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Assessment of Bee Products Use among Jordanian Community: Folkloric Practice vs. Evidence-Based Literature.

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ABSTRACT

Background: There is a limited number of investigations on consumer behaviors and applications of various bee products within the Jordanian population. The study aims to explore the use of different bee products among Jordanians and to assess the claimed usage against evidence-based pharmacological studies.

Methods: This cross-sectional, web-based study was conducted using a structures questionnaire created on Google Forms. This study employed a cross-sectional, web-based design to evaluate the use of bee products utilizing the platform for data collection. The survey link was distributed via social media platforms (Facebook, Instagram, and WhatsApp) and shared through the personal networks of the research team to collect data.

Results: The study revealed that honey is primarily used as a prophylactic measure against upper respiratory tract disorders (48.3%) and for immune stimulation and allergy protection. The survey revealed that 52.9% of respondents used bee products in conjunction with their medications. Furthermore, 23.0% of the participants discontinued their medications and relied solely on bee products.

Conclusions: The findings of this study indicated that Jordanian participants utilized different bee products primarily for preventive and therapeutic purposes, emphasizing the growing awareness and recognition of the medicinal properties of bee products within Jordanian society. The use of bee products is supported by numerous international studies. However, there is a lack of local research in this area. It is well known that Phyto-constituents can vary significantly from one geographical area to another, so local studies are warranted. Furthermore, consumers should be informed about the potentially harmful interactions between bee products and conventional medications.

Keywords: Bee products, Honey, Propolis, royal jelly, Beeswax.

Introduction

Throughout history, bee products have been utilized for various purposes and widely marketed due to their medicinal properties (1). They have been known since ancient times in Egypt, Greece, and China because their advantages are referenced in various religious texts, such as the Vedas, the Bible, and the Quran (2). Bees, essential for sustaining natural life for over 100 million years, are becoming increasingly significant (1). This has led to growing demand in the beekeeping industry and the development of new products and activities (1). For centuries, bee products like honey, propolis, royal jelly, beeswax, and bee pollen have been recognized for their nutritional and medicinal benefits(3). Figure 1 indicates the types and the general pharmacological activities of bee products.

Their use is associated with numerous health advantages. For instance, royal jelly contains more than 200 chemicals, including essential amino acids, enzymes, peptides, lipids, carbohydrates, bioelements, organic acids, nucleic acids, hormones, vitamins, and nucleotides (4). It demonstrated a broad-spectrum antibacterial activity against pathogens such as Bacillus metiens, Escherichia coli, Mycobacterium tuberculosis, Proteus vulgaris, Staphylococcus aureus, and Streptococcus species (5). Additionally, it exhibits antioxidant (6), anti-inflammatory (7), anticancer (8), neuroprotective (9), and hypocholesterolemia effects (10). Propolis, high in flavonoids, offers various pharmacological benefits (5). It possesses anticancer, antiviral, antifungal, antioxidant, and anti-histaminic properties (11). Additionally, it aids in maintaining a healthy body weight (12). In cosmetics, propolis is valued for its bacteriostatic and re-

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generative effects on the skin, including its ability to stimulate collagen production (13). The therapeutic properties of pollen are determined by its composition, such as fatty acids, nucleic acids, nucleosides, phenolic compounds, vitamins, and bioelements (14). Moreover, bee pollen has been utilized to alleviate allergic conditions like hay fever. It can also be consumed directly as a food source because of its high protein and lipid content (5, 15).

Beeswax is recognized for its antiseptic, regenerative, and fortifying qualities. Its antimicrobial and moisturizing properties help accelerate wound healing and promote epidermal regeneration (14). In medicine, beeswax is employed to address inflammation in joints, muscles, and nerves (14). Moreover, honey is the bee product that is most commonly used (4). It has been recognized by nutritional scientists as a component of the human diet and a remedy for various medical conditions. Its nutritional and therapeutic benefits are closely linked to the concentrations of carbohydrates, amino acids, and polyphenols it contains (16). Research has identified over 200 distinct polyphenolic compounds in honey, including phenolic acids, flavonoids, flavanols, catechins, and cinnamic acid derivatives, which are of significant biological and clinical importance (17, 18). Its broad antimicrobial activity and diverse therapeutic components make honey useful in treating several disorders affecting the gastrointestinal tract, nervous system, eyes, and fertility (19).

