% of the participants had contracted Covid-19 once, with 43.2% reporting mild disease. Despite this, 70.6% expressed the belief that the vaccines were not effective in overcoming Covid-19. Furthermore, 72.8% of the students did not intend to receive another Covid-19 vaccine. It was also found that 37.7% of participants used antibiotics during their illness. Around 33.3% of the participants experienced loss of taste and smell during the Covid-19 disease process, and 30% continued to experience these symptoms after recovery (Table 1).

Table 1. Sociodemographic characteristics of the participants according to the mean scale scores.

Variables	n	%	PF $\bar{X}\pm SD$	RP $\bar{X}\pm SD$	BP $\bar{X}\pm SD$	GH $\bar{X}\pm SD$	E $\bar{X}\pm SD$	SF $\bar{X}\pm SD$	RE $\bar{X}\pm SD$	MH $\bar{X}\pm SD$	CAS $\bar{X}\pm SD$
Gender											
Female	244	47.5	134.4±29.4	62.2±11.3	89.7±41.1	95.0±28.5	78.2±33.9	83.8±36.7	60.2±10.7	82.8±27.6	25.5±7.5
Male	270	52.5	132.8±25.9	60.4±11.1	89.0±39.7	88.4±20.2	76.3±30.8	79.0±33.4	56.9±10.0	79.4±25.4	23.1±6.7
Test			t=0.636	t=1.835	t=0.192	t=3.070	t=0.661	t=1.530	t=0.083	t=0.191	t=3.979
Significance			p=0.525	p=0.067	p=0.848	p=0.002	p=0.509	p=0.127	p<0.001	p=0.142	p<0.001
Grade											
1st	156	30.4	133.6±26.8	60.3±10.9	88.3±38.7	94.3±23.1	74.1±30.9	79.8±34.0	59.4±10.2	8.5±29.1	23.1±7.1
2nd	145	28.2	137.1±28.8	62.5±11.9	92.5±40.1	91.5±26.8	78.6±35.9	88.2±37.9	59.3±11.0	84.1±24.7	25.6±7.4
3rd	86	16.7	135.1±30.7	61.4±10.8	89.5±41.0	93.1±25.0	80.5±31.4	81.1±34.7	59.7±11.0	83.5±26.2	22.9±7.0
4th	127	24.7	128.5±24.3	60.9±11.2	87.0±42.4	87.2±23.5	77.3±30.2	75.3±32.1	55.6±9.1	76.5±25.1	24.8±7.2
Test			F=2.285	F=0.977	F=0.486	F=2.105	F=0.843	F=3.245	F=4.483	F=2.146	F=4.390
Significance			p=0.078	p=0.403	p=0.692	p=0.099	p=0.471	p=0.022	p=0.004	p=0.093	p=0.005
Chronic disease											
Yes	63	12.3	132.7±26.7	56.3±10.1	80.1±37.6	91.0±25.1	76.6±32.4	79.7±30.7	54.9±8.5	80.2±26.8	23.6±6.7
No	451	87.7	140.1±33.1	61.9±11.3	90.6±40.6	95.6±21.7	81.7±31.1	81.5±35.6	59.1±10.6	86.9±23.6	24.3±7.3
Test			Z=-1.563	Z=-3.730	Z=-1.838	Z=-1.434	Z=-1.341	Z=-0.282	Z=-2.858	Z=-2.144	Z=-0.421
Significance			p=0.118	p<0.001	p=0.066	p=0.152	p=0.180	p=0.778	p=0.004	p=0.032	p=0.674
Type of chronic disease											
Cardiovascular	13	20.6	152.7±34.1	54.1±8.8	94.4±48.0	91.6±21.6	83.3±25.0	88.8±28.2	52.7±5.5	83.3±26.5	21.5±8.2
Metabolic	17	29.1	152.9±37.3	56.6±9.9	97.1±36.6	102.9±23.1	85.2±23.4	72.1±24.8	53.6±7.3	89.7±25.8	24.3±7.3
Respiratory system	33	50.3	135.6±27.2	57.9±10.7	71.2±33.1	95.4±21.1	83.3±36.2	84.8±33.6	54.9±9.8	85.2±24.6	25.1±7.6
Test			X^2=4.672	X^2=3.532	X^2=2.580	X^2=1.591	X^2=0.943	X^2=0.644	X^2=3.918	X^2=0.982	X^2=0.625
Significance			p=0.003	p=0.015	p=0.053	p=0.191	p=0.420	p=0.587	p=0.009	p=0.401	p=0.599
Smoking											
Yes	153	29.8	132.5±29.2	60.2±11.3	86.2±38.4	91.3±26.4	81.8±35.6	87.9±37.6	58.8±11.1	84.9±29.4	26.4±8.2
No	361	70.2	134.1±26.9	61.7±11.2	90.7±41.2	91.6±24.0	75.3±30.7	78.5±33.6	58.4±10.2	79.4±25.1	23.2±6.6
Test			Z=-0.858	Z=-1.315	Z=-1.167	Z=-0.505	Z=-1.637	Z=-2.635	Z=-0.154	Z=-1.661	Z=-4.513
Significance			p=0.391	p=0.189	p=0.243	p=0.614	p=0.102	p=0.008	p=0.878	p=0.097	p<0.001
