

Article

Determinants of Honey Consumption with Special Reference to the Influence of Nutritional Knowledge and Health Status on Consumption Habits

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Featured Application: The results presented in this paper provide a reference point on the important determinants of honey consumption which can help honey marketers to promote consumer buying behaviour as well as provide doctors and nutritionists with arguments to encourage higher honey consumption by patients.

Abstract: Due to its sensory qualities and therapeutic properties, honey is a desirable dietary ingredient. Despite the growing interest in proper nutrition in developed countries, honey consumption in developed countries is relatively low. This is also true in Poland. Hence, research was undertaken to determine Polish consumers' behaviour with regard to honey, and its determinants, with particular emphasis on nutritional knowledge and health status. The relationships between the different aspects of consumer behaviour in the honey market and the demographic and economic characteristics of the respondents were verified using the Mann–Whitney U test for comparisons of non-dependent groups for variables on an interval scale. A multiple regression model was developed to examine the relationship between the respondents' nutritional knowledge and their honey-related behaviour, while the relationship between the respondents' health status and their behaviour towards honey was verified using a logistic regression model. Obtained results indicate that gender, age, education, and income differentiate consumers' behaviour with regard to honey. The level of nutritional knowledge had a moderate effect on variations in the respondents' behaviour. A better assessment of health status was associated with greater importance of nutritional-health motivators of honey consumption, while poorer health status determined a greater importance of such determinants as the place where honey is sold or its label attractiveness.

Keywords: honey consumption; Poland; nutritional knowledge; health self-assessment



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1. Introduction

According to the EU Directive [1], honey is a naturally sweet product produced by bees (*Apis mellifera*) from the nectar of plants, from secretions of living parts of plants, or excretions of plant-sucking insects on the living parts of plants, collected by bees, processed by combining specific substances from bees, stored, dehydrated, collected, and left in honeycombs to ripen. Based on its origin, a distinction is made between floral (nectar) honey and honeydew honey. Floral honey is referred to by the name of the single plant

which it comes from (e.g., heather honey, lime honey, buckwheat honey), while multi-flower honey comes from several plants. Honeydew honey is produced by bees from the excretions of insects, mainly aphids. It can be made from leafy or coniferous honeydew.

Honey is considered to be one of the most energy-dense foods in nature [2]. Both wild and domestic, it contains approximately 80–95 percent sugar and is a concentrated source of fructose and glucose [3,4]. The sweet taste of honey determines its sensory attractiveness, which was probably the main reason for its consumption by primitive peoples. The nutritional and therapeutic properties of the product were discovered and widely exploited in ancient times [5]. Nowadays, extensive studies are conducted to discover and prove the effects of the components contained in honey on human organism. The existence in honey has been proved of many bioactive compounds, including vitamins (A, E, K, B₁, B₂, B₃, B₆, C), phenols, flavonoids, and fatty acids, as well as organic acids (hydroxybenzoates, octadecanoic, abscisic, cinnamic, feluronic), ethyl ester, apigenin, pinocembrin, and acacetin [6,7]. In addition, honey contains amino acids of physiological importance such as arginine, cysteine, glutamic acid, aspartic acid, and proline [8]. The content of the individual compounds depends on the type of honey [9], weather, and the natural-geographical conditions determining the growth of honey-producing and melliferous plants [10,11]. Buckwheat honey, for example, is characterised by a higher content of phenolic compounds, sugars, and minerals than other types of honey from different varieties [12]. Heather honey is characterised by high antimicrobial activity compared to other types of honey due to its high osmolarity, low acidity, as well as the content of polyphenolic compounds and hydrogen peroxide [13]. Acacia honey has a low glycemic index compared to other types of honey [14]. Honeydew types of honey have a higher antioxidant potential than nectar honey types and, in addition, due to their osmotic properties, they counteract inflammatory reactions [15]. These types of honey also display antibacterial activity against several pathogenic bacteria, including antibiotic-resistant strains [16].

The composition of honey determines its nutritional value and health-promoting effects [17–19]. The antioxidant effect of honey, which is a consequence of polyphenol, flavonoid, and phenolic acid content, is made use of in prophylaxis and therapy in cardiovascular and cancerous diseases, as well as diabetes, by protecting cell-defence systems against damage caused by free radicals and other oxidising factors [7,20]. The antibacterial, antiviral, and fungicidal properties of honey are taken advantage of in the treatment of dermatological conditions and wounds [17,18,21,22] as well as the oral cavity [23]. The availability of bioactive components of honey and its antiseptic and immune-boosting properties are used in the treatment of upper respiratory tract disorders, especially chronic cough in children and adults [24,25]. Beneficial immunomodulatory, anti-cancerous, anti-hypertensive, anti-allergic, and prebiotic effects of certain types of honey have also been proven effective on patients with endocrine dysfunction [5,14], and in fertility treatment [26].

The nutritional and therapeutic properties of honey, along with its sensory appeal, should encourage its consumption, especially in highly developed countries where honey could play an important supporting role in combating the epidemic of civilisation diseases. However, according to FAO and Statista [27,28], it is developing countries that lead the way in honey consumption. For example, daily honey consumption in the USA is estimated at 1.8 g, in Europe, it averages 3–4 g, and in the Central African Republic 9.6 g. Pocol and Bolboaca [29] attribute the decline in honey consumption in developed countries to its high-caloric content and high content of simple sugars, while suggesting a possible increase in consumption of this product due to growing interest in traditional foods. Chekol et al. [30] found an increasing consumer interest in consuming organic honey, free from pesticides and heavy-metal residues present in other types of honey [31,32]. Poland has many protected areas of high natural value where nectar is extracted for honey, which accounts for the high nutritional value of local products [33].

