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Knowledge and practices of the use of honey for acute respiratory infections

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ABSTRACT

BACKGROUND & OBJECTIVE: Honey has been used for centuries as both a food and a traditional remedy. Known for its antimicrobial, anti-inflammatory, and antioxidant properties, honey is frequently used to treat various ailments, including respiratory infections. In Morocco, particularly in regions such as Guelmim, the use of honey is deeply ingrained in cultural practices. Despite this, there remains a limited amount of scientific data on public knowledge and practices regarding honey as a treatment for acute respiratory infections (ARIs). Understanding these aspects can help bridge the gap between traditional medicine and evidence-based healthcare strategies. This study aimed to clearly assess the population's level of knowledge and practices related to the use of honey as a treatment for ARIs in the Guelmim region of southern Morocco.
METHODOLOGY: A cross-sectional survey was conducted from September 2022 to July 2024 among 834 participants from Guelmim. The questionnaire, available in French and Arabic, was administered online and in person. Data were analyzed using the chi-square test and logistic regression.
RESULTS: The study found that 82% of respondents use honey for respiratory issues, with 46.2% consuming it occasionally. A preference for Saharan plant honey was noted in 38% of respondents. Honey was commonly used for sore throat (57.7%) and cough (32.7%). A significant association was found between honey use and knowledge level ($\beta = 2.96$; ORa = 37.28; $p < 0.05$), although only 34.2% of participants had high knowledge of its benefits.
CONCLUSION: Age, education, and chronic disease significantly influenced knowledge levels. Most respondents (67.3%) used honey as a complementary treatment for ARIs.
KEYWORDS: Respiratory Infections, Knowledge, Traditional Medicine.

INTRODUCTION

Honey is a natural product of bees (Apis mellifera, Family: Apidae) [1], Beyond its traditional role as a source of energy and nourishment, honey has been studied for its therapeutic potential, particularly in the management of respiratory symptoms such as acute cough in children. Its complex composition rich in sugars, amino acids, vitamins, minerals, and bioactive compounds like polyphenols contributes to its antimicrobial, antioxidant, and soothing effects, which can provide symptomatic relief and support overall health [1].

Acute Respiratory Infections (ARIs) continue to pose a major global public health challenge, leading to millions of medical consultations annually. Evidence suggests that honey is an effective complementary treatment, particularly for acute cough in upper respiratory tract infections. A systematic review and meta-analysis by Abuelgasim et al. (2021) demonstrated that honey was associated with significant improvements in cough frequency and severity compared with usual care. In Morocco, ARIs account for 30–50% of primary health care visits, and they remain a priority for national health programs aimed at reducing morbidity [2].

People consume honey primarily for its recognized health, nutritional, and medicinal properties, with consumption influenced by factors such as quality, origin, labeling, brand reputation, variety, taste, texture, and price. Knowledge, Attitudes, and Practices (KAP) surveys are important strategic tools to identify the educational needs of populations in relation to health behaviors. According to the World Health Organization, health promotion is defined as enabling individuals and communities to improve and manage their health effectively [3].

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There is limited research on KAP related to the use of honey. In Romania, education, occupation and age were found to influence honey consumption, with a preference for local honey. Similarly, in Morocco, honey is highly valued, and consumers often purchase it from reputable beekeepers due to its medicinal and nutritional benefits [4].

Honey consumption is closely linked not only to its nutritional and therapeutic value but also to the ecological role of Apis mellifera. This species plays a vital role in the structure, composition, and functioning of natural and agricultural habitats, particularly in fruit trees, generating important positive externalities for the environment. In Sicily, a consumer study revealed that a majority of participants (327 out of 527) reported consuming honey mainly because of its health and therapeutic properties (Sgroi & Modica, 2023). These findings highlight that honey purchasing behavior is strongly influenced by both its recognized health benefits and the multifunctional value of beekeeping, which combines food production with environmental sustainability [5].

A survey of acute respiratory infections (ARIs) in Guelmim, southern Morocco, found that 60% of families use honey alongside antibiotics to treat ARIs. Guelmim is also known for its "yellow bee", which is well adapted to the Saharan climate, with 30,650 hives producing 472 tones' of honey annually.

However, little is known about the population's knowledge and practices regarding the use of honey for ARI. This study aims to fill this gap by using a KAP (Knowledge, Attitudes, and Practices) survey to assess the population's level of knowledge, attitudes that drive their behaviour, and their preventive and management practices related to honey use for ARI in the Guelmim region.