Covid-19 vaccination status											
Yes	395	76.8	134.3±28.4	61.5±11.3	90.1±40.1	90.6±24.1	78.2±32.8	82.2±35.1	58.6±10.5	82.2±26.2	23.9±7.2
No	119	23.2	131.1±24.9	60.5±11.2	87.1±41.4	94.7±26.4	74.1±30.5	78.1±34.8	58.1±10.3	77.3±27.2	25.2±7.1
Test			Z=-0.822	Z=-0.865	Z=-0.687	Z=-1.665	Z=-0.967	Z=-1.434	Z=-0.527	Z=-2.002	Z=-1.493
Significance			p=0.411	p=0.387	p=0.492	p=0.096	p=0.334	p=0.152	p=0.598	p=0.045	p=0.135
Number of Covid-19 vaccine doses											
1	66	16.7	127.2±27.1	61.1±11.1	84.2±41.3	88.7±22.6	69.2±26.3	75.6±33.7	56.4±9.1	80.7±27.5	26.1±7.6
2	287	72.6	134.1±29.1	61.1±11.2	89.8±39.9	91.7±24.8	80.7±33.6	81.7±34.3	58.1±10.5	83.1±26.3	23.1±7.1
3	42	10.7	139.5±26.9	61.1±12.5	90.2±39.7	93.7±26.3	72.9±34.5	97.2±40.4	64.2±9.5	74.3±26.1	28.1±7.3
Test			X^2=6.457	X^2=0.535	X^2=1.463	X^2=1.095	X^2=8.176	X^2=9.664	X^2=16.724	X^2=6.301	X^2=22.053
Significance			p=0.091	p=0.911	p=0.691	p=0.778	p=0.041	p=0.022	p=0.001	p=0.098	p<0.001
Frequency of Covid-19 occurrences											
1	414	80.5	132.8±27.2	61.6±11.3	90.3±40.7	91.1±25.7	76.6±32.4	82.3±35.9	59.1±10.4	79.5±26.3	24.3±7.3
2	78	15.2	136.8±30.1	60.4±11.1	85.8±40.1	91.1±18.4	78.2±31.0	75.6±30.1	56.5±10.4	86.6±25.8	25.1±6.8
3 and over	22	4.3	136.6±27.5	56.8±10.1	82.9±34.8	104.5±22.6	85.2±35.9	81.8±35.5	55.1±9.9	89.2±30.9	19.8±6.9
Test			X^2=1.679	X^2=4.358	X^2=1.304	X^2=6.875	X^2=1.442	X^2=1.442	X^2=7.956	X^2=6.796	X^2=9.377
Significance			p=0.432	p=0.113	p=0.521	p=0.032	p=0.486	p=0.486	p=0.019	p=0.033	p=0.009
How did the Covid-19 process go?											
Bad	86	16.7	139.5±31.4	58.7±10.5	94.4±38.2	90.4±25.1	81.6±30.5	77.3±29.1	56.1±9.9	83.5±29.1	23.5±7.1
Middle	206	40.1	128.3±24.5	64.2±11.6	94.7±41.3	95.2±27.6	78.1±34.2	83.8±38.4	60.5±10.9	81.6±26.1	25.7±7.5
Good	222	43.2	136.1±28.1	59.5±10.7	82.4±39.5	88.6±21.0	74.7±31.1	80.5±33.8	57.6±9.9	79.5±25.9	23.1±6.8
Test			X^2=9.441	X^2=23.162	X^2=11.234	X^2=3.606	X^2=3.390	X^2=0.478	X^2=14.445	X^2=1.281	X^2=15.241
Significance			p=0.009	p<0.001	p=0.004	p=0.165	p=0.184	p=0.788	p=0.001	p=0.527	p<0.001
Are vaccinations effective in Covid-19?											
Yes	151	29.4	136.2±25.6	63.2±11.5	86.2±38.1	94.7±23.9	78.6±34.8	88.5±36.3	61.2±10.3	81.3±24.2	23.9±7.3
No	363	70.6	132.5±28.4	60.4±11.0	90.7±41.3	90.2±25.0	76.7±31.2	78.3±34.1	57.4±10.3	80.9±27.5	24.3±7.2
Test			Z=-1.940	Z=-2.493	Z=-1.382	Z=-2.310	Z=-0.302	Z=-3.288	Z=-4.165	Z=-0.606	Z=-0.514
Significance			p=0.052	p=0.013	p=0.167	p=0.021	p=0.763	p<0.001	p<0.001	p=0.545	p=0.607
Would you consider getting vaccinated against Covid-19 again?											
Yes	140	27.2	136.1±24.5	63.1±11.4	90.1±38.8	93.7±27.9	77.8±34.9	92.1±38.6	60.1±10.7	83.8±24.3	25.2±7.4
No	374	72.8	132.6±28.7	60.5±11.1	89.1±41.1	90.7±23.4	77.1±31.3	77.2±32.8	57.9±10.3	80.1±27.3	23.8±7.1
Test			Z=-1.884	Z=-2.241	Z=-0.058	Z=-1.393	Z=-0.106	Z=-4.080	Z=-2.243	Z=-1.865	Z=-2.101
Significance			p=0.060	p=0.025	p=0.953	p=0.164	p=0.916	p<0.001	p=0.025	p=0.062	p=0.036
Use of antibiotics during Covid-19 treatment											
Yes	194	37.7	134.7±29.4	58.6±10.8	87.5±40.6	90.4±23.7	79.7±33.8	82.6±33.4	56.7±9.1	79.7±25.1	23.6±6.5
No	320	62.3	132.8±26.5	62.8±11.3	90.5±40.3	92.2±25.3	75.7±31.3	80.5±36.1	59.6±11.1	81.8±27.4	24.5±7.6