Given Jordan's long-standing tradition of beekeeping and the rising interest in natural and complementary medicine, understanding how bee products are used is crucial. Beekeeping in Jordan is increasingly becoming a vital source of honey, aiming to reduce reliance on imported honey (20). It has deep roots in Jordan, especially in the Irbid and Amman districts (21). The establishment of the Jordanian Beekeepers' Association and initiatives like the bee breeding project underscore the ongoing development in this field (21).

Despite the long-standing use of honey and other bee products in traditional and modern wellness practices, there is a notable gap in research concerning the motives and methods of honey use for medicinal purposes (22-24). Additionally, existing studies on the use of bee products other than honey remain limited and often outdated (25, 26). This study aimed to describe the patterns of bee product usage in Jordan and to evaluate whether these practices align with evidence-based medicine. By doing so, we bridge the gap between folkloric practices and clinical literature, providing insights for both researchers and public health professionals.



Figure 1. Types and general pharmacological activities of bee product (27).

Methods

Study Design and Study Population

This study employed a cross-sectional, web-based design to evaluate the use of bee products utilizing the Google Forms platform for data collection. The survey link was disseminated through social media, such as Facebook, Instagram, and WhatsApp, as well as through the personal networks of the research group members.

Study Population and Sampling:

The inclusion criteria were Jordanian adults aged ≥ 18 years who were currently residing in Jordan, able to read and understand Arabic, had access to the internet and social media platforms, and who agreed to complete the questionnaire. This population was selected because the study focused on community patterns of bee products in the Jordanian context. A snowball sampling technique was employed for participant recruitment. The questionnaire link was initially distributed via social media platforms (Facebook, Instagram, WhatsApp) and through personal networks of the research team. Participants were then encouraged to share the link within their own networks, thereby facilitating recruitment of a larger and more diverse sample. Snowball sampling was used because there is no national registry of bee product users in Jordan, social media provides a rapid and cost-effective means of reaching diverse demographic regions, and this method is well-known in exploratory research.

Sample size calculation

Sample size was estimated using the Open Epi, Version, and Kish formula 15 below:

Where:

$$n = [DEFF*Np(1-p)]/ [(d^2/Z^2_{1-a/2}*(N-1)+p*(1-p)]$$

P: hypothesized % frequency of outcome factors in the population: 5%±5

n: population size (for finite population correction factor or fpc)

d: confidence limit as % of 100 (absolute ±%): 5%

Deff: design effect (for cluster survey): 1

Z: value for 95 % confidence limit

p: estimated prevalence

The ideal sample size was calculated to be 384. To account for a potential non-response rate, an additional 10% of the calculated sample size was added. Hence, the final representative sample size was calculated to be 422(28).

Ethical Approval

Before starting, the participants were provided with a brief explanation of the study and its aims, along with assurance of anonymity and confidentiality. The study was approved by the ethical committee of Applied Science Private University (Approval number: 2024-PHA-39).

Questionnaire and Validation

The questionnaire used in this study was adapted from previously published and validated tools (4, 29, 30). The questionnaire consisted of four sections. The first involved questions related to characteristics of respondents such as gender, age, education, income, and health status, including current disease, and medication use. The second part of the questionnaire addressed the type of bee products used and the reasons for using bee products, including medicinal, prophylactic, and cosmetic purposes. The questions in the third part of the questionnaire explored the source of purchasing bee products, and the way of using the bee product, including timing, and the concurrent use with medications. Then the questionnaire was translated into Arabic, and the translated version was reviewed by a panel of three experts in pharmacy practice to assess content validity. Based on a pilot study conducted on participants, to assess clarity, validity, and reliability, minor wording adjustments were made. Internal consistency reliability of the questionnaire was evaluated using Cronbach's Alpha, which yielded a coefficient of 0.8, indicating high reliability of the instrument.

