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Research article

Survey of reasons why women utilize honey therapeutically, and reasons for not utilizing honey

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ABSTRACT

There are various situations when honey can be reasonably used in cases of disease, for example radiotherapy and/or chemotherapy-induced oral mucositis. We investigated the underlying reasons why women eat honey and why some would refuse to use honey even if it was reasonable to do so. In order to answer these questions, we asked 201 women to answer various questions related to the consumption of honey. We found that the preferred routes of administration change when honey is used as a remedy. Most importantly, we identified "organic beekeeping" and a second factor related to the perception of honey regarding price, handling and health by principal component analysis as relevant regarding the refusal of the use of honey even when scientifically reasonable. If honey is to become an acceptable treatment option, it seems important to address all aspects of ethical beekeeping in the production of medicinal bee products.

1. Introduction

Holistic apitherapy represents a part of complementary and alternative medicine (CAM) that focuses on medical treatment using bee products. Some apitherapists claim that almost all diseases can be cured using these products alone or in combination with other CAM methods. As shown in earlier analyses of various medical topics (dysmenorrhea, seasonal allergic rhinitis cancer treatments), holistic apitherapy clear treatment concepts and does not explain the background of these treatment concepts (Münstedt, 2018; Münstedt and Männle, 2020). In light of these analyses, apitherapeutic concepts appear to be arbitrary and apitherapists must be regarded as unwilling to adapt to scientific findings on bee products (Münstedt, 2018; Münstedt and Männle, 2020). Examples of such reasonable treatment concepts using bee products that are not considered by apitherapists are the treatment of herpes virus-associated skin lesions with propolis or the treatment of radiotherapy-induced oral mucositis with honey (Münstedt, 2019; Münstedt, 2018). In contrast to holistic apitherapy such treatments may be considered as scientific apitherapy and may become part of modern evidence-based medicine.

Apart from medicinal concepts and a clear demand for evidence-based apitherapy, the wide use of bee products is limited by side effects (e.g. allergies) and patient willingness to accept bee products with respect to taste and quantity. As previously shown, the addition of pollen and propolis to a bee product increases the phenolic content and thus the medicinal value of a bee product on one hand but decreases the acceptability of the bee product on the other (Rios et al., 2018). Attributes like astringency, bitter flavor, pungency and intense yellow color are associated with poor acceptability (Rios et al., 2018). Sweetness and weak astringency were found to be related to the high acceptance of products (Rios et al., 2018); however, only to a certain extent, as trials have shown that there were drop-out rates of 33% in a trial because 30 g of honey was regarded as too sweet (Rajan et al., 2002). Two recent surveys assessed the average quantities at which patients were willing to accept bee products as a medical treatment (Münstedt et al., 2019a,b); Männle et al. (2020). As indicated, even honey does not seem to be very appealing. About 35% of people in a random sample said that is unlikely or very unlikely that they would consider taking honey as a medication (Münstedt et al., 2019a,b). The reasons for this have not been elucidated in the referred study. A subsequent analysis found that people who already consumed honey were willing to accept larger quantities of honey on a daily basis (~63 g versus ~37 g) (Münstedt et al. 2019a). So, it seems that there are some limitations regarding the consumption of honey as a medicinal product. In order to better understand the reluctance to accept honey as a potential treatment for various health problems, we undertook this survey.

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2. Patients and methods

We designed an assessment form, the purpose of which was to focus on:

- some statistics of honey consumption (frequency of intake, amount of intake)
- readiness to use honey in cases of disease (yes/no)
- preferred ways of intake (pure, diluted in liquids, as a bread spread) (yes/no)
- various aspects regarding the handling of honey, attitudes towards beekeeping, food preferences and perception of honey's health benefits

Aspects regarding the last bullet point (handling of honey, attitudes towards beekeeping, food preferences and perception of honey's health benefits) were rated on a 10-point scale from 1 (very unlikely) to 10 (very likely). The questionnaire may be obtained from the first author of this paper. The assessment form was pre-tested for intelligibility by 10 members of the obstetrics and gynecology department at the Ortenau Clinic Hospital in Offenburg, Germany.