The Guelmim region, located in southern Morocco on the edge of the Sahara Desert, has a semi-arid to arid climate. This influences the health of the population and local agricultural practices. Respiratory illnesses are common, particularly during seasonal changes when dust, wind and temperature fluctuations are frequent. Guelmim is also a major centre for beekeeping, with a long-standing tradition of apiculture supported by the presence of the 'yellow bee' (Apis mellifera sahariensis), which is renowned for its ability to thrive in challenging conditions. Despite honey's cultural importance in local healing practices, there has been little scientific research examining how people in the region understand and use honey for health purposes. To our knowledge, no previous studies have specifically assessed the knowledge, attitudes and practices relating to the use of honey for ARIs in this population.

METHODOLOGY

This study was approved by the Ethics Committee for Biomedical Research on 26/09/2022 under protocol number 57/22. All participants provided informed written consent prior to inclusion, after receiving a clear explanation of the study's objectives and nature. Participation was voluntary, anonymous, and confidential. Data collection adhered strictly to the principles outlined in the Declaration of Helsinki and the Good Clinical Practice guidelines.

A cross-sectional survey was conducted between September 2022 and July 2024 among residents of the Guelmim region in southern Morocco. The objective was to evaluate the population's knowledge and practices regarding the use of honey as an adjuvant treatment for acute respiratory infections (ARIs). Participants were recruited through a combination of in-person outreach in health centres and online dissemination via social media platforms targeting residents of Guelmim. After data collection, participants were classified into two groups based on their responses regarding honey use for ARIs: the honey group (n = 417), including those who reported using honey to treat respiratory infections, and the reference group (n = 417), comprising participants who did not use honey for this purpose.

The survey was conducted among the population residing in the Guelmim region. The required sample size was calculated using the standard formula for cross-sectional studies:

$$N=d2Z2.p(1-p)/d^2$$

Where Z = 1.96 for a 95% confidence level, p = 0.5 (assumed prevalence due to lack of prior data), and d = 0.05 (margin of error). This yielded a minimum sample size of 384 participants. To improve precision and account for potential non-responses, the final sample comprised 834 participants.

The survey was administered both online and in person. The questionnaire was available in Arabic and French, and distributed with an accompanying consent form. Participation implied acceptance and took approximately 15–20 minutes to complete. The overall response rate exceeded 85%.

Instrument Development and Pretesting:

The questionnaire was developed based on prior validated instruments used in similar studies (Ribeiro et al. [6]).

To ensure content and face validity, the questionnaire was pretested with a pilot group of 10 individuals from the target population selected through convenience sampling. The pretest aimed to assess the clarity, comprehensibility, and cultural appropriateness of the items. Feedback was used to revise ambiguous wording and optimize the layout and format of response options. The revised version was then finalized for deployment.

Questionnaire Structure

The final questionnaire was divided into three main sections:

1.Sociodemographic data: gender, age, residence, income, education level.

2.Honey usage patterns: frequency of use, therapeutic indications, reasons for use/non-use. Most questions were closed-ended, with some open-ended items supported by multiple-choice options.

3.Knowledge and practices regarding honey: 32 close-ended items (yes/no) designed to assess knowledge levels and consumption behaviors.

A KAP (Knowledge, Attitudes, and Practices) scoring scale was applied. Knowledge levels were categorized as follows:

Poor: ≤ 25% correct answers (≤ 8 correct),

Inadequate: 26–50% (9–16 correct),

Average: 51–75% (17–24 correct),

Good: > 75% (> 24 correct).

Data were entered into Microsoft Excel and analyzed using SPSS software (version X). Descriptive statistics (frequencies, percentages, means) were used to summarize the sample characteristics. Inferential analysis involved chi-square tests for bivariate associations and logistic regression to explore the relationship between sociodemographic variables and honey knowledge/practice. A p-value < 0.05 was considered statistically significant.

RESULTS

Practices

The survey was carried out with the inhabitant population of Guelmim region in southern Morocco. Thus, the global number of the interviewed people is equal to 834 persons, divided into two groups: the honey group (417) of the persons who use honey, and the reference group (417) of the persons who do not use honey. The socio-demographic data concern age, gender, origin, family status, educational level, and professional status are shown in Table- I.

Regarding the age, we notice a predominance of two age groups: 38 - 48 with a percentage of 36.2%, and 48 - 58 with a percentage of 33.3%. As for gender, there is a slight predominance of men (57.8%), and the same goes on for the origin of the population, with a percentage of 54.4% for the urban environment. Regarding family status, 80% of the respondents are married. The level of education came as follow: a) Illiterate (34.7%), primary (20.5%), secondary (26.0%), and university (18.1%). Finally, in terms of professional status, one-third of the population is active (34.1%).

Table-II: Areas of therapeutic use.

Diseases	Workforce/consumers (417) n(%)
Respiratory diseases	342(82)
Skin conditions	21 (5)
Gastrointestinal diseases	17 (4)
Urogenital diseases	12 (3)
Other	25 (6)

Table- I: Sociodemographic data of the population.