	n	%	PF	RP	BP	GH	E	SF	RE	MH	CAS
Test			t=0.756	t=-4.101	t=-0.828	t=-0.800	t=1.356	t=0.643	t=-3.003	t=-0.871	t=-1.374
Significance			p=0.450	p<0.001	p=0.408	p=0.424	p=0.176	p=0.520	p=0.003	p=0.384	p=0.170
Symptoms experienced during Covid-19											
Musculoskeletal disorders	134	26.1	136.1±26.4	61.4±11.3	86.7±39.4	92.5±25.6	79.6±35.2	85.1±33.8	59.3±10.3	84.1±23.8	23.9±6.7
Loss of taste, smell	171	33.3	133.3±26.8	60.4±11.4	89.7±41.1	87.4±21.4	72.2±30.8	76.1±33.1	57.3±10.1	75.8±24.5	24.6±7.6
Palpitations	27	5.3	141.6±32.5	61.5±10.9	87.9±41.2	93.5±23.6	79.6±33.9	82.4±37.8	59.2±11.2	87.9±29.3	25.7±7.6
Diarrhea	40	7.8	130.6±26.2	61.2±10.5	98.1±40.9	96.8±20.5	70.6±26.4	86.8±37.9	56.8±9.7	80.6±26.3	22.7±6.7
Headache	57	11.1	132.8±28.4	62.9±11.3	89.9±38.6	91.6±27.6	81.5±31.8	78.5±36.1	61.4±11.3	82.4±27.3	25.1±7.6
Weakness/fatigue	52	10.1	137.1±30.7	62.7±11.4	90.3±38.7	101.9±27.4	86.5±34.1	94.2±39.1	60.5±11.1	93.7±32.8	23.2±7.8
Sleep problems	33	6.4	117.4±22.9	59.4±11.7	86.3±46.3	84.8±27.9	78.1±27.1	70.4±29.6	54.5±8.7	68.9±22.9	24.3±5.7
Test			X^2=17.811	X^2=4.088	X^2=2.741	X^2=17.027	X^2=13.384	X^2=17.678	X^2=14.940	X^2=26.145	X^2=5.994
Significance			p=0.007	p=0.665	p=0.841	p=0.009	p=0.037	p=0.007	p=0.021	p<0.001	p=0.424
Loss of working capacity after Covid-19											
Yes	248	48.2	137.1±29.4	59.1±10.7	81.9±37.3	91.8±25.1	80.1±33.4	81.5±32.5	57.2±9.8	84.2±25.4	23.7±6.8
No	266	51.8	130.2±25.5	63.3±11.4	96.3±41.9	91.3±24.3	74.6±31.1	81.1±37.3	59.7±10.2	78.1±27.2	24.6±7.6
Test			t=2.860	t=-4.359	t=-4.091	t=0.220	t=1.938	t=0.143	t=-2.683	t=2.647	t=-1.370
Significance			p=0.004	p<0.001	p<0.001	p=0.826	p=0.053	p=0.886	p=0.008	p=0.008	p=0.171
Persistence of problems after Covid-19											
Yes	80	15.6	141.5±34.2	58.1±9.7	91.2±37.9	90.9±22.5	85.9±33.9	83.4±34.6	54.5±8.1	84.1±25.1	22.9±5.9
No	434	84.4	132.1±26.1	61.8±11.4	89.1±40.8	91.7±25.1	75.6±31.8	80.9±35.2	59.2±10.7	80.5±26.8	24.4±7.4
Test			Z=-2.200	Z=-2.626	Z=-0.515	Z=-0.058	Z=-2.656	Z=-0.763	Z=-3.631	Z=-1.333	Z=-1.773
Significance			p=0.028	p=0.009	p=0.607	p=0.954	p=0.008	p=0.445	p<0.001	p=0.183	p=0.076
	X̄±SD	Min.	Max.								
Age	21.01±2.43	18	38								