Research on consumer behaviour in the honey market focuses on learning the characteristics of this product and circumstances of its purchasing decisions, as well as the demographic, social, and economic characteristics of honey consumers [34–37].

Comparatively, limited consideration has been given in analyses to date to determinants of honey consumption such as consumers' nutritional knowledge and health status. Both these factors, as proven in studies [38–40], can significantly modify dietary preferences and behaviour. Therefore, this study pays particular attention to these honey-consumption determinants.

The aim of the study was to identify Polish consumers' behaviour with regard to honey, and its determinants, with particular emphasis on nutritional knowledge and health status. In the context of this defined research idea, the following detailed objectives were formulated:

- recognizing Polish consumers' behaviour as regards frequency of honey consumption and manner of its use, reasons for honey consumption, preferences regarding the type of honey used, determinants of honey selection, and places of its purchase;
- determining the impact of demographic and economic characteristics on consumers' honey-related behaviour;
- evaluating the relation between the level of consumers' nutritional knowledge and their behaviour in the honey market;
- assessing the relation between consumers' health status and their behaviour in the honey market.

2. Materials and Methods

2.1. Study Design

The paper is based on the results of a questionnaire research study conducted in 2022 using the CAWI method. The survey was carried out in full observance of national and international regulations compliant with the Declaration of Helsinki (2000). The participants' data and personal information were anonymous in accord with the General Data Protection Regulation of the European Parliament (GDPR 679/2016).

The ethical aspects followed throughout the study ensured continued safety of participants as well as integrity of the accumulated data. A brief description of the study and its aim as well as the declaration of anonymity and confidentiality were given to the participants before answering the questionnaire. Respondents did not give their names or contact information (including the IP address) and were allowed to finish the survey at any stage. Answers were saved only when participants clicked the "submit" button after filling in the questionnaire.

Study participants were recruited from among people registered by personal contact and social media.

2.2. Questionnaire

The questionnaire consisted of three sections. The first was based on the respondents' collection of socio-demographic data, including characteristics such as gender, age, education, and income.

The second part included questions on:

- frequency of honey consumption (question on a scale: 0—not at all, 1—several times a year or less, 2—once a month on average, 3—5–8 times a month, 4—several times a week, 5—daily or almost daily);
- manner of honey use (question on a scale: 0—not at all, 1—several times a year or less, 2—once a month on average, 3—5–8 times a month, 4—several times a week, —daily or almost daily);
- relevance of selected determinants of honey choice (1—unimportant, 2—rather not important, 3—moderately important, 4—rather important, 5—very important);
- places to buy honey (nominal multiple-choice scale question);
- reasons for consuming honey (nominal multiple-choice scale question);

- consumer preferences for types of honey (nominal multiple-choice scale question);
- changes in honey-consumption frequency during the COVID-19 pandemic (question on a scale: 1—decreased a lot, 2—decreased a little, 3—remained the same, 4—increased a little, 5—increased a lot).

Questions in the third part of the questionnaire concerned the respondents' health status and the level of their nutritional knowledge. The respondents' health status was assessed using the WHO five-point health-status self-assessment scale (1—very bad, 2—bad, 3—average, 4—good, 5—very good) [41]. A similar scale was used to measure the self-assessment of respondents' nutritional knowledge.

2.3. Statistical Analysis

Descriptive statistics were used to calculate frequencies and means. Relationships between the frequency and manner of honey consumption, factors influencing the choice of honey, the place of purchase, and preferred type of honey bought by the demographic-economic characteristics of the respondents were all verified using the non-parametric Mann–Whitney U test. For the purpose of analyses, a dichotomous division was made of the respondents' age (18–46 and over 46 years of age), education (primary and secondary as well as higher education), and monthly net per capita income (of less than or equal to PLN 3500 and more than PLN 3500). The assumed minimum level of significance for all statistical tests was 0.05.

To investigate the relationship between the respondents' nutritional knowledge and honey-consumption behaviour, a multilevel regression model was developed describing the relation between the level of knowledge (Yw) and variables characterising consumer behaviour in the honey market. The relationship between the respondents' health status and their behaviour regarding honey was verified using a logistic regression model describing the relationship between health status (Yz: 1—high self-assessment of health status, 0—medium and low self-assessment of health status) and variables depicting consumer behaviour.

2.4. Characteristics of Respondents

From a total of 487 respondents taking part in the survey, 434 (89.1%) declared honey consumption, and this group's answers were taken into account in the analysis. In terms of gender, 58.5% of the respondents were women and 41.5% were men. As regards the age structure, 71.8% of the respondents were 18–46 years old and 28.2% over 46 years of age. In terms of education, 59.8% of respondents had completed higher education, and 40.2% were graduates of secondary or primary schools. The analysis of the respondents' economic situation showed that 65% had a monthly per capita income of less than or equal to PLN 3500, and 35% higher. The level of nutritional knowledge was considered as good or very good by 60.4% of the respondents, while 39.6% considered it average or low. As for self-assessment of their health, 62% of the respondents rated it as very good or good, while 38% as medium. None of the respondents rated it as bad or very bad (Table 1).

Table 1. Characteristics of the study population ($n = 434$, data in %).

Gender	
Female	Male
58.6	41.4
Age	
Younger (18–46 years old)	Older (over 46 years old)
71.8	28.2
Education	
Lower (primary, secondary)	Higher
40.2	59.8

Table 1. Cont.