Characteristics		Modalities, Frequencies and Percentages				
Age	Categories	18 - 28	28 - 38	38 - 48	48 - 58	58 +
	n(%)	56(6.7)	56(6.7)	302(36.2)	278(33.3)	142(17.0)
Type	Categories	**Female**		**Male**		
	n(%)	352(42.2)		482(57.8)		
Provenance	Categories	**Rural**		**Urban**		
	n(%)	380(45.6)		454(54.4)		
Family status	Categories	**Single**	**Married**	**Divorced**	**Widowed**	
	n(%)	125(15)	664(80)	31(4)	14(1)	
Level of education	Categories	**Illiterate**	**Primary**	**Secondary**	**University**	
	n(%)	289 (34.7)	171(20.5)	217(26.0)	151(18.1)	
Professional status	Categories	**Working**	**Retired**	**Not working**	**Casual work**	
	n(%)	284(34.1)	176(21.1)	203(24.3)	171(20.5)	

Table- III:The modalities of use of the honey.

Type of honey use							
Type	**Euphorbia**	**Thistle**	**Thyme**	**Orange**	**Flowers**	**Saharan plants**	**Eucalyptus**
n(%)	50(12)	7(2)	34(8)	67(16)	9(2)	160(38)	90(22)
Method of preparation							
Type	**Aloe**	**With coffee**	**With tea**	**With water**	**With lemon**	**With vegetable oil**	**With plants**
n(%)	104(25)	33(08)	21(05)	108(26)	67(16)	38(9)	46(11)
Mode of use with plants (11%)							
Type	**Absinthe**	**Garlic**	**Aloe**	**Ginger**	**Mint**	**Thyme**	**Thyme/ginger**
n(%)	7(15.6)	6(13.0)	2(4.0)	19(41.30)	3(6.5)	8(17.4)	1(2.2)
Use with vegetable oils (9%)							
Type	**Olive**		**Argan**			**Soy**	
n(%)	27(70.6)		10(26.60)			1(2.9)	
Preferred honey consistency							
Type	**Liquid and translucent honey**		**Creamy honey**			**Hard honey**	**I don't know**
n(%)	193(46.2)		127(30.6)			48(11.5)	49(11.7)
Temperature (with drink)							
Type	**Hot**		**Warm**			**Cold**	
n(%)	171(41)		92(22)			154(37)	

From the questionnaire we can see that 35.8% of the consumers buy their honey directly from the beekeeper and the cooperatives (29.4%), the other destinations as the specialized stores (19.6), the markets (7.8%), the grocers (3.9%), the private individuals (2%) and the big surfaces (2%) are less intended by the consumers with a very weak rate. The survey also showed several reasons for the non-consumption of honey, among others: a) the high prices (25%), b) the non-availability of good honey (62.5%), c) diabetes (12.5%), and d) allergy (01%).
In Table-II, the types of diseases treated with honey are listed.

We find respiratory affections with a rate of 82% that is to say, 342 people surveyed, and cutaneous affections with a percentage of 5% that is to say, 21, and other diseases, such as the gastro-intestinal affections 4% with a number of 17, and the urogenital affections are treated by several 12 consumers with a total percentage of 3%.

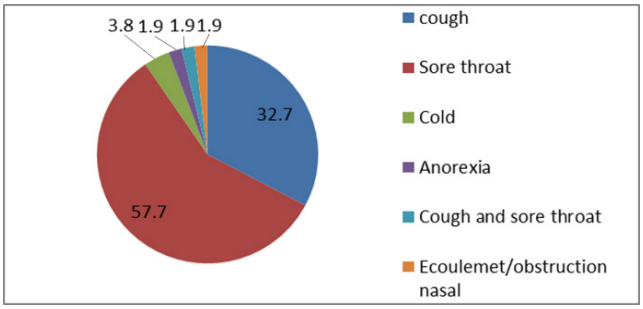
Concerning the frequency of honey consumption, the study gave the following results: A) the annual consumption (per year/per person), 50% of the respondents declared that they consume a quantity of 1.5 kg to 2.5 kg, while 25% affirmed the consumption of 500 g to 1 kg per year, 15.4% consume 2.5 kg to 4 kg per year, and finally, 9.6% said to have consumed more than 4 kg per year.

Frequency of consumption highlights that 46.2% consume honey occasionally, 38.5% use it a few times a week, 9.6% consume it once a month/week, and finally 5.8% use it every day. When the time of consumption during the day is in question, 59.6% of respondents take honey at breakfast, 28.8% at bedtime, 7.7% at dinner, and 3.8% prefer it at lunch and snack time. Satisfaction with the offer (varied honey, good products) indicates that 69.2% of the population is satisfied. When the use of honey during illness is in question, 71.7% declare that they increase their consumption of honey during the illness. For the modalities of honey use, several variables are considered (Table-III).