Statistical analysis

Participants' responses were coded and entered into Statistical Package for the Social Sciences software (SPSS), Version 26.0 (IBM Corp., Armonk, New York, USA). Descriptive statistics were applied to categorical variables and were expressed as frequencies (n) and percentages (%). Our main purpose was to provide a descriptive snapshot of current usage of honey products and to evaluate whether these practices align with evidence-based medicine. So, descriptive statistics were chosen intentionally. We aim to reflect real practices in the context of evidence-based medicine (EBM).

Results

Socio-Demographic Data

A total of 520 responses were collected following the dissemination of the questionnaire via various social media platforms. Overall, 52.5 % of the respondents were between 18-30 years old. Among this age group, 57.9 % were women, and 42.1% were men. More than half of the participants held a bachelor's degree, reported being in good health, and did not suffer from any chronic diseases. Table 1 shows the demographic characteristics of participants. Family members were reported as the primary source of information about bee products (30.6%), followed by personal preference (20.6%). Table 2 shows the sources of information used by participants.

Type and reason for using Bee products

Participants reported using various honey products primarily for prophylactic measures (251, 48.3%), followed by therapeutic applications (82, 15.8%), and cosmetic reasons (20,3.9%). Several participants used honey products for dual purposes: therapeutic and cosmetic (10, 1.9%), therapeutic and prophylactic (137, 26.3%), and prophylactic and cosmetic (20, 3.8%). Table 3 shows the reasons for using bee products by participants. Prophylactically, most participants reported using bee products to prevent upper respiratory tract disorders such as the common cold, to stimulate immunity, and to protect against allergies. Therapeutically, participants used bee products to treat upper respiratory tract disorders, lower respiratory tract disorders, gastrointestinal disorders, immune-related disorders, dermatological conditions, heart diseases and hypertension, infertility, and cancer. In contrast, only a few participants reported using bee products for cosmetic purposes, including skin peeling, anti-aging, acne management, and moisturizing (Figure 2). Honey was the preferred bee product used by participants (83.3%). Among honey types, Seder (23.3%) was the most commonly chosen, followed by Mountain (21.2%) and Citrus (15.4%) honey. Other bee products were also reported, including propolis (7.7%), beeswax (4.2%), royal jelly (3.7%), bee bread (0.8%), and bee venom (0.4%).

Factors Influencing Participants' Decisions when Purchasing Bee Products

The analysis revealed that participants mainly focused on the quality of bee products (305, 58.6%), followed by the source (90, 17.3%), price (57, 11%), taste (51, 9.8%), and brand (17, 3.3%).

Patterns of Bee Product Use among Participants

Most participants (90.8%) believed that the bee product they used provided a beneficial effect. The majority of participants consumed bee products mainly in the morning before eating. Additionally, 52.9% of respondents used bee products alongside their medications, while 23% stopped using their medications and relied solely on bee products. Awareness of potential interactions between bee products and medications was noted among 37.3% of participants, Table 4. Reported side effects included allergies (15, 2.9%), vomiting (6, 1.2%), headache (6, 1.2%), and bleeding (1, 0.3%).

Table 1. Demographic characteristics of participants, n=520.

Characteristic	Percentage of Participants
Age	
18-30	52.5
> 30	47.5
Gender	
Female	57.9
Male	42.1
Educational level	
Elementary	1.3
High school	15.4
Diploma	8.5
Bachelor	70.6
Higher education	5.6
Place of residence	
Northern Jordan	22.5
Central Jordan	68.7
Southern Jordan	8.8

Table 2. Sources of information used by participants.

Source of Information	Percentage of Participants
Family member	30.6
Personal preference	20.6
Search engine	11.0
Social media	10.6
Friends	9.8
Dietitian	7.0
Pharmacist	6.0
Others (Books, TV/radio/Websites, and physicians)	4.4

Table 3. Main reasons for using bee products by participants.

Main Reason	Percentage of Participants
Prophylactic measures	48.3
Therapeutic applications	15.8
Dual purposes	32

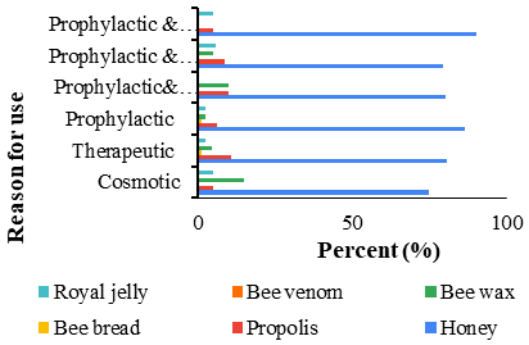

Figure 2. Reasons for the use of bee products by the participants.