Per Capita Income PLN/EUR *				
Lower (under or equal to PLN 3500 / EUR 743*) 64.9		Higher (over PLN 3500/ EUR 743) 35.0		
Nutritional Knowledge				
Very bad 0.2	Bad 3.0	Average 36.4	Good 45.6	Very good 14.7
Health Assessment				
Average 38.0		Good or very good 62.0		

* As of 21 November 2022, NBP Exchange rates are available at: <https://www.nbp.pl/home.aspx?f=/statystyka/kursy.html>. (accessed on 21 November 2022).

3. Results

3.1. Determinants of the Frequency and Patterns of Honey Consumption

The analysis of honey-consumption frequency showed that 21% of the respondents consume honey on average once a month and about 20% of those surveyed do so daily or almost daily. Frequencies of several times a week, several times a month, and several times a week were declared by 19–20% of the respondents (Figure 1). An analysis of changes in the frequency of honey consumption during the COVID-19 pandemic indicated that 32% of the respondents increased their consumption slightly or significantly, 5.3% decreased their intake, and 62.7% made no change.

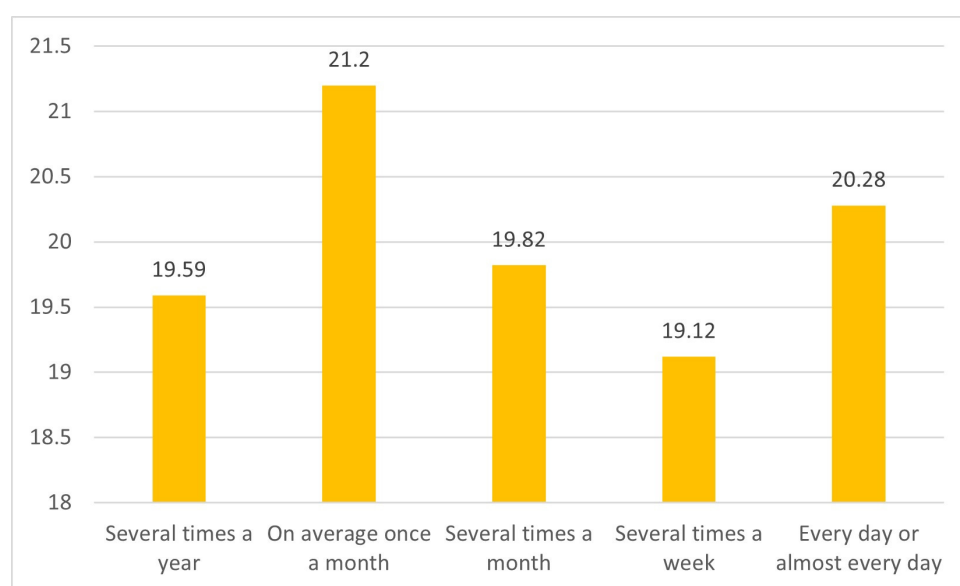


Figure 1. Frequency of honey consumption ($n = 434$, data in %).

The most common way respondents used honey for consumption was in hot drinks (mean 2.21). Less frequently, respondents used honey as an accompaniment to sandwiches (1.62), direct consumption (1.54), and desserts (1.52). Respondents were least likely to use honey with fish (0.21) and alcoholic beverages (0.36) (Figure 2).

The analysis of the relationship between the frequency of honey consumption and the demographic–economic characteristics of the respondents showed that only age significantly differentiated the frequency of honey consumption statistically—it was consumed more frequently by those aged over 46 years. There was no effect of demographic–economic characteristics on changes in the frequency of honey consumption during the COVID-19 pandemic.

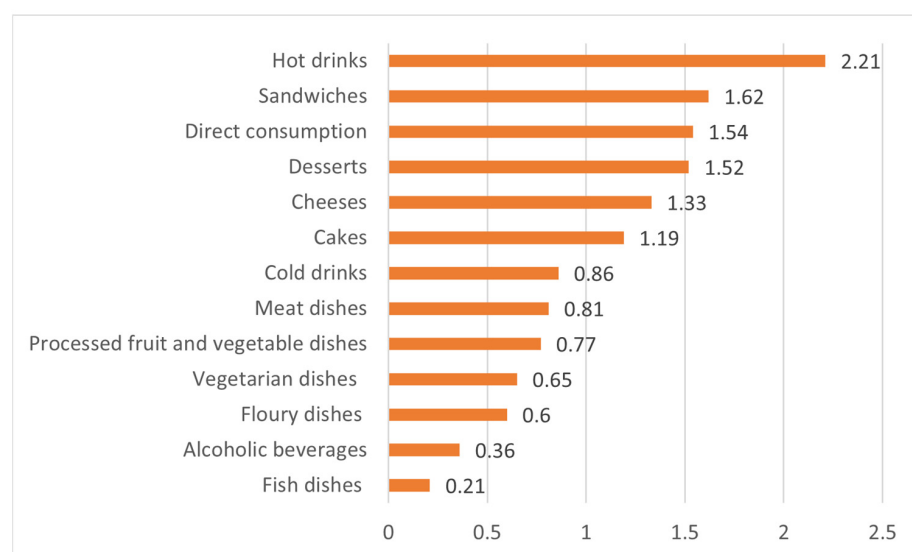


Figure 2. Patterns of honey consumption ($n = 434$, average on a scale: 0—not at all, 1—several times a year or less, 2—once a month on average, 3—5–8 times a month, 4—several times a week, 5—daily or almost daily).