Firstly, the type of honey used, according to the results obtained, 160(38%) of the population prefer honey based on saharan plants, 90(22%) of the respondents use honey from the eucalyptus, 67(16%) consume orange honey, 50(12)% use that of the euphorbia, the thistle, the thyme, and the flowers. As for the mode of preparation, the results show that 108(26%) use honey with water, 104(25%) of the respondents use it only as honey, 67(16%) with lemon, 46(11%) with plants, 33(8%) with coffee, 38(9%) with vegetable oils, and 21(5%) with tea. Regarding the mode of use with plants, 19(41.3%) of the participants in the study took ginger, 8(17.4%)% chose thyme, 15.6% wormwood, and consumed honey with 6(13.0%)garlic,2(4.0%) aloe, and 3(6.5%) mint. Moreover, this study also identifies the mode of use of honey with vegetable oils, with 27 (70.6%) using olive oil, 10 (26.6%) consuming argan oil, and 1 (2.9%) preferring soy. As for the consistency of the honey preferred, indeed, a rate of 193(46.2%) of the consumers use liquid and translucent honey, a rate of 127(30.6%) take creamy honey (but spreadable), and a rate of 48(11.5%) choose hard honey (not spreadable). The last modality of honey use is temperature. Most people surveyed prefer honey with a hot drink (171, 41%), while 37% of the population prefer it cold, and 92% (22%) of the respondents consume it with a warm drink.

Regarding the reasons for the use of honey for acute respiratory infections, most of the people questioned (67.3%) consider honey as a complementary treatment, while 21.2% use it as the main treatment, and finally, a rate of 5.8% have no knowledge or do not use it for acute respiratory infections. The survey also showed that the population uses honey to treat several symptoms, to relieve acute respiratory infections, so 57.7% of the population consumes it for sore throat, followed by cough with a percentage of 32.7%, cold with a rate of 3.8%, and finally anorexia, runny nose, and obstruction with a percentage of 3.8% (Figure-I).

Figure-I: Symptoms treated by honey.



Knowledge

In general, for the level of knowledge (LK) about the use of honey for acute respiratory infections, the survey highlighted a "bad" level within the population (34.2%), followed by the average level, which represents 24.9%, while the rest have an insufficient level 20.9% and a good level 20.0%. It is noteworthy that 43.5% of the population suffers from a chronic disease.

The comparison between the two groups reveals that the honey group possesses a high level of knowledge, with a percentage of 19% and an average of 20%. The reference group has a poor level of 28% and an insufficient level of 16%. Concerning the variable of age and its relationship with the level of knowledge, we notice that the two age groups between 38 - 48 years and 48 - 58 years have, respectively, an average level (27% and 25%, respectively), and a good level (13% and 20%, respectively). On the other hand, a good level of knowledge (30%) is observed among people aged 58 years and above. The LK is less important among people under the age of 38, with a low level (32% and 25%, respectively).

It can be observed that there is no difference in the level of knowledge based on gender. Table-IV also shows that the level of knowledge is higher among the rural population (average and good - 33%, and 26%) than among the urban population (poor and insufficient - 41%, 26%).

Table-IV: Level of knowledge of the use of honey .

Variables	Categories	Level of Knowledge			
		Poor n(%)	Insufficient n(%)	Average n(%)	Good n(%)
Age	18-28	18 (2.15)	18(2.15)	12(1.4)	12(1.4)
	28-38	16(1.9)	16(1.9)	14(1.7)	16(1.9)
	38-48	111(13.9)	61(7.31)	84(10.1)	41(4.91)
	48-58	108(12.9)	42(5.0)	65(7.8)	58(7.0)
	≤ 58	29(3.5)	36(4.3)	37(4.4)	40(4.8)
Gender	Female	123 (14.7)	74 (8.9)	83(9.9)	72 (8,6)
	Male	162 (19.4)	100 (12)	125(14,9)	95 (11.4)
Origin	Rural	95 (11.4)	55 (6.6)	129(15.5)	101 (12.1)
	Urban	190 (22.8)	119 (14.3)	79(9.5)	66 (7.9)
Level of education	Illiterate	133(15.9)	91(10.9)	56(6.7)	10(l.1)
	Primary	86(10.3)	43(5.1)	23(2.7)	22(2.6)
	Secondary	50(6.0)	25(3.0)	77(9.23)	67(8.0)
	University	5(0.5)	25(2.9)	51(6.1)	70(8.4)
Chronic illnesses	No	12(1.4)	18(2.1)	51(6.1)	70(8.4)
	Yes	29(3.4)	55(6.6)	321(83)	278(33)
Use of honey	Honey group	41(4.9)	33(3.9)	181(21.7)	162(19.4)
	Reference group	49(5.8)	42(5.03)	166(19.9)	160(19.1)

Regarding the level of knowledge in relation to the level of education, we observe average and good levels (34%, 46%) among the university population, as well as average and good levels for the secondary level (35%, 30%). Finally, the level of knowledge is more important for people with a chronic disease; people with a chronic disease have an average and good level (47%, 41%).