Furthermore, we assessed patient personalities using the 10 Item Big Five Inventory (BFI-10) by Rammstedt et al. (2013).

Two-hundred-twenty consecutive patients in a private gynecological practice in Weilburg, Germany were asked to complete the assessment form. There were no criteria for inclusion and exclusion except for the ability to read and write in German. The questionnaire was distributed from December 2019 to February 2020 to all patients after informed consent was obtained. We restricted our analyses to females because they were more critical regarding apitherapy in comparison to men (Münstedt et al., 2019a,b).

Statistics: SPSS software was used for the data management and statistical analyses. Statistical analyses included descriptive statistics, Spearman's bivariate correlation (two-sided), cross-tabulation, principle component analyses and Pearson's χ^2 test. A probability of error less than 5% was regarded as significant.

Ethical approval: The ethics committee of the University of Gießen, Germany, approved our study on November 18, 2019 (Application number AZ 225/19).

3. Results and discussion

Of the 220 questionnaires, 201 were received back (response rate 91.4%). The main demographic factors are summarized in Table 1. Among the women in our collective, about three quarters consumed honey (74.4%; 148/199). The median frequency of honey consumption was twice a week (mean 2.03; range once a month to every day). Median daily consumption was reported to be 10 g (mean 13.5 g; range 1–50 g).

The readiness of the women to use honey as a remedy if the use was reasonably founded was 94.6% (188/199). In case of disease, 61.2% of the women would accept any reasonable dose; however, 38.8% of the women would be ready to consume a maximum of 42 g a day on average (median 30 g; range 1–200 g). The age and education of the women were not found to affect this decision (ANOVA; χ^2 test).

Figure 1 compares women's consumption preferences between regular consumption and consumption in case of disease. It shows that, in case of disease, women prefer to take the higher amounts of honey dissolved in foods or beverages or pure but not as a bread spread ($p < 0.001$; paired t-test). We found that the presence of diseases that could affect the consumption or use of honey as a medical treatment (allergy to pollen, food allergy, diabetes mellitus, fructose intolerance, sensitivity to caries) did not affect the women's decision regarding both aspects (χ^2 test).

Table 2 summarizes the mean values of the answers of honey consumers and non-consumers. It shows that there could be about four dimensions behind the answers of the women which is indicated by principle component analyses. "Women's health", "health qualities and taste of honey", "food preferences" and "beekeeping ecology" could be these dimensions, which must be confirmed in further analyses (data not shown).

Women's personality as assessed by the *Short Scale for Assessing the Big Five Dimensions of Personality* by Rammstedt et al. (2013) was not associated with the use of honey under normal conditions or regarding its use for diseases.

Table 1. Characteristics of 201 patients in this study.

Characteristic of participants	
Age [years]	
Mean (SD)	39.4 (13.9)
(Range)	(18–81)
Gender [N (%)]	
Female	201 (100.0)
Type of patient [N (%)]	
Patient with acute disease	13 (6.0)
Patient with chronic disease	17 (7.7)
Healthy person for routine checkup	150 (68.2)
Patient for follow-up visit	14 (6.4)
Cancer patient	3 (1.4)
Others	18 (8.2)
Missing	5 (2.3)
School leaving certificate [N (%)]	
None	3 (1.5)
Elementary school	1 (0.5)
Lower Secondary School (Hauptschule)	35 (17.4)
Intermediate Secondary School (Realschule)	85 (42.3)
Vocational diploma	26 (12.9)
Grammar school certificate/university entrance diploma	20 (10.0)
Tertiary education/university degree	23 (11.4)
Others	4 (20)
Missing	4 (2.0)
Diseases which might limit honey consumption [N (%)]	
None	130 (64.7)
Allergy to pollen	42 (20.9)
Allergy to honey	0 (0.0)
Food allergy	12 (6.0)
Diabetes mellitus	2 (2.0)
Fructose intolerance	7 (3.5)
Sensitivity to caries	17 (8.5)
Missing	2 (1.0)