Table 4. Patterns of bee product use among participants.

Question	Percentage of participants
Use bee products alongside their medications	52.9
Use bee products solely	23
Awareness of potential interactions with medications	37.3

Discussion

Bee products are valuable sources of diverse phytochemical constituents with demonstrated therapeutic potential. These products, including honey, bee bread, pollen, propolis, royal jelly, bee venom, and beeswax, have long been used in traditional medicine. However, further research is still needed to better understand these properties and to promote their safe and effective use, emphasizing the importance of aligning folk practices with evidence-based medicine (31). The present study aimed to determine the patterns of use of different bee products in Jordan, and to evaluate how these practices correspond to scientific evidence. Among our participants, honey was the most consumed product, primarily as a preventive measure, particularly against flu and common cold, and for boosting immunity. Bee products have been used throughout history to treat numerous maladies and to promote general wellness (32). These findings align with previous literature documenting the widespread belief in honey's preventive and therapeutic properties. The use of natural products to boost immune responses is a widespread practice among the Jordanian population(33). One study reported that the consumption of honey may reduce the incidence and alleviate the signs and symptoms of the common cold (34). Furthermore, Henatsch and coworkers demonstrated the effectiveness and safety of bee products in otorhinolaryngology(35, 36).

The results demonstrate consistency with evidence from theliterature regarding the antimicrobial, immune-modulatory, and cardio-protective roles of bee products. Honey is widely recognized as a natural remedy for upper respiratory tract infections (URTIs). Honey possesses antimicrobial properties and is recommended as an alternative to antibiotics. It causes fewer adverse effects than conventional antibiotics and does not contribute to antibiotic resistance. Numerous studies have documented its broad antimicrobial activity against Gram-positive and Gram-negative bacteria (37) Specifically, honey demonstrates potent antimicrobial activity against the most common bacterial pathogens responsible for respiratory tract infections, showing relatively higher sensitivity towards Streptococcus pneumonia and Streptococcus pyogenes, followed by Staphylococcus aureus, Klebsiella pneumonia, and finally Pseudomonas aeruginosa (37). On the other hand, propolis is empirically used for the prevention and treatment of respiratory diseases. It exerts significant antimicrobial activity and has been investigated for its therapeutic potential in respiratory health (38, 39).

Bee products are enriched with bioactive compounds, such as polyphenols and polypeptides, that influence immune regulation by stimulating inflammatory mediator production and reducing reactive oxygen species production(40, 41). While bee products enhance innate immune responses through the activation of B and T lymphocytes, their adaptive immune effects are limited (36, 40). The immunomodulatory effects of honey vary according to type,

reflecting differences in its phytochemical constituents (42). This immune-modulating property has sparked growing interest in clinical applications of be products(40). The positive perception among participants of bee products as immune boosters aligns with these studies.

Cardiovascular diseases are considered a major cause of death and disability around the globe. Several secondary metabolites in honey have been shown to play a protective role by reducing the risk of cardiovascular diseases(43). Recently, bee products have gained attention for their prophylactic and medical benefits in conditions such as atherosclerosis, hypertension, ischemic heart disease, and myocardial infarction (43). Honey intake has been shown to significantly reduce risk factors associated with metabolic and cardiovascular diseases (41). Its cardioprotective effects include vasodilation, maintaining vascular homeostasis, and improving lipid profiles (41). Flavonoids are among the major secondary metabolites found in honey. They exert cardioprotective effects through enhancing coronary vasodilation and improving endothelial function. Additionally, they decrease the tendency of platelets to form clots, prevent oxidation of low-density lipoproteins (LDL), the essential step of the development of atherosclerosis, and increase high-density lipoproteins levels (HDL) (41). While participants' use may be motivated by traditional beliefs, their practice may grant cardiovascular benefits as supported by experimental data.