PF: Physical functioning, RP: Role-physical, BP: Bodily pain, GH: General health, E: Energy, SF: Social functioning, RE: Role-emotional, MH: Mental health, CAS: Coronavirus anxiety scale.

It was reported that 58.4% of the students were unaware of apitherapy, 25.3% used some form of apitherapy during the Covid-19 process, and 33.8% used honey as the most commonly applied apitherapy method. Additionally, 50% of participants reported that these methods were very useful in overcoming the disease. In terms of nutritional supplements, 37.9% of students used supplements during illness, with 37.4% specifically taking vitamin supplements (Table 2).

According to the Turkish version of the SF-12 Health Survey, it was found that the mean scores for bodily pain (t=-2.968; p=0.003) and social functioning (t=-2.312; p=0.021) sub-dimensions were lower in those who were familiar with apitherapy during the Covid-19 process compared to those who were not, with statistically significant differences (Table 2).

It was also found that the mean pain sub-dimension scores of those who used apitherapy during the Covid-19 process were lower than those who did not (Z=-3.768; p<0.001). A significant difference was observed between the apitherapy methods used and the bodily pain sub-dimension scores. The mean score for the physiological function sub-dimension was higher in honey users (X^2=14.274; p=0.014), showing a significant difference between the apitherapy method used and the bodily pain sub-dimension scores. The lowest mean bodily pain sub-dimension score was found in those who used a mixture of bee products (X^2=25.659; p<0.001). A significant difference was also found between the apitherapy methods used and the Coronavirus Anxiety Scale (CAS) scores. The mean score for pollen users was higher (X^2=14.696; p=0.005) (Table 2).

A significant difference was observed between the perceived benefit of the apitherapy method used in overcoming the disease and the mean score of the role-physical sub-dimension. Those who rated the benefits of apitherapy as low had higher mean scores for role-physical difficulty (X^2=7.845; p=0.049). The difference between the perceived benefits of apitherapy methods and CAS scores was also statistically significant. Participants who reported that the benefit of the apitherapy methods was low had higher CAS scores (X^2=9.668; p=0.022) (Table 2).

A structural equation model (SEM) was established to determine the relationship between the use of apitherapy products, fear of Covid-19, and quality of life. Upon examining the fit values in the model, it was determined that the established model ($\chi2$/df=1.823, RMSEA=0.123, CFI=0.983, GFI=0.982) met the required criteria, indicating that the model was appropriately fitted, and significant results were obtained. The standardized regression (beta) coefficient for the SEM in this study was β=-0.205; p=0.036 (Figure 1).