When examining the variations in honey use by gender, age, education, and income, it was found that women were statistically significantly more likely than men to use honey for cakes, vegetarian dishes, desserts, fruit and vegetable preserves, and hot drinks. Respondents older than 46 years were statistically significantly more likely to use honey for sandwiches, cheese, meat dishes, cold drinks, and direct consumption than younger respondents, who were more likely to add honey to desserts and hot drinks. Those with higher education were statistically significantly more likely to use honey for sandwiches, cheese, meat, vegetarian and vegan dishes, and direct consumption than other respondents. On the other hand, respondents with higher incomes were statistically significantly more likely to use honey for sandwich spreads, cheese, fish dishes, and cold drinks, while low earners were more likely to add honey to hot drinks (Table 2).

Table 2. Determinants of the frequency and patterns of honey consumption ($n = 434$, Mann–Whitney test).

Specification	Women vs. Men	Younger vs. Older	Lower vs. Higher Education	Lower vs. Higher Income
Frequency of honey use				
	−0.32	2.09 *	−1.40	−1.15
Ways to use honey				
Sandwiches	−1.72	4.95 *	−3.68 *	−2.94 *
Cheeses	1.24	2.72 *	−2.41 *	−3.12 *
Meat dishes	1.71	2.06 *	−1.96 *	−1.66
Cakes	2.88 *	−1.68	0.98	0.10
Fish dishes	−0.38	1.74	−1.24	−2.53 *
Floury dishes	1.52	−0.32	0.18	1.58
Vegetarian dishes	2.07 *	1.33	−1.96 *	−1.02
Desserts	3.94 *	−2.34 *	−0.91	−0.81
Processed fruit and vegetable dishes	3.05 *	0.70	1.79	0.02
Cold drinks	0.24 *	2.71 *	−0.61	−3.40 *
Hot drinks	2.58 *	−3.22 *	1.37	2.98 *
Alcoholic beverages	0.76	−0.46	0.45	0.48
Direct consumption	0.16	2.38 *	−2.81 *	−1.19

* $p < 0.05$.

3.2. Reasons for Honey Consumption

The main reason for honey consumption indicated by respondents was preference (65%). Almost half of those surveyed (48%) declared use of honey on advice from family members and friends. Another frequently given reason (37%) was habit. Less-important motivations for honey consumption were nutritional and health reasons such as the intention to change diet (21%), enhancing food's nutritional value (20.5%), and deteriorating health (20%) (Figure 3). There was no statistically significant variation in the frequency with which individual reasons were indicated on account of the respondents' demographic and economic characteristics.

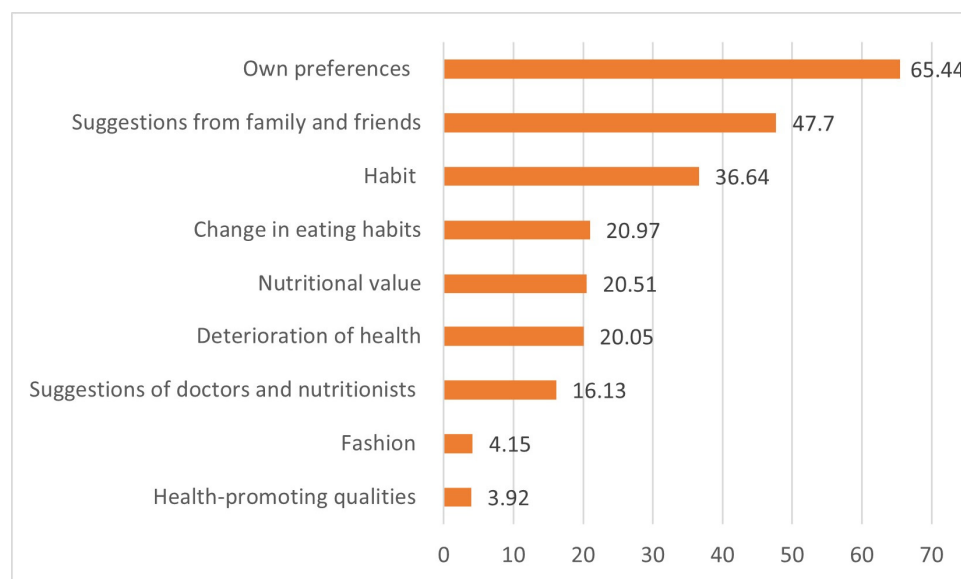


Figure 3. Reasons for consuming honey ($n = 434$, data in %).

3.3. Determinants of Honey Choice

The most important factors in the respondents' choice of honey were the type of the product (mean 3.9), the production method (3.3), and the place of purchase (3.2). Less-important factors determining their purchase of honey were the type of packaging (3.2), consistency (3.1), price (3), information on the label (2.8), and package size (2.7). The least-important factor determining the purchase of honey was the label attractiveness (1.8) (Figure 4).

An analysis of the determinants' significance in honey selection, taking into account the respondents' demographic and economic characteristics, showed that such features of honey as price, consistency, the colour of honey, package size, label attractiveness, and information given on the label were statistically significantly more important for women than for men. For respondents over 46 years of age, such characteristics of honey as the production method, place of sale, and packaging type were statistically significantly more important, while younger respondents rated the importance of price, consistency, colour of honey, packaging size, and label attractiveness significantly higher. For respondents with a higher level of education, such characteristics of honey as the production method and the place of sale were more important, while those with a lower level of education rated statistically higher the importance of the price, colour of honey, size of packaging, and information on the label. Respondents with lower income paid statistically significantly more attention to the price, honey consistency, and package size when purchasing honey, while for the more affluent respondents such factors as the honey production method and the place of sale were more important (Table 3).