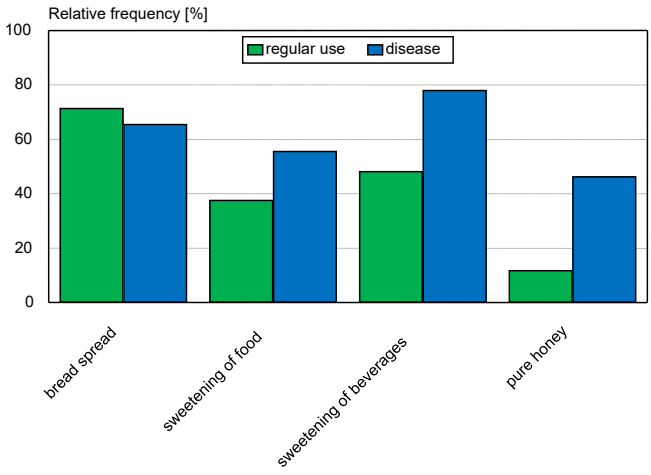

Figure 1. Women's consumption preferences between regular consumption and consumption in case of disease.

Table 2. Mean values and standard deviations of the answers of honey consumers and non-consumers to various statements on honey (mean values are based on a 10-point scale).

	Honey consumption	Mean	SD
Compared to sugar, I believe that honey is too expensive.	yes	2.22	2.54
	no	2.81	2.85
I don't believe that the health benefits of honey are sufficiently scientifically proven.	yes	3.47	2.59
	no	4.15	2.97
I refuse to eat honey because of my vegan/vegetarian lifestyle.**	yes	.17	.64
	no	.82	2.13
I don't like the taste of honey.**	yes	.88	1.87
	no	4.15	3.88
I don't like the consistency of honey.**	yes	.48	1.25
	no	3.10	3.71
I find the handling of honey more difficult than that of sugar (e. g. measuring and weighing).**	yes	2.55	2.50
	no	4.23	3.73
I have doubts regarding the quality of honey.**	yes	1.32	1.81
	no	2.72	2.70
Honey is too sweet for me.**	yes	1.38	1.86
	no	4.68	3.61
I don't eat honey because of my own illness.**	yes	.14	.83
	no	.67	1.90
I reject honey as a product of bees due to animal welfare aspects.**	yes	.30	.95
	no	1.49	2.70
I only buy honey that I believe has health benefits.	yes	2.83	3.61
	no	3.06	3.35
I only like certain types of honey.	yes	3.71	3.62
	no	3.72	3.68
I prefer varied food and don't want to eat honey every day.	yes	5.71	3.33
	no	6.55	3.50
Because of my own illnesses (e.g. allergy, diabetes) I don't eat honey.*	yes	.25	.945
	no	.93	2.17
For me, the "regional product" aspect also plays a role in honey.	yes	6.86	3.70
	no	5.53	3.83
I would only eat honey that comes from sustainable beekeeping.*	yes	6.60	3.57
	no	5.18	3.76
I think honey does not contain to enough vitamins, minerals and other vital substances.**	yes	1.31	1.76
	no	2.53	2.73
Honey is too high in calories for me.*	yes	2.00	2.42
	no	3.00	2.87
I consider beekeeping to be the exploitation of bees and therefore do not eat honey.**	yes	.31	.87
	no	1.15	2.06
When I eat honey, I have uncomfortable physical reactions, e.g. heartburn, nausea, diarrhea etc.*	yes	.36	1.34
	no	.92	2.19
I wouldn't eat honey even if I knew it would make medical sense.**	yes	.38	1.50
	no	1.42	2.47
I think honey damages my teeth.	yes	2.83	2.58
	no	3.43	2.97
With regard to honey, the "organically produced product" aspect plays an important role for me.	yes	6.08	3.72
	no	5.11	3.69
I eat honey to help the beekeepers who are responsible for keeping the bees.**	yes	4.84	3.55
	no	2.96	3.23
For me, the price is crucial when choosing honey.	yes	2.07	2.50
	no	2.09	2.65
I prefer to eat jam or nut nougat cream over honey.**	yes	3.30	3.01
	no	6.45	3.51
I prefer a hearty breakfast with sausage and cheese.**	yes	3.93	3.34
	no	6.38	3.57

* = $p < 0.05$ ** = $p < 0.01$.