Table 2. Distribution of apitherapy and dietary supplement use according to scale mean scores.

Variables	n	%	PF X̄±SD	RP X̄±SD	BP X̄±SD	GH X̄±SD	E X̄±SD	SF X̄±SD	RE X̄±SD	MH X̄±SD	CAS X̄±SD
Knowledge about apitherapy											
Yes	214	41.6	133.1±27.1	60.5±11.1	83.1±39.2	91.2±21.4	76.5±30.4	77.1±30.5	58.5±10.2	81.1±24.5	24.2±6.6
No	300	58.4	134.1±28.1	61.8±11.4	93.8±40.7	91.8±26.8	77.8±33.6	84.3±37.7	58.5±10.6	81.1±27.9	24.2±7.6
Test			t=-0.379	t=-1.306	t=-2.968	t=-0.268	t=-0.454	t=-2.312	t=-0.015	t=0.038	t=-0.081
Significance			p=0.705	p=0.192	p=0.003	p=0.788	p=0.650	p=0.021	p=0.988	p=0.969	p=0.935
Use of apitherapy method during Covid-19											
Yes	130	25.3	131.9±28.1	60.1±10.5	77.5±38.4	91.1±21.7	74.2±30.1	79.8±31.7	57.8±9.9	82.2±24.9	23.6±7.3
No	384	74.7	134.1±27.4	61.6±11.5	93.4±40.3	91.7±25.7	78.3±33.1	81.8±36.1	58.7±10.6	80.6±27.1	25.9±6.6
Test			Z=-0.618	Z=-1.167	Z=-3.768	Z=-3.352	Z=-1.028	Z=-0.181	Z=-0.656	Z=-0.792	Z=-1.773
Significance			p=0.537	p=0.243	p<0.001	p=0.725	p=0.304	p=0.857	p=0.512	p=0.428	p=0.076
Product of apitherapy used											
Honey	44	33.8	142.1±26.9	62.5±10.1	84.2±39.3	85.7±26.6	71.4±21.1	84.2±32.7	57.5±10.1	82.1±28.6	23.6±7.3
Propolis	33	25.3	131.1±27.2	58.3±10.2	77.2±38.7	92.4±18.2	78.1±31.7	75.7±32.1	56.4±10.4	79.1±25.5	24.8±6.1
Pollen	10	7.6	141.1±29.3	61.2±10.9	105.1±45.3	82.5±16.8	87.5±29.4	80.1±32.9	56.2±8.8	90.1±20.2	28.2±6.3
Royal jelly	35	26.9	126.7±28.2	59.9±11.3	71.1±35.7	97.1±20.3	71.1±34.9	80.6±32.7	59.9±10.2	83.5±23.3	22.1±6.4
Mixture	8	4.8	109.3±18.6	57.8±9.3	50.1±0.1	87.5±18.8	71.8±28.1	71.8±20.8	56.2±6.6	78.1±21.9	26.2±6.7
Test			X^2=14.274	X^2=4.328	X^2=25.659	X^2=7.139	X^2=5.126	X^2=1.479	X^2=3.679	X^2=2.619	X^2=14.696
Significance			p=0.014	p=0.503	p<0.001	p=0.210	p=0.401	p=0.915	p=0.596	p=0.758	p=0.005
The benefits of apitherapy in overcoming the disease											
Less	15	11.5	133.3±22.4	68.3±9.2	103.3±41.0	86.6±28.1	86.6±36.4	78.3±33.8	61.6±12.1	75.8±21.3	28.8±7.5
Middle	41	31.5	135.9±31.6	60.6±10.2	82.3±39.2	91.4±21.3	71.3±29.8	79.8±33.1	59.4±9.9	82.9±27.2	22.1±7.3
Much	65	50.0	129.2±29.1	60.1±11.5	75.3±37.1	92.3±19.7	76.5±32.1	71.1±28.7	55.9±9.1	80.5±23.9	25.4±7.4
Undecided	9	7.0	134.7±27.2	61.4±11.5	93.8±40.3	91.7±26.1	78.3±32.3	83.4±36.5	58.8±10.7	80.9±27.1	23.8±7.1
Test			X^2=2.092	X^2=7.845	X^2=7.087	X^2=0.781	X^2=3.119	X^2=3.520	X^2=5.535	X^2=0.751	X^2=9.668
Significance			p=0.553	p=0.049	p=0.069	p=0.854	p=0.374	p=0.318	p=0.137	p=0.861	p=0.022
Use of nutritional supplements											
Yes	195	37.9	133.5±29.1	58.9±10.5	81.1±40.6	88.9±20.7	77.5±30.9	75.3±28.7	56.3±9.2	80.8±24.2	23.7±6.7
No	319	62.1	133.6±26.8	62.6±11.5	94.5±39.5	93.1±26.7	77.1±33.1	84.9±38.1	59.8±10.9	81.1±27.9	24.5±7.5
Test			t=-0.012	t=-3.667	t=-3.716	t=-1.875	t=0.152	t=-3.023	t=-3.747	t=-0.122	t=-1.125
Significance			p=0.990	p<0.001	p<0.001	p=0.061	p=0.879	p=0.003	p<0.001	p=0.903	p=0.261
Type of dietary supplement used											
Vitamin	73	37.4	133.7±27.7	59.4±10.3	73.7±38.4	87.3±20.1	81.8±32.1	79.2±29.6	56.9±8.7	78.5±21.2	22.9±6.2
Mineral	41	21.0	137.1±29.1	56.4±10.5	97.5±41.3	91.4±22.1	80.4±33.3	91.4±33.8	56.6±6.9	74.3±23.1	23.1±5.6
Extract	27	13.8	133.3±30.2	61.5±10.9	77.7±40.6	91.6±16.9	85.1±34.8	68.5±26.4	57.8±10.4	83.3±25.7	24.5±7.7
Soups	17	8.7	127.9±23.1	60.2±10.1	80.8±40.1	82.3±26.1	79.4±35.6	69.1±24.2	58.8±11.4	83.8±26.4	24.5±6.8
Herbal teas	18	9.2	125.1±22.6	63.1±12.4	94.4±42.4	90.2±25.9	69.4±27.8	70.8±31.2	58.3±10.5	75.1±25.3	24.2±8.9
Local food and/or products	19	9.9	127.6±37.1	57.2±9.6	73.6±37.7	96.1±17.2	69.7±31.8	65.7±31.4	53.2±7.0	94.1±28.3	26.1±7.7
Test			F=0.702	F=2.852	F=4.151	F=1.041	F=1.049	F=2.766	F=3.593	F=1.572	F=0.854
Significance			p=0.648	p=0.010	p<0.001	p=0.398	p=0.392	p=0.012	p=0.002	p=0.153	p=0.529

