CONSUMER KNOWLEDGE, ATTITUDE AND PRACTICE REGARDING STINGLESS BEE HONEY IN KLANG VALLEY, MALAYSIA

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Abstract. There are significant differences in attitude and consumption of stingless bee honey among different income group in Negeri Sembilan. However, there is limited study conducted on consumer knowledge, attitude and practice of stingless bee honey consumption in Klang Valley with good proximity of public transport. Therefore, the objectives of this study are to identify consumer knowledge on stingless bee honey, to identify consumer attitudes and to identify consumer practice on stingless bee honey. A crosssectional survey involving 301 respondents was conducted using an online questionnaire, assessing knowledge, attitudes, practices and consumer preference. The data was analyzed using SPSS version 29.0. Questions 3, 6, and 8 were designed as control questions to assess the respondents' exact knowledge of stingless bee honey. Only 22.3% respondents knew about high moisture content of stingless bee honey (Question 3) and 85.6% respondents wrongly believed stingless bee honey does not need refrigeration to preserve its quality (Question 6). This indicates limited knowledge about stingless bee honey among Klang Valley consumers. Respondent consumption frequency on stingless bee honey is also relatively low (2.39±0.78) which indicates a need for increased awareness on the health benefits of stingless bee honey to encourage more regular usage. There was a significant difference in stingless bee honey consumption between different income groups. Respondents earning over RM5000 highly practiced the consumption of stingless bee honey (9.56±2.28) due to having more disposable income. This study may benefit stingless beekeepers in providing understanding on consumer knowledge, attitude and practice towards local stingless bee honey.
Keywords: *stingless bee honey, Klang Valley, knowledge, attitude, practice*

Introduction

According to Main and Sotelo (2022), native people from the tropical regions started to harvest stingless bee honey from variety types of species for thousands of years. Stingless bee can be found in tropical areas around the globe, coming from the Hymenoptera family, with more than 500 identified species across 32 genera and potentially more than 100 uncharacterized species (Ávila et al., 2018). These bees gather floral nectar from native plants and chemically alter it using their own specific substances, such as salivary secretions from abdominal glands and enzymes from their head glands (Chuttong et al., 2016). Mustafa et al. (2018) stated that Malaysian Agricultural Research and Development Institute (MARDI) started stingless beekeeping at Malaysia in year 2007. About 32 species of stingless bees found in Malaysia, and the most stingless bee species used from meliponiculture are Geniotrigona thoracia and Heterotrigona itama (Norowi et al., 2010). Due to simple management of stingless bee, stingless beekeeping or meliponiculture started to become popular (Nordin et al., 2018). Stingless beekeeping does not need safety equipment because it does not sting (Abd Jalil et al., 2017). Stingless bee nesting behaviour which includes developing and constructing hive in hollow area also contribute to easier beekeeping than compared to

other bee species such as Apis Mellifera (Fletcher et al., 2020). In Malaysia, there are currently over 50,000 commercially operated beehives, of which 6,000 are stingless beehives with the largest areas are in Sarawak and Kelantan. In 2020, the stingless bee industry brought in RM33.6 million in revenue, but with full development, its own the potential to generate up to RM3.03 billion each year (Lee, 2021). In Malaysia, stingless bees yield an average of 4 kilograms of honey per colony annually (Mustafa et al., 2018).

According to Saludin et al. (2019), based on an interview conducted during sensory evaluation with 406 honey consumers in Klang Valley, Malaysia, it was found that sensory factors such as bitterness, colour, sweetness, viscosity, sourness, spices aroma, fruity aroma, and herbal aroma affected consumer preferences towards stingless bee honey. The respondents tasted the sample and then responded by filling out a questionnaire. However, the main factor that affect consumer preferences towards stingless bee honey is viscosity. This is because viscosity will affect or influence the honey texture and mouthfeel. Münstedt et al. (2020) had conducted survey on women stayed at Weilburg, Germany. They found that the main reasons for some women refused to consume honey although there are scientific facts on its benefits is because they care if the honey being produced in an ethical and environmentally friendly. In Piedmont region of north-western Italy, Zanchini et al. (2022) conducted a survey on consumers' attitude towards honey consumption and found that factors like age, gender and body mass index (BMI) affect the consumer attitude towards honey consumption.