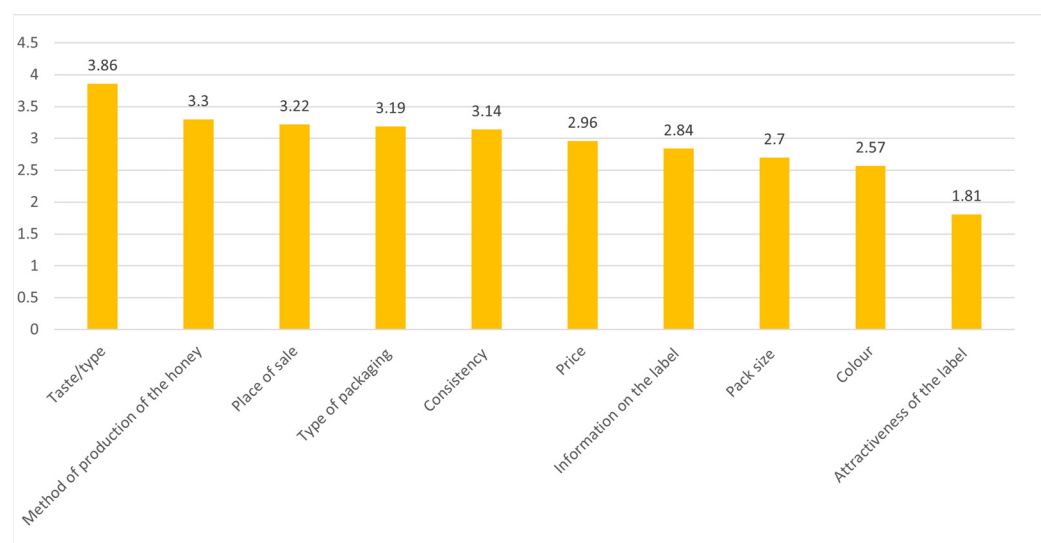


Figure 4. Factors determining the choice of honey ($n = 434$, average on a scale: (1—unimportant, 2—rather not important, 3—moderately important, 4—rather important, 5—very important).

Table 3. Determinants of purchasing decisions regarding choice of honey ($n = 434$, Mann–Whitney test).

Specification	Women vs. Men	Younger vs. Older	Lower vs. Higher Education	Lower vs. Higher Income
Method of production of the honey	−0.47	4.30 *	−2.16 *	−4.12 *
Place of sale	1.29	3.10 *	−2.66 *	−3.40 *
Price	2.70 *	−3.85 *	3.40 *	3.92 *
Taste/type	−0.27	−0.94	0.91	0.97
Consistency	3.11 *	−4.92 *	1.66	3.08 *
Colour	2.82 *	−2.11 *	2.49 *	1.92
Pack size	4.16 *	−4.92 *	3.44 *	2.63 *
Type of packaging	1.25	2.63 *	−0.86	−0.57
Information on the label	3.01 *	−0.94	2.37 *	1.87
The attractiveness of the label	3.19 *	−3.17 *	1.77	1.23

* $p < 0.05$.

3.4. Determinants of Respondents' Preferences for the Type of Honey

The analysis of the respondents' preferences regarding the type of honey used showed that multi-flower honey is consumed most often (80.2% of indications). Consumed much less frequently are lime honey (59.9%) and acacia honey (52.0%). The fewest respondents mentioned heather honey (24.7%) as their preference (Figure 5).

The respondents' demographic and economic characteristics made little difference as regards their preferences for honey type. Statistically, significant differences were noted as regards forest honey, which was preferred more by men, people aged over 46 years, and respondents with higher income, as well as for honeydew and heather honey, which were preferred by more affluent people. Education did not differentiate respondents' preferences in the study (Table 4).

3.5. Determinants of Ways of Obtaining/Purchasing Honey

Most respondents received honey from family and friends (49.0%) and bought it at a marketplace (40.3%). More than a third of the respondents indicated that they bought honey from an apiary, and nearly one in four respondents did so at a supermarket. Less-popular places of purchase included online shopping sites = (16.4%) and neighbourhood stores (11.3%). The respondents were least likely to buy honey at organic (8.5%) and fruit and vegetable (5.1%) stores (Figure 6).

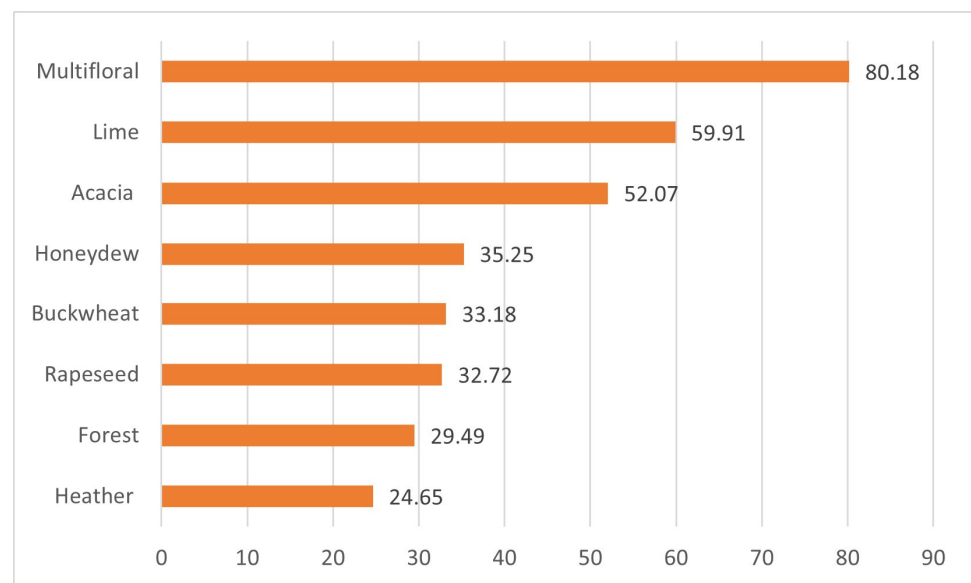


Figure 5. Preferences in types of honey ($n = 434$, data in %).