In order to identify the underlying dimensions which might be responsible for the refusal of women to use honey as a remedy, all statements with a significant influence on this were put in a principal component analysis (PCA). This was done in order to extract the most

important independent factors. The Kaiser-Meyer-Olkin measure of sampling adequacy was .749. Bartlett's test of sphericity was significant ($p < .001$). Both results mean that we achieved a relatively good factor analysis and that correlations between items were sufficiently large for performing a PCA.

Examination of Kaiser's criteria and the scree-plot yielded empirical justification for retaining two factors with eigenvalues exceeding 1, which accounted for 57.59% of the total variance. The Varimax-rotated two-factor solution provided the most interpretable solution. Interestingly most items loaded highly only on one of the two factors (Table 3). One factor may be named "organic beekeeping" since health benefits are also expected from organic beekeeping. The other factor relates to the perception of honey regarding price, handling and health.

To the best of our knowledge, this is the first study to analyze the factors associated with honey consumption under normal conditions and in the perceived case of disease. Our study shows that 94% of the women in our study are willing to take honey as a medical treatment, if indicated, and that 61% of them are willing to take honey at higher doses than normal. Readiness to consume 42 g a day may seem to be a lot, but the patients who want to use honey for the prevention or treatment of radiotherapy-induced and radiochemotherapy-induced oral mucositis would have to consume 20 g three times a day (Münstedt et al., 2019a,b). So, readiness to consume 42 g a day may not be sufficient. Interestingly, the women chose that, in the case of disease, they would prefer different methods of administration, not as a bread spread but rather dissolved in food, beverages or especially pure. Among women who reported not to be willing to consume honey, the majority about 73% had no health-related reason (e.g. allergy).

We also found that patients with pollen allergy were able to consume honey without problems and that the assessed demographic factors as well as personality traits did not seem to influence honey consumption. In this respect, our study supports the findings of Kiistala et al. (1995).

The taste and sweetness of honey as well as food preferences seem to be interesting issues that may determine women's attitude towards honey. As mentioned, the dimensions "women's health", "health qualities and taste of honey", "food preferences" and "beekeeping ecology" can be derived from the degree of consent to the various statements on honey and its related fields. However, neither taste nor sweetness seems to be important regarding the decision on use in case of disease.

Regarding beekeeping ecology, our data support that the consumption and purchase behavior of honey is clearly influenced by a woman's attitude towards local and organic food. This has already been shown for apples, butter, flour and steak, but not for honey (Hempel and Hamm, 2016). In accordance with other work, our results also indicate that credence attributes have a prominent role in consumer organic food purchases, as non-consumers agreed more with the statement "I have doubts regarding the quality of honey" (Massey et al., 2018). As shown before, consumers have repeatedly been confronted with scandals on honey and other bee products being polluted by pesticides, heavy metals, bacteria and radioactive materials or being adulterated (Al-Waili et al., 2012; Everstine et al., 2013). As described by Leng et al. (2017) who suggested that personality characteristics could play some role in honey consumption, we did not find such correlations.