However, there is limited study conducted locally on consumer knowledge towards stingless bee honey. Next the consumer attitude and practice towards stingless bee honey also were not well-documented. This phase will leave a void in the understanding of how different demographic factors influence honey purchasing and usage behaviours. This lack of information on our local consumer attitudes and practices towards stingless bee honey also may hinders the ability of our local stingless beekeepers and sellers to effectively market and expand the reach of stingless bee honey to consumers. Figure 1 shows conceptual framework which illustrates the relationship between knowledge, attitude and practice (KAP) regarding stingless bee honey. Individual's knowledge such as understanding the health benefits and traditional uses will affect their attitudes towards stingless bee honey. As individuals gain more knowledge about the various applications and advantages of stingless bee honey, their attitudes become more positive such appreciating its medicinal benefits, safety, quality, and cultural relevance (Héger et al., 2023). Knowledge together with attitude will influence the individual practice on stingless bee honey. Therefore, the objectives of this study are to identify consumer knowledge on stingless bee honey, to identify consumer attitudes on stingless bee honey, and to identify consumer practices on stingless bee honey. This study may benefit stingless beekeepers or honey producer in providing comprehensive understanding of consumer attitudes towards stingless bee honey, including perceived benefits, and any cultural or religious factors influencing these attitudes.

Materials and Methods

Research design

The study was conducted to determine the consumer knowledge, attitude, practice (KAP) and consumption pattern in Klang Valley, Malaysia. The cross-sectional study design is the most suitable and appropriate study design to achieve the objectives of this

study. According to Setia (2016), the design of the cross-sectional study is a type of observational study design, and the investigator measures the outcome and variables in the participants of the study at the same.

Survey and questionnaire

In this study, respondents were given a questionnaire with five sections. The first section covers consumers knowledge on stingless bee honey. The second section is related to consumers attitude on local stingless bee honey. The third section covers consumer practice on stingless bee honey whereas the fourth section questions cover respondents' preference. The fifth section is about demographic profile questions such as gender, age, highest education level attained, monthly income range and ethnicity. Šedík et al. (2023), Zanchini et al. (2022), Andrade et al. (2020), Lim et al. (2020) as well as Saludin et al. (2019) are the studies referred and adapted in developing the questionnaire of this study. The survey was carried out online via sharing the Google form link, and respondents were invited to take part in the study by personally contact using WhatsApp. In total, the survey received 301 responses from all over the Klang Valley.

Sub-title/topic Study location, duration, population, inclusion and exclusion criteria

The study location for this study was done in Klang Valley area. Based on the development of Klang Valley shown that this state is excellent in accessibility; as the result, many expressways have been developed such as the Federal Highway and public transports such as Light Rail Transit (LRT) is used to connect the community and avoid traffic jams during the working days (Devaraj, 2024). This study was carried out from July 2024 until October 2024 among the honey consumers in Klang Valley. Malaysian citizens in Klang Valley who consumed stingless bee honey. The population of Klang Valley in 2023 is approximately 7.5 million people (DOSM, 2024). For inclusion, citizens of Malaysia aged 18 years old and above in Klang Valley; while exclusion criteria refer to citizens of Malaysia aged below 18 years old in and outside Klang Valley.

Sampling unit

Sampling method applied in this study is convenience sampling. Convenience sampling is a method where respondents were selected based on ease and availability of respondents. According to Mishra (2020), the sample size is an important element to be considered because it can give an effect on how the sample findings can precisely represent the population. Larger sample size is more likely to generalize an accurate reflection of the population (Ahmad et al., 2023).

Reliability of questionnaire

Before the actual data collection, the questionnaire was pre-tested among 35 respondents. Using the Cronbach alpha coefficient, internal consistency was analysed. A few adjustments were made after pre-testing the questionnaire by removing unnecessary items. Cronbach's alpha is a method used to evaluate reliability by measuring the proportion of shared variance among the items in an instrument compared to the total variance (Collins, 2007). The Cronbach alpha obtained was

suitable and acceptable such as knowledge α=0.99, attitude α=0.72, practice α=0.76. Alpha values were categorized into many categories which are excellent (>0.90), good (>0.80-0.90), acceptable (>0.700.80), and below that 0.70 will be considered as questionable (Taber, 2017).