A few participants reported using honey and propolis for digestive health. Honey plays a beneficial role in managing gastrointestinal reflux diseases (GERD) by stimulating sphincter growth and serving as a potent inhibitor for Helicobacter pylori, the bacterium responsible for gastritis and peptic ulcer disease (40). Individuals diagnosed with inflammatory bowel syndrome (IBS) have reported symptom relief after consuming raw Manuka honey on an empty stomach(40). Additionally, honey has been shown to alleviate gastric pain, support liver function, and neutralize toxins(41). Propolis and bee bread have been thoroughly studied for their beneficial effects in the treatment of gastrointestinal disorders, including ulcerative colitis, gastrointestinal cancers, and gastric ulcers (42, 44).The use of bee products for fertility and reproductive health is largely based on traditional knowledge; however, research has reported significant ameliorative effects of several bee products on male reproductive defects, using in-vivo studies(45). However, these benefits have not yet been proven to be effective and safe in clinical experiments. The biological properties of various extracts of bee products are largely attributed to their high content of flavonoids, polyphenols, and radical-scavenging capacity(45).Cancer remains one of the leading causes of death globally. Bee venom has been reported to induce cytotoxicity and apoptosis and to hinder the proliferation of cancer cells. In addition, honey is well-documented to possess antioxidant, pro-apoptotic, anti-proliferative, anti-metastatic, immune-modulatory, and anti-inflammatory properties against several types of cancer cells(27). In addition, the immunostimulatory properties of honey encompassing the innate and adaptive system play a key role in the immunological processes for the elimination of cancer cells (46).

Notably, participants' perceptions of the health benefits of bee products were positive, with more than 90% reporting beneficial effects. However, our results also revealed limited awareness of potential interactions with conventional medicines. On the other hand, there are limited studies examining the interactions between honey and conventional medicines. This finding highlights the need for integrating evidence-based guidance on the safe use of natural products alongside prescribed treatments. One study reported that multiple doses of honey significantly increased the urinary excretion of 6β-hydroxy cortisol, suggesting induction of Cytochrome P450 3A4 (CYP3A4) activity(47). However, since honey composition differs from one geographical region to another, its effects may also differ (47). Only a few participants reported side effects of the bee products. Most of our participants named allergy as the main possible side effect. This fact is supported by other studies.

While the therapeutic applications of bee products are broad, including gastrointestinal, respiratory, cardiovascular, dermatological, and even oncological uses, our findings emphasize that many consumers rely on family traditions and experience, and informal sources of information rather than scientific or medical advice. This pattern can be interpreted through the Health Belief Model, where perceived benefits and trust in traditional sources outweigh perceived risks or lack of formal guidance (48). This pattern suggests a disconnect between traditional use and evidence-based medicine. Another critical observation is that cosmetic use, though less common, reflects an emerging trend where bee products are integrated into skincare for their regenerative and anti-aging properties(49). This aligns with international reports documenting the rising demand for natural cosmetics(50).

Limitations

This study marks the first exploration of bee product use among the Jordanian population; it has several limitations. One constraint is the reliance on social media platforms and the snowball sampling method for participant recruitment, which restricted the study to individuals who can use the internet and social media. Another limitation is the need for more specific questions targeting the participant's medical history to better understand the context of bee product use. Addressing this gap can pave the way for future research to better understand the use of bee products within the Jordanian population. It was found that honey was the main bee product used by participants.

Conclusion

The findings of this study demonstrate the frequent use of bee products against several ailments among the Jordanian population and their alignment with many, though not all, evidence-based pharmacological studies. While many uses reported by participants are supported by international studies, the reliance on local evidence remains limited. Furthermore, the study identifies critical gaps in consumer knowledge, particularly concerning safety profile, potential interactions, and the limited clinical validation of these products. Addressing these gaps will require educational campaigns, integration of bee products into evidence-based clinical guidelines, and the development of further controlled trials will ensure safer and more effective use of bee products in public health.

Conflict of Interest

The authors declared no conflict of interest.

Availability of data and materials

The raw data required to reproduce these findings are available in the body and illustrations of this manuscript. Further data

are available on request.

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