PF: Physical functioning, RP: Role-physical, BP: Bodily pain, GH: General health, E: Energy, SF: Social functioning, RE: Role-emotional, MH: Mental health, CAS: Coronavirus anxiety scale.
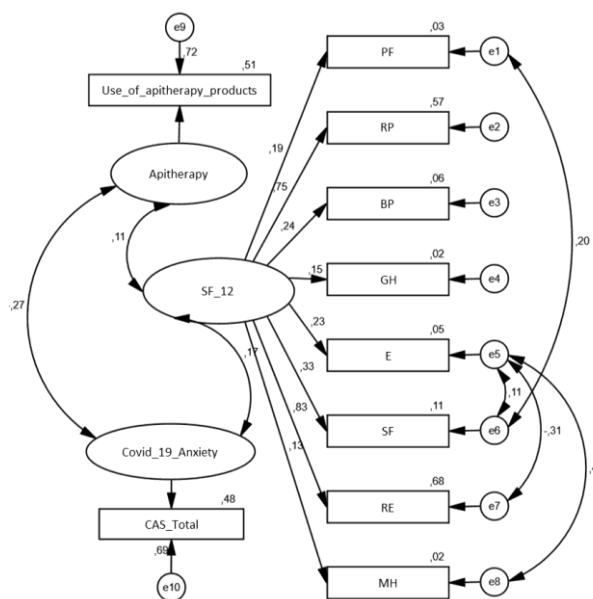

Figure 1. Standardized path coefficients.
Abbreviations: PF: Physical functioning, RP: Role-physical, BP: Bodily pain, GH: General health, E: Energy, SF: Social functioning, RE: Role-emotional, MH: Mental health, CAS: Coronavirus anxiety scale.