Ethical considerations, data collection and data analysis

All respondents who agreed to participate were provided written informed consent. Ethical approval for this study was granted by the Jawatankuasa Etika Universiti Putra Malaysia (JKEUPM). The respondents' answers and data are confidential and for academic purposes only. The ethical approval number is JKEUPM-2024-578. The raw data were collected based on the five sections and all the data were obtained from the respondents themselves. The respondents were asked to answer and complete the questionnaire by themselves based on their knowledge and submitted the questionnaire as they finish answering via Google Form. A total of 301 respondent's data were analyzed using descriptive analysis, independent t-test, and analysis of variances (ANOVA) were performed using IBM Statistical Package for the Social Sciences (SPSS) version 29.0. This software, extensively utilized for data analysis, concentrates specifically on statistical analysis centered around variables. It employs a comprehensive and methodical series of processes that are crucial for ensuring that the resulting analysis is both valid and pertinent to the research objectives (Sheard, 2018). Descriptive analysis was employed to ascertain the frequency and percentage of the demographic profiles of the respondents and stingless bee honey consumers. Meanwhile, the knowledge, attitudes and practices of consumers towards stingless bee honey were expressed using mean values and standard deviations. The comparison between demographic profile with knowledge, attitude and practice were analyzed using t-test and one-way ANOVA.

Results and Discussion

Socio-demographic characteristics of respondents

Total number of respondents selected for this study was 301 through google form. The response rate was 100%. According to Fincham (2008), the survey response rate was calculated according to the number of questionnaires returned divided by the total sample been sent. Types of analysis covered in this study were descriptive analysis, independent t-test, and analysis of variances (ANOVA) were performed using IBM Statistical Package for the Social Sciences (SPSS) version 29.0. Socio-demographic indicators of stingless bee honey consumers in Klang Valley consisted of gender, age range, highest education level attained, monthly income range, marital status and ethnicity. From 301 respondents (*Table 1*), 46.8% of the respondents were male and 53.2% were female. In year 2023, the population of Malay ethic is 58.0%, Chinese ethnic is 22.6%, and Indian ethnic is 6.6% (DOSM, 2024). Malay ethnics contribute to the highest number of respondents in this study which is 92.4%. Out of 301 respondents 57.5% of them were still single. Majority of respondents attained a bachelor's degree as their highest education level, accounting for 71.8% of the sample. According to Curtin et al. (2000), more educated individuals are more likely to participate in surveys than those with lower education levels. Meanwhile, respondents with a monthly income of less than RM1000 were the most common, making up 41.2% followed by those earning

above RM5000, who comprised 33.2% of the total respondents. Additionally, *Table 1* shows the age range of 21-30 as the highest number of respondents, making up to 55.1% who involved in this study. Females represented a slight majority, with 53.2% of the respondents being female, compared to 46.8% male. Overall, respondents with an income of less than RM1000, those aged 21-30, and females had the highest representation in the questionnaire responses.

Table 1. *Socio-demographic profile of stingless bee honey consumer in Klang valley*.

Socio-demographic factors	Frequency [N] (Percentage [%])
Gender	
Male	141 (46.8%)
Female	160 (53.2%)
Age	
18-20	5 (1.7%)
21-30	166 (55.1%)
31-40	30 (10.0%)
41-50	39 (13.0%)
51-60	55 (18.3%)
Above 60	6 (2.0%)
Highest education level attained	
Primary school	0 (0.0%)
Secondary school	15 (5.0%)
Certificate/Diploma	47 (15.6%)
Bachelor's Degree	216 (71.8%)
Master's Degree	21 (7.0%)
Doctor of Philosophy	2 (0.7%)
Monthly income range	
Less than RM1000	124 (41.2%)
RM1000-RM1999	19 (6.3%)
RM2000-RM2999	29 (9.6%)
RM3000-RM3999	11 (3.7%)
RM4000-RM4999	18 (6.0%)
Above RM5000	100 (33.2%)
Marital status	
Single	173 (57.5%)
Married	128 (42.5%)
Ethnicity	
Malay	278 (92.4%)
Chinese	12 (4.0%)
Indian	10 (3.3%)
Sabah's native	0 (0.0%)
Sarawak's native	0 (0.0%)
Others	1 (0.3)