Table 4. Determinants of respondents' preference for honey type ($n = 434$, Mann–Whitney test).

Specification	Women vs. Men	Younger vs. Older	Lower vs. Higher Education	Lower vs. Higher Income
Multifloral	−1.18	−0.27	1.69	0.52
Acacia	0.08	1.53	−1.47	−0.77
Honeydew	0.97	−1.56	−0.01	−2.04 *
Buckwheat	0.68	0.40	−0.05	−0.72
Rapeseed	0.13	−0.63	0.84	−0.55
Lime	0.02	0.06	−0.99	−1.44
Heather	−0.44	1.92	−1.44	−2.87 *
Forest	−3.31 *	4.21 *	−1.96	−3.35 *

* $p < 0.05$.

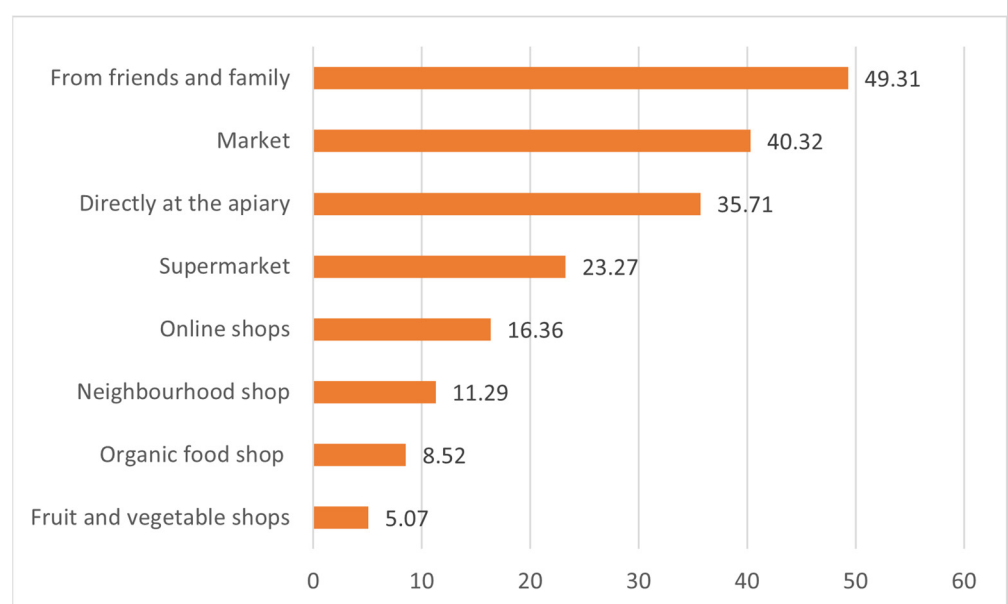


Figure 6. Ways of obtaining honey ($n = 434$, data in %).

It follows from the analysis of the demographic–economic differentiation of the ways of obtaining and places of purchasing honey that men are statistically significantly more likely to buy honey from neighbourhood shops as well as fruit and vegetable shops, while women are more likely to obtain honey from friends and family. Younger people (18–46 years) are more likely to buy honey in markets and bazaars and online, while older people obtain honey from family and friends. People with lower education are more likely to buy honey in neighbourhood shops and supermarkets, while respondents with higher education tend to buy honey directly from apiaries and online. The level of income significantly differentiates the purchasing behaviour of respondents only in the case of online shopping being common among those better-off (Table 5).

Table 5. Determinants of ways of obtaining/purchasing honey ($n = 434$, Mann–Whitney test).

Specification	Women vs. Men	Younger vs. Older	Lower vs. Higher Education	Lower vs. Higher Income
Market	−1.05	3.06 *	−0.45	−0.53
Directly at the apiary	1.63	−0.17	−2.05 *	−0.75
Neighbourhood shop	−2.66 *	0.39	2.85 *	−0.26
Supermarket	−1.17	−1.62	2.14 *	0.56
Healthy food shop	−1.27	1.35	1.09	−0.01
Fruit and vegetable shops	−2.16 *	1.35	1.40	0.32
Online shops	−1.71	5.40 *	−2.24 *	−3.53 *
From friends and family	2.54 *	−5.37 *	0.74	0.77

* $p < 0.05$.

3.6. Nutrition Knowledge and Consumption Behaviour of Respondents concerning Honey

The analysis of the relationship between the level of nutritional knowledge and the respondents' honey-consumption behaviour was carried out using the multiple regression method. It follows from the results obtained that the respondents' assessment of the level of nutritional knowledge (Y_w) builds up with a more frequent use of honey for direct consumption (X_1), for sandwiches (X_5), and with an increase in the importance of the form of honey (X_3) in the decision to purchase it. In contrast, a decrease in nutritional knowledge is associated with the frequency with which honey is purchased in fruit and vegetable shops (X_2), supermarkets (X_4), and organic food shops (X_6) (Table 6).

Table 6. Parameter values of the multiple regression model.