The study examined the relationship between knowledge level and associated factors using logistic regression (Table-V). The parameters used in this method to assess the effect of the explanatory variables on the dependent variable are:
- β: regression coefficient: a value greater than zero indicates a positive influence of the independent variable on the dependent variable.- p: significance level of the model with the independent variable included compared to the reference model (absence of the independent variable), the coefficient is significant if $p < 0.05$.- ORa: Odds-Ratio adjusted for the level of knowledge in relation to the interest in honey. The value of this parameter is greater than 0. When the OR is different from 1, it means that the dependent variable is associated with the explanatory variable in question, all other things being equal.

From this table, it is evident that a significant relationship exists between the use of honey and the level of knowledge. (β = 2.96; ORa = 37.28; p = ≤0.001), For the factor of age, it can be concluded that there is a significant relationship between this variable and the level of knowledge. (β = 2.17; ORa = 13.14; p = ≤0.001). Regarding the level of education, the results indicate a significant correlation between education and the level of knowledge. (β = 16.42; ORa = 9.97; p = ≤0.001).

The results presented in the previous two tables enable us to infer that there is a significant relationship between the presence of chronic disease and the level of knowledge. (β = 3.56; ORa = 35.51; p = ≤0.001). Ultimately, the level of knowledge about honey use is significantly influenced by the aforementioned factors. The table below (Table-VI) presents the detailed results of the inferential analysis underpinning the univariate and multivariate logistic regression models of use, illustrating the relationship between the study's variables.

Table-V:The relation between the level of knowledge and the associated factors.

Factors associated	β	ORa	P
Use of honey	2.96	37.28	≤0.001
Age	2.17	13.14	≤0.001
Education	16.42	9.97	≤0.001
Presence of a chronic disease	3.56	35.51	≤0.001

Table-VI: Logistic analysis of knowledge level (n = 834) .

Variables (Categories)		Univariate analysis		Multivariate analysis	
		OR_b (IC 95%)	P-value	OR_a (IC95%)	P-value
Use of honey	Yes (R)	1*		1	
	No	5.78 (2.52 - 13.25)	0.00	37.28 (11.29 - 123)	0.00
Age	58+ (R)	1		1	
	48 - 58	3.04 (1.71 - 5.40)	0.00	7.24 (2.86 - 18.34)	0.00
	38 - 48	4.16 (2.30 - 7.54)	0.00	11.02 (4.32 - 28.11)	0.00
	28 - 38	1.53 (0.63 - 3.70)	0.34	3.05 (0.78 - 11.94)	0.10
	18 - 28	2.30 (0.96 - 5.50)	0.06	13.14 (3.12 - 55.29)	0.00
Gender	Male (R)	1			
	Female	0.87 (0.58 - 1.32)	0.53		
Origin	Urban (R)	1			
	Rural	1.06 (0.70 - 1.62)	0.76		
Familiy status	Widower (R)	1			
	Divorced	0.72 (0.33 - 1.57)	0.41		
	Maried	0.85 (0.37 - 1.95)	0.71		
	Bachelor	0.76 (0.36 - 1.60)	0.48		
Educational level	University (R)	1		1	
	Secondary school	4.35 (2.13 - 8.88)	0.00	2.63 (1.05 - 6.57)	0.03
	Primary school	23.88 (10.9 - 51.9)	0.00	4.33 (1.42 - 13.20)	0.00
	Analphaet	86.2 (34.6 - 214.4)	0.00	9.97 (3.06 - 32.45)	0.00
Professionnal status	Active (R)	1		1	
	Retired	1.07 (0.59 - 1.95)	0.80	0.49 (0.21 - 1.13)	0.09
	Unemployed	9.73 (4.86 - 19.50)	0.00	0.73 (0.24 - 2.15)	0.57
	Occasional work	9.50 (5.18 - 17.39)	0.00	0.54 (0.19 - 1.55)	0.25
Presence of a chronic desease	Yes (R)	1		1	
	No	71.9 (36 - 143.6)	0.00	35.51 (17.06 - 73.92)	0.00

***: 1 is a reference value.**

DISCUSSION

In the present study, it can be seen that there is a statistically significant relationship between honey use and knowledge level ($\beta = 2.96$; ORa = 37.28; $p = 0.00 < 0.05$). Findings from Italy further emphasize that purchasing behavior is strongly associated with expectations related to traceability and sustainability (Mascarello et al., 2024). In particular, Italian consumers demonstrated a preference for honey of certified origin and were highly attentive to information ensuring product authenticity and environmental responsibility. These results underline that beyond sociodemographic factors, consumer trust and awareness play a decisive role in shaping honey consumption patterns [7].