DISCUSSION

In this study, we investigated the impact of bee products on quality of life, anxiety, and Covid-19 prognosis in young adolescents who experienced Covid-19. Bee products, including propolis, pollen, and royal jelly, have a history of use in traditional medicine, known for their various benefits. The antioxidant, anti-inflammatory, and antimicrobial properties of these bee products, as well as natural remedies used in alternative medicine, may play a crucial role in alleviating symptoms and improving overall health status following Covid-19.[27] In this study, we found that the use of natural products during pandemics such as Covid-19 has positive effects on general health status, the fear of Covid-19, and the prognosis of the disease. Previous a research emphasized the antioxidant and anti-inflammatory properties of bee products, highlighting their positive effects on general health and quality of life.[27] In addition, another study reported that bee products positively affect the immune system and may have healing properties for general health.[28] A study has shown that bee products have the potential to improve quality of life by positively affecting general health.[29] In addition, a study published in 2019 reported that natural treatment methods positively affect the physical and mental health of young adolescents.[30]

The results of this study indicate that bee products have positive effects on Covid-19-related fear in young adolescents. These findings are consistent with a study published in 2020, which showed that natural therapeutic methods can effectively reduce anxiety and stress during the pandemic.[31] It has also been reported that natural products can improve the psychological health of young adolescents. Natural products can have effective results in alleviating anxiety and depression, which are common problems among young people during the pandemic period.[32,33,34]

One of the most important results of this study is that the use of bee products in Covid-19 disease is effective in mild disease and acceleration of the healing process. Previous studies have reported that bee products can strengthen the immune system and positively impact the recovery of Covid-19 patients.[35,36] A study published in 2021 stated that natural products can be effective in strengthening the immune system that protects the body against viral infections and alleviating the infection process.[37] Natural treatment methods have been reported to be useful in the management of chronic diseases and in improving quality of life.[38] In

another study, it was reported that the use of natural products by young people during the pandemic had a positive effect on the recovery process.[39] This suggests that natural products could be used effectively in treating viral infections, particularly during pandemic situations.[40] Some studies further indicate that alternative treatments can play a significant role in managing epidemics such as Covid-19.[41]

CONCLUSION

The results of this study indicate that bee products, known for their antioxidant, anti-inflammatory, and antimicrobial properties, positively impact the general health and quality of life of young adolescents. Natural bee products were observed to have a favorable effect on the overall well-being of young individuals, reducing fear associated with Covid-19. These results underscore the effectiveness of natural therapeutic methods in enhancing quality of life and alleviating Covid-19-related fears during the pandemic. Furthermore, the study suggests an association between the use of bee products and a milder course of Covid-19, contributing to a faster recovery process. These results highlight the potential benefits of incorporating bee products into therapeutic approaches for managing Covid-19 in young individuals. In summary, this study sheds light on the potential benefits of bee products for young adolescents during and after the Covid-19 pandemic. To enhance our understanding of the effectiveness of bee products in epidemic diseases, it is advisable that future studies adopt larger sample sizes, a multicenter approach, and present results in a comparative manner. Furthermore, the conduct of long-term follow-up studies is essential to investigate the sustained impact of bee products. This will enable a deeper exploration of the prolonged effects of Covid-19, and the role of bee products in mitigating these effects can be elucidated. Although not addressed in this study, it is worthwhile for future research to compare the efficacy of bee products with standard treatment methods. Such comparisons will contribute to determining whether bee products serve as alternatives or complementary approaches to traditional treatment methods.

Limitations

This study was conducted to evaluate the effect of bee products on the quality of life, Covid-19 anxiety, and disease prognosis in young adolescents with Covid-19, has several limitations. Firstly, the

cross-sectional design of the study hinders the determination of causality. Additionally, the reliance on data from a single province restricts the generalizability of the results to the broader population. Furthermore, the assessment of Covid-19 fears and quality of life relied on self-report scales, which introduces the possibility of bias, and other factors influencing these aspects couldn't be comprehensively determined. Despite these limitations, the study's strengths include the utilization of a large sample group and the innovative use of structural equation modeling, providing a novel approach to understanding the relationship between the use of apitherapy products and fear of Covid-19, as well as the quality of life. These methodological choices enhance the reliability of the study's results.

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