Variables		Assessment B	p -Value
Direct consumption (patterns of honey consumption)	X_1	0.0939	0.0003
Fruit and vegetable shops (ways of obtaining/purchasing honey)	X_2	−0.4625	0.0047
Consistency (determinants of purchasing decisions)	X_3	0.0848	0.0032
Supermarket (ways of obtaining/purchasing honey)	X_4	−0.2351	0.0056
Sandwiches (patterns of honey consumption)	X_5	0.0614	0.0213
Healthy food shop (ways of obtaining/purchasing honey)	X_6	−0.2661	0.0409
constant		3.2888	

The resulting model can be described by the Equation:

$$Y_w = 3.2888 + 0.0939 \times X_1 - 0.4625 \times X_2 + 0.0848 \times X_3 - 0.2351 \times X_4 + 0.0614 \times X_5 - 0.2661 \times X_6 + e \quad (1)$$

In the above model, all structural parameters standing by the explanatory variables X_i are statistically significant ($p < 0.05$). The good predictive properties of the model are confirmed by the obtained conformity of the distribution of the residuals with the normal distribution (value of Pearson's χ^2 Pearson = 0.9008; $p = 0.34258 > 0.05$).

3.7. Health Status and Consumption Behaviour of Respondents with Honey

The analysis of the relationship between the respondents' health status and consumer behaviour regarding honey was performed using the logistic regression method. It follows from the results obtained that a better health condition (Y_z) is declared by respondents consuming honey on recommendation from their doctors and dieticians (Z_6) as well as family members and friends (Z_2), those eating honey more frequently with fish (X_5), those motivated to consume honey because of its nutritional value (Z_7) and preferences (Z_{11}), and those taking into account the size of the packaging while buying the product (Z_8). In contrast, the likelihood that a respondent would rate their health as good decreases with an increase in the frequency of using honey for sandwiches (Z_1) and cold drinks (Z_4). An increase was noted in the importance of the place of sale (Z_{10}) and the attractiveness of the honey label (Z_9) when making purchasing decisions. An increase in the frequency of honey purchases at markets and bazaars (Z_3) and an increase in the frequency of honey consumption was observed during the COVID-19 pandemic (Z_{12}) (Table 7).

Table 7. Parameter values of the logistic regression model.

Variables	Assessment	Odds Ratio	p-Value
Sandwiches (patterns of honey consumption)	Z_1 −0.340	0.712	0.001
Suggestions from friends and family (reasons for consuming honey)	Z_2 0.513	1.67	0.045
Market (ways of obtaining/purchasing honey)	Z_3 −0.718	0.488	0.007
Cold drinks (patterns of honey consumption)	Z_4 −0.308	0.735	0.018
Fish dishes (patterns of honey consumption)	Z_5 0.686	1.985	0.002
Suggestions of doctors and nutritionists (reasons for consuming honey)	Z_6 0.899	2.458	0.008
Nutritional value (reasons for consuming honey)	Z_7 0.721	2.057	0.019
Pack size (determinants of purchasing decisions)	Z_8 0.384	1.468	0.002
Label attractiveness (determinants of purchasing decisions)	Z_9 −0.307	0.736	0.016
Place of sale (determinants of purchasing decisions)	Z_{10} −0.290	0.748	0.005
Own preferences (reasons for consuming honey)	Z_{11} 0.565	1.759	0.042
Increased frequency of honey consumption during the COVID-19 pandemic	Z_{12} −0.368	0.692	0.023
constant	0.487		

The resulting model can be described by the Equation:

$$Y_z = 0.487 - 0.340 \times Z_1 + 0.513 \times Z_2 - 0.718 \times Z_3 - 0.308 \times Z_4 + 0.686 \times Z_5 + 0.899 \times Z_6 + 0.721 \times Z_7 + 0.384 \times Z_8 - 0.307 \times Z_9 - 0.290 \times Z_{10} + 0.565 \times Z_{11} - 0.368 \times Z_{12} + u \quad (2)$$

In the above model, all parameters standing next to the explanatory variables are statistically significant ($p < 0.05$), meaning that these variables significantly influence the dependent variable Y . The model shows a high percentage of prediction (76.83%) and a good fit of the model to the data ($\chi^2 = 79.917$; $p = 0.0000$).

4. Discussion

The objectives of the research undertaken were to define the behaviour of Polish honey consumers as regards honey-consumption frequency, the manner of honey use, motives of honey consumption, preferences as regards the type of honey used, determinants of honey selection, and honey purchase sites.

The analysis indicated that honey is consumed by nearly 90% of the respondents, about 40% of whom do so several times a week or more often. Widespread consumption of honey is also corroborated by other studies conducted in Poland as well as in several other countries. According to a study by Kopala et al. [42], only 5% of Polish consumers do not eat honey at all. According to a study by Roman et al. [43], one in five Poles consume honey every day. In a study conducted in Turkey, honey consumption was declared by 84% of respondents. In contrast, Schifani et al. [44], studying honey consumption in southern Italy, found that nearly one-fifth of respondents consume the product daily.

Analysis of changes in the frequency of honey consumption during the COVID-19 pandemic indicated that 34% of respondents increased their consumption somewhat or significantly and that just 6% of respondents decreased their consumption. According to the study [45,46], the increased interest in honey consumption during the SARS-CoV-2 risk period is accounted for by the belief in the product's immune-promoting properties and consumers' higher propensity to eat health-enhancing products during the pandemic. It is noteworthy that the medical rationale exists for increasing honey consumption during a pandemic as observations were made that naringin present in honey can inhibit SARS-CoV-2 activity in vitro, and that honey treatment of COVID-19 patients promotes earlier recovery and reduces mortality [47].

An analysis of how honey is consumed showed that respondents most often add it to hot drinks, spread it on sandwiches, eat it directly, or add it to desserts. In all these instances, honey serves as a more beneficial alternative to sugar, as was also found in a study by Guziy et al. [48] made in Slovakia and Russia. Such perception of honey was supported by scientific research. Evidence available from experimental studies also shows that honey plays a beneficial role in managing diabetes mellitus. The benefits consist of better control of the hyperglycemic state, and reduction in other metabolic disorders and the deleterious effects on different organs causing diabetic complications [49]. Unfortunately, when honey is subjected to high temperatures, which occurs during its heat treatment, its antioxidant capacity is reduced, affecting its nutritional and health benefits [50]. It is, therefore, more beneficial for health to use honey as a sandwich spread, as is popular not only in Poland but also in other countries, e.g., in Australia [37] and Romania [51].