Similar results were obtained in a study conducted in China, which found that organic consumers are likely to have a higher income level [8], the result of the age attribute showed that the median age of honey consumers (31 years) is higher than that of organic consumers.

By treating the variable "age", it can be concluded that there is a significant relationship between this variable and the level of knowledge. ($\beta = 2.17$; ORa = 13.14; $p = 0.00 < 0.05$). The data of the present study unveil, that the age group of more than 38 years, has a "good" and "average" level, in contrast to the younger age group, less than 38 years, which has a "bad" level, in this sense, a Lithuanian study has shown that the most confident in their knowledge of apitherapy are those who are older than 26 years. Another study states that the vast majority of young people (85%) consume a very small amount of honey per month [9].

The annual consumption of the younger generation is lower compared to older generations, this is confirmed in a study by several researchers; Issanchou and Nicklaus, assures that: "some preferences change with age, positively or negatively" However, university students majoring in human nutritional sciences have demonstrated higher levels of knowledge and awareness of honey. Presumably, they will make more informed purchasing decisions regarding honey [10].

The results also prove that there is a significant relationship between education and knowledge level, ($\beta = 16.42$; ORa = 9.97; $p = 0.00 < 0.05$). The study shows that the level of knowledge increases, with the level of education; the results indicate a "good" level among academics (46%). Finally, the mentioned results, allow us to deduce that there is a significant relationship between the presence of chronic disease and the level of knowledge, ($\beta = 3.56$; ORa = 35.51; $p = 0.00 < 0.05$). On the other hand, the NC of patients with chronic diseases is "good" (41%). In his survey, Żak [11], explains that there will be a possibility that we will change our dietary and therapeutic behavior, either due to newly acquired knowledge or because of the diseases that force us to enter rigorous diets.

Gender differences also play a role in honey consumption. According to Šedík et al. (2023), women tend to consume honey more frequently than men, a finding that has been associated with greater awareness of nutrition and health benefits among female consumers. The study further highlights that women show higher preferences for natural and traditional honey, while men demonstrate a greater focus

on price and availability. These results confirm that honey consumption patterns are not only influenced by cultural and dietary habits but also by gender-related perceptions and expectations [12].

In addition, the higher level of knowledge observed among the rural population (average: 33%, good: 26%) may be explained by their closer relationship with traditional practices and natural resources. As highlighted by Ahmad et al. (2021) [10], rural communities often preserve ethnobotanical knowledge, particularly regarding the medicinal use of honey and its associated bee flora. This cultural heritage promotes a deeper awareness of honey's therapeutic properties, as local populations rely not only on modern medicine but also on longstanding practices involving honey and medicinal plants for treating common ailments [13].

The comparison between the two groups shows that the honey group had a higher proportion of participants with "good" (20%) and "average" (19%) levels of knowledge, while the reference group was more represented in the "bad" (16%) and "insufficient" (28%) categories. Similar results were reported by Kowalczuk et al. (2023) in Poland, where nutritional knowledge was found to be a significant determinant of honey consumption. Their study highlighted that individuals with higher awareness of honey's nutritional and health-related benefits were more likely to consume it regularly, whereas lower levels of knowledge were associated with reduced consumption and weaker perceptions of honey's role in a healthy diet [14].

The results of our study revealed that honey users demonstrated more favorable perceptions of honey as a complementary medicine, particularly in relation to its traditional use for respiratory ailments. These findings are in line with the work of Massous et al. (2023), who showed that Moroccan honeys, while valued for their nutritional and organoleptic qualities, also possess physicochemical properties that contribute to their therapeutic reputation. Nevertheless, the study highlighted the presence of certain contaminants, such as pesticide residues, which raises concerns regarding consumer safety and calls for stricter quality monitoring [15].

In terms of purchasing practices, the preference for direct acquisition from beekeepers and cooperatives reflects the importance of trust and authenticity in the Moroccan honey market. Massous et al. (2023) further emphasized that consumer confidence is strongly influenced by the quality control of honey and its botanical origin, with local producers playing a crucial role in maintaining authenticity while ensuring compliance with food safety standards [15].

In Morocco, our findings indicate that most people purchase honey directly from beekeepers (45%), followed by special markets (22%) and general markets (11%). A key barrier to consumption, reported by 62.5% of non-consumers, was the lack of access to good-quality honey, while only 1% cited allergies as a reason for avoidance [16]. These results align with the broader European context described by Kleisiari et al. (2022), who demonstrated that consumer behavior is strongly influenced by perceived authenticity and quality rather than by demographic factors or health concerns. Their multi-country survey confirmed that doubts regarding the reliability of product origin and quality [17].