We believe that, on the basis of the data now known, we must assume that women unwilling to use honey in cases of disease may be convinced to do it, if they could be assured that honey was produced considering the most stringent ethics in animal husbandry. According to a recent survey by the Bundesministerium für Ernährung und Landwirtschaft (German Federal Ministry of Food and Agriculture), the vast majority of the people in Germany consider animal welfare to be an important issue. It reports that the vast majority of Germans are willing to pay more for food if the animals are kept better than the law dictates, and four out of five consumers want a state animal welfare label (https://www.bmel.de/SharedDocs/Downloads/Broschueren/Ernaehrungsreport2018.pdf?_blob=publicationFile; accessed March 24th, 2020). However, it also is unclear what is considered animal welfare in case of the management of bee hives. Future analyses will have to find out whether consumers mean good beekeeping practices which have been established or Darwinian beekeeping which aims to improve honey bee health by applying some principles of their biology to management techniques (Rivera-Gomis et al., 2020; Seeley, 2019). Acknowledging the other dimension relating to price, handling and health, it could be reasonable to discuss these aspects with patients in order to convince them to use honey when reasonable.

There are some limitations to our study. We did not assess cultural influences on the perception of honey. For example, honey has been described as a source of healing in the Quran, and since the Quran is considered to be governed by logic, the perception of honey can differ between members of different religions (Purbafrani et al., 2014; Salarvand and Pournia, 2014). We also did not assess the potential influence of the parents of women in our collective. Parental influences (parental modeling, food exposure, forcing consumption, restricting food access) have been shown to influence children's food preferences (Russell et al., 2015; Yee et al., 2017). However, the impact of these influences may persist into adolescence and adulthood. It may be considered as a limitation of this study that we did not address these aspects, but this would have required some stratification. Another limitation is that we used a selected convenience sample of women in a gynecologic private practice. We chose to do that because this study must be interpreted as a continuation of our earlier studies which focused on the topic on the readiness of patients to accept bee products in cases of disease (Münstedt et al., 2019a,b); Männle et al. (2020). In this way, we are able to make direct comparisons between the collectives across multiple studies. Also, the focus on women for a study like this seems to be reasonable as it has been

Table 3. Results of the principle component analysis regarding unwillingness to use honey for medical reasons (Kaiser-Meyer-Olkin measure of sampling adequacy = .749); Bartlett's test of sphericity ($p < .001$). Two components were identified.

Component matrix

	Component	
	1	2
Compared to sugar, I believe that honey is too expensive.	-.154	**.698**
I don't believe that the health benefits of honey are sufficiently scientifically proven.	.086	**.694**
I find the handling of honey more difficult than that of sugar (e. g. measuring and weighing).	.098	**.792**
I only buy honey that I believe has health benefits.	**.536**	.188
For me, the "regional product" aspect also plays a role in honey.	**.787**	-.049
I would only eat honey that comes from sustainable beekeeping.	**.883**	-.039
With regard to honey, the "organically produced product" aspect plays an important role for me.	**.860**	.157
I eat honey to help the beekeepers who are responsible for keeping the bees.	**.666**	-.193

Extraction method: Principle component analysis.
Rotation method: Varimax with Kaiser normalization.

shown that women are a relevant group with respect to food selection and dietary diversity (Amugsi et al., 2016). Also, in Germany, about two thirds of the food buying is done by women (http://ernaehrungsdenkwerkstatt.de/ernaehrungsverhalten/kaufverhalten-pos.html; accessed March 24th, 2020). Furthermore, women are more sensitive regarding health issues related to food (https://www.bmel.de/SharedDocs/Downloads/Broschueren/Ernaehrungsreport2018.pdf?_blob=publicationFile; accessed March 24th, 2020).

4. Conclusion

This study has identified relevant aspects that may hinder women from using honey in cases of disease. Especially aspects related to ethical and organic beekeeping seem to matter, so these aspects must be considered, especially when honey is produced for medical purposes. We believe that our results in this respect can be transferred to other bee products as well. These effects could be even more pronounced regarding other bee products like royal jelly or apilarnil (juiced drones) as reluctance towards these products could be even greater because the production of both leads to the death of male and female bee larvae.

Declarations

Author contribution statement

Karsten Münstedt: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Heidrun Männle: Conceived and designed the experiments; Analyzed and interpreted the data; Wrote the paper.

Thomas Riepen: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Competing interest statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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