The main reasons for honey consumption specified by the respondents included self-choice preference, family suggestions, habits, and nutritional and health benefits of the product. The relevance of the therapeutic properties of honey as consumption motivations was also highlighted in other studies [48,52,53].

The factors most relevant to the respondents' choice of honey involved its type (multi-flower honey was the most common choice, which may be due to its relatively low price and high availability), its production method, place of sale, and the packaging type. Previous studies have only partially confirmed the stated hierarchy of determinants. As far as the research conducted in Poland is concerned, the most significant determinant of honey choice listed in the study of Kopala et al. [42] was that of the availability of the specific flavoured honey product, rather than its price and appearance. Correspondingly, research conducted by Roman et al. [43] confirmed the marginal importance of the product label in honey-buying decisions. The variation in the importance of honey choice is corroborated by studies in other countries. A study by Pocol et al. [54] in Romania indicated that aroma, texture, and colour are among the most important determinants in selecting the definite honey type. In a study carried out in Ireland by Murphy et al. [55], the most important determinants of honey choice listed were the texture, packaging, brand, and colour. A study by Ismaiel et al. [56] showed that Saudi Arabians consider mainly the price, colour, type, and taste of honey when purchasing honey. Conversely, a study conducted in Hungary by Mezone [57] found that price, brand, and quality of packaging are the most important factors in that regard.

An analysis of how respondents acquire honey indicated that they acquire it most often from friends or family, and when buying, they are most likely doing so in a neighbourhood shop or directly in an apiary. Similar findings were made in other studies conducted in Poland [42] and elsewhere [58,59].

The other main objective of the study conducted was to determine the demographic and economic considerations of consumers' honey-buying behaviour. Of the respondents' characteristics enumerated in the study (gender, age, education, and income), only age affected the frequency of honey consumption, and it was higher in the older respondents' group. In contrast, all these characteristics influenced honey consumption according to studies carried out in Hungary and Romania [48].

The study also found that gender, age, education, and income differentiate such aspects of consumer behaviour as honey-consumption patterns, purchasing sites, and determinants of choice, as well as (although to a lesser extent) preference for honey type. However, the analysed characteristics had no bearing on evaluating the importance of honey-consumption reasons and the importance of factors taken into account when selecting the type. Direct reference of the obtained data to the previous research results is not fully possible due to the specificity of the authors' individual analytical approach to the issues examined. However, they found variations confirming researchers' opinions regarding the multifaceted differentiation of consumer behaviour in the food market [60,61] and suggesting the necessity of a thorough segmentation of consumers in the honey market and precise recognition of the needs of isolated target groups, as this will help to meet the expectations of various groups of recipients [62,63].

Another specific aim of the conducted research was to determine the relationship between the level of consumers' nutritional knowledge and their behaviour on the honey market. The correlations noted as a result of the analyses carried out lead to the conclusion that consumer behaviour in the honey market is moderately affected by the level of nutritional knowledge, which was also found to be true in studies of other food products conducted by Koch et al. [38] and Scalwedi et al. [39]. Previous studies have shown that the nutritional value and health-promoting effects of honey are important motivations for its consumption [48,52,64,65], although the question of the relationship between health status and honey consumption has not yet been studied. For this reason, this issue was also included among the research objectives. The results of the analyses suggest the existence of a link between better health status and a more rational approach to honey consumption, characterised by a reflection on its nutritional value. On the other hand, poorer health status seems to be correlated with a more spontaneous and emotional attitude to honey consumption, manifested in the perception of its quality through the prism of the place of sale or the attractiveness of the label, as well as in increased consumption of honey in situations of disease risk. This observation can be used when doctors and nutritionists work with patients. The conducted research can help to expand scientifically objective knowledge of consumer behavior in the honey market and its results can be taken advantage of in business and therapeutic activities. It is important to stress the exploratory nature of the conducted research, oriented as it was towards learning about consumer behavior in the honey market and defining its determinants. For this reason, the results obtained cannot be considered conclusive. Nevertheless, they significantly expand the current state of knowledge in the field of issues addressed. Further research is needed to overcome the limitations of the present study, based only as it was on a sample of Polish consumers.

5. Conclusions

The conducted research allowed us to learn about the behaviour of Polish consumers in the honey market and to define their determinants. It was found that honey is consumed by 90% of people surveyed and that the most common types of honey consumption were using it for hot drinks, desserts, cakes, spreading on sandwiches, and direct consumption. The main reasons given for consuming honey were personal preferences and habit. In selecting honey, the respondents pay main attention to the type of honey, its texture, production method, and place of sale. The most frequently mentioned places of purchasing honey by respondents were apiaries, markets or bazaars, and supermarkets. Among the respondents' demographic, social, and economic characteristics, honey-consumption behaviour was differentiated by gender, age, education, and income. The level of nutritional knowledge had a moderate effect on differentiating respondents' behaviour towards honey. Yet, the analysis of the relation between their health status and honey consumption indicated that a better assessment of their health was associated with a greater importance attached to nutritional-health motivators of honey consumption, while worse health status meant attaching greater importance to such honey-consumption determinants as the place of sale or label attractiveness.

The results of the analysis may inspire honey producers and marketers alike to activate consumer buying behaviour and give doctors and nutritionists arguments to encourage patients to eat more honey.

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