Regarding therapeutic use, our study shows that respiratory diseases are the primary health conditions treated with honey (82% of cases). This is consistent with recent evidence reported by Ahmed et al. (2021), who highlighted honey's significant potential in the treatment of respiratory tract infections, noting its anti-inflammatory, antimicrobial, and soothing properties. Their updated review confirms that honey is widely recognized as a safe and effective complementary therapy for respiratory symptoms, such as cough and sore throat, supporting its role as more than just a food but also as a natural therapeutic agent [10].

Regarding the consumption of honey, the study showed that the average is 0.697 kg/person/year; this figure corresponds to the national average. Indeed, in Morocco, the consumption of honey is (0.520 to 0.750) kg/person/year according to the High Commission for Planning [18]. This level of consumption is close to the consumption of honey in the neighboring countries, notably Algeria with an average of 0,200 kg/person/year, and Tunisia, which varies from (0.170 to 0.200) kg/person/year.

However, this level of consumption is well below the European average of 610 g/person/year and the Canadian average of 1.05 kg/person/year. It should be noted that during Ramadan, honey consumption in households increases considerably.

It emerges from the data that the majority of the respondents (46.2%) consume honey occasionally, and a percentage of 38.5% use it a few times a week, in a Moroccan study, the researchers found the same results, so we can see that most of the consumers 34% (n = 69) consume honey occasionally: 1.5 kg to 2.5 kg, while those who consume more than 4 kg are less represented 18% (n = 35).

An Italian study shows that the majority of consumers prefers to consume honey, once a week or month, usually in autumn and winter, mixed with other foods or used as medicine. The preference for national honey is based on factors such as quality, and contribution to the development of the region [19].

For the time of consumption during the day, it was possible to verify that a rate of 59.6% takes honey at breakfast, and 28.8% at bedtime, According to the results of a survey of honey consumption in France, a rate of 35% of the respondents consume honey at breakfast, while 20% consume it at night, on the other hand, 69. 2% of the population is satisfied with the offer (varied kinds of honey, good products) which is proved by the Apinov survey which shows that 92% of the respondents declared to be satisfied with the offer on the places of purchase [20].

Regarding the use of honey during the illness, 71.7% declare that they increase the consumption of honey during the illness. According to a Brazilian study, in general, the

indication of the true meaning of honey for most individuals is closer to a medicine than to a food, besides a comparative study between Romania and Slovenia, showed that in both countries, majority of the consumers think that honey has certain curative properties, and increase the consumption of honey during a period of illness as well as use honey in the processes of healing of the diseases [21].

For the modalities of the use of honey, several variables are addressed. First, regarding the type of honey used, according to the results obtained, 38% of the population prefers honey made from Saharan plants. Indeed, several authors have reported that the populations tend to take the local honey [22]. In addition, a recent study shows that the majority of consumers prefer to consume local honey, the preference for national honey is based on factors such as quality (85.4%) in autumn, (85.4%) in autumn and winter (57.4%), and once a week (29.3%) or once a month (25.8%) in combination with other foods (37.8%), or use as medicine in case of illness [6].

In Morocco, honey is not only a widely consumed natural product but also recognized for its significant biological activities. A recent study demonstrated that Moroccan honeys from different botanical origins exhibit strong antioxidant and anti-glycation properties, confirming their important role in the prevention of oxidative stress and metabolic disorders (Lakhmili et al., 2024). These findings highlight that beyond its nutritional and traditional medicinal uses, honey contributes to health promotion through bioactive compounds that reinforce its therapeutic value [23].

Regarding the modes of consumption, the study community reported diverse practices in combining honey with other products. In Portugal, consumer trends similarly highlight honey's frequent use not only as a sweetener but also in combination with natural ingredients, reflecting its perceived nutritional and therapeutic value (Mata et al., 2023). These findings confirm that honey consumption habits often extend beyond direct intake, being incorporated into traditional remedies and dietary practices that reinforce its role as both a food and a health-promoting product [24].

Moreover, in the present study, it is identified: the mode of use of honey with 3 vegetable oils (olive oil, argan oil, and soybean), a Polish study confirms this finding, the inhabitants use much more remedies based on vegetable oil and honey, with differences within each group [21].

In Morocco, honey is characterized by remarkable variability in its physicochemical properties, which reflect the botanical and geographical origins of production. According to Massous et al. (2023), Moroccan honeys generally meet international quality standards in terms of parameters such as pH, moisture content, electrical conductivity, and sugar profile. However, the study also revealed the presence of contaminants, including pesticide residues and trace elements, underlining the importance of continuous monitoring to ensure consumer safety. These findings suggest that Moroccan honey not only retains its nutritional and organoleptic value but also requires stricter quality control measures to guarantee both authenticity and health safety [15].

The last modality of use of honey: is temperature, most respondents prefer honey with a hot drink (41%), According to the authors, heat degrades the living assets, heat disturbs the proper functioning of honey because it is sensitive to oxidation and heat. As the temperature increases, the enzymes are degraded. Beyond 42 0C, all living activity is destroyed, and on the other hand, other studies, report that hot water and honey are effective when taken separately, especially for flu-like conditions. It increases vasodilation in the oral region [25].

Regarding the reasons for using honey in the management of acute respiratory infections, most participants in our study reported considering honey as a complementary treatment (67.3%). This aligns with findings from Bouddine et al. (2023), a survey of 642 respondents in eastern-central Morocco (Errachidia), which showed that households primarily consume honey for its perceived therapeutic benefits and nutritional value, with traditional dietary practices and religious considerations also shaping use. The same study reported preferences for creamy/liquid honey, glass-jar packaging, and purchasing in physical markets rather than online—reinforcing honey's dual role as both a food and a natural therapeutic product [26].

Moreover, the present study highlighted the symptoms treated by honey: (a) sore throat 57.7%, (b) cough (32.7%), (c) cold (3.8%), and (d) anorexia (3.8%). This result is consistent with the study by Raeessi et al [27] who found that 53% used honey to treat sore throat, and 57.1% for cough.

Many users reported using honey to treat common ailments such as cough (57.1%, 96/168), and sore throat (53%, 89/168). A small percentage of users (13.1%, 22/168) used honey to treat asthma [28].

Our findings indicate that while the majority of participants use honey for treating acute respiratory infections (ARIs), only a minority demonstrate a high level of knowledge regarding its medicinal properties. This suggests a disconnect between practice and scientific understanding.

This paradox may be explained by several contextual factors specific to the Guelmim region and Moroccan society more broadly. Firstly, honey holds a strong cultural and symbolic value, deeply rooted in traditional practices and religious beliefs. It is often used across generations as a trusted remedy, even in the absence of formal education or scientific evidence. The high usage observed, despite limited knowledge, may therefore be driven by inherited customs, local beliefs in its efficacy, and its promotion as a "natural cure" within family and community networks.

Secondly, the accessibility and affordability of honey compared to pharmaceutical treatments could contribute to its popularity, particularly in semi-rural regions like Guelmim, where healthcare services may be less accessible or under-resourced. In this context, honey represents both a familiar and available option for households seeking alternative or complementary treatments for common respiratory ailments.

This additional line of interpretation reinforces the importance of integrating cultural health practices into public health initiatives, ensuring that health education efforts respect and build upon existing knowledge systems.

CONCLUSION

The survey was conducted among the inhabitants of the Guelmim region. The total number of interviewed people is 834, divided into two groups: the honey group (417) of individuals who use honey, and the reference group (417) of individuals who do not use honey. According to the present study, it is possible to conclude that the dominant tendency for purchasing honey is directly from the beekeeper and cooperatives (65.2%), and the primary reason for honey consumption is the relief of acute respiratory infections, specifically sore throat (57.7%) and cough (32.7%). Regarding the use of honey during illness, 71.7% declare that they increase their consumption of honey during illness.

The survey also showed several reasons for not consuming honey. Among them are: a) high prices (25%), and b) non-availability of good honey (62.5%). The majority of participants consume honey occasionally, rather than regularly. Regarding the time of consumption during the day, 59.6% of respondents take honey at breakfast. As for the mode of preparation, the results show that 26% use honey with water, 25% of the respondents use it alone, and 16% with lemon. For the modality of use, most respondents prefer to use honey with a hot drink (41%), while 37% of the population prefer it cold, and 22% of the respondents consume it with a warm drink.

The highest percentage of respondents use honey as a complementary treatment, 67.3%. In terms of annual consumption, we can say that the majority of the respondents (50%) consume a quantity of 1.5 kg to 2.5 kg. Moreover, we tested statistically the dependencies between the level of knowledge and factors (the use of honey, age, education, and the presence of chronic disease). Based on this test, we can conclude that the above-mentioned factors had a statistically significant influence on the level of knowledge about honey. The comparison between the two groups reveals that the honey group possesses a high level of knowledge, with a percentage of 19% and an average of 20%. The reference group has a poor level of 28% which is insufficient. However, further studies are needed to prove the therapeutic effect of honey on acute respiratory infections in this region.

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Ahmed Ouaamr : Designed the study and collected the data.
MounaMekkaui: Drafting the work.
Hajar El Ouadni: Reviewing it critically for important intellectual content.
Mohammed Hassar: the acquisition and analysisof data for the work.
Yahya Cherrah: Interpretation of data for the work.
Katim Alaoui: Final approval of the version to be published.

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