Level of respondents' knowledge towards stingless bee honey

Nine questions were created to access the respondents' knowledge towards stingless bee honey. The answer of the questions should be either "True" or "False". Each question was assigned a value of either 1 or 0, where a correct answer was given a value of 1 and an incorrect answer was given a value of 0. Therefore, the overall score for the 9 knowledge questions would range from 0 to 9 points. The respondents' knowledge

levels were categorized based on Bloom's cut-off point, where if the score was between 80 and 100% (7-9 points), thus it is considered as good. If the score was between 50 and 79% (46 points) it is considered as moderate, and if the score was less than 50% (<4 points) thus, it is considered as poor. *Table 2* shows majority of the respondents (87.7%) had good knowledge on stingless bee honey. Based on the result obtained in Table 3, knowledge question number 1 which is about stingless bee honey benefits such as antimicrobial, antioxidant and antiinflammatory (Gadge et al., 2024) has the highest number of correct answer (100.0%). The respondents seem to be aware that stingless bee honey contains many benefits. However, only 67 out 301 respondents (22.3%) have correctly answered question number 3 which test the respondents' knowledge on level of moisture content in stingless bee honey. The moisture level in stingless bee honey differs from other types of honey where most people may not realize that stingless bee honey has higher moisture content than other types of honey. The respondents might be able to score question 3 correctly if they have tasted or consumed the different kinds of honey. Nascimento et al. (2015) mention that stingless bee honey has a higher moisture content compared to other types of honey (*Table 3*).

***Table 2**. Distribution of the knowledge of respondents.*

Category	Percentage (%)
Good (score≥80%)	87.7
Moderate (score between 50 and 79%)	12.3
Poor (score≤50%)	0.0

***Table 3**. Distribution of respondents (%) according to knowledge questions (n=301).*

Questions	True	False
1. Stingless bee honey has many benefits such as antimicrobial, antioxidant, and anti-inflammatory.	100.0	0.0
2. Stingless bee honey can be stored at room temperature.	97.7	2.3
3. Stingless bee honey has lesser moisture content compared to other types of honey.	77.7	22.3
4. Stingless bee honey has its own standard or regulation.	94.0	6.0
5. Stingless bee honey can promote wound healing and skin regeneration due to its antimicrobial properties.	92.0	8.0
6. Refrigeration is not necessary for preserving the quality of stingless bee honey.	85.7	14.3
7. Stingless bee honey is known to treat respiratory disease like coughing.	97.0	3.0
8. Stingless bee honey has a sweeter taste compared to other types of honey.	47.2	52.8
9. Stingless bee honey shall be placed in clean, dry, and sealed food-grade containers as required by the Malaysia Standard of Stingless Bee Honey.	97.3	2.7

The range of stingless bee honey moisture content is 21.52-31.00% and moisture content of Tualang honey is 17.53-26.51% (Mohd Kamal et al., 2021). Question number 6 with similar objectives as question 3 showed 85.7% respondents have incorrectly justified not to refrigerate stingless bee honey to preserve its quality. Al-Diab and Jarkas (2015) stated that refrigeration helps to preserve honey such as citrus, anise and stingless bee quality by slowing down the increase of hydroxymethylfurfural (HMF) level because increasing level of HMF will lower the honey antioxidant properties and reducing its health benefits. Again, question number 8 with similar intention as question number 3 and showed only 52.8% (159 out of 301 respondents) have correctly answered on which stingless bee honey should not have sweet taste. This showed 47.2% (142 out of 301 respondents) may have low frequency of stingless bee honey consumption or less knowledge on the stingless bee honey which led them to choose the wrong answer on question number 8. Respondents who do not consume stingless bee honey regularly or never consume it, might not be familiar with its unique taste compared to other type of honeys. A study by Ng et al. (2024) found that stingless bee honey has a unique taste profile, characterized by its tanginess and sourness, which sets it apart from other types

of honey. This unfamiliarity could lead them to incorrectly assume stingless bee honey sweeter compared to other type of honey. Based on research by Ab et al. (2023), on KAP of honey health benefits among community in Malaysia, majority of their respondents also have good knowledge towards honey (Apis mellifera) which is 46.3% of the respondents.

Respondents' attitude towards stingless bee honey

There were 5 questions created to identify the attitude of the respondents towards stingless bee honey. These questions were used to indicate the level of awareness of the consumer related to stingless bee honey. The questions were in objective format, with the 5-Likert scale. The range of answer is from strongly disagree to strongly agree. *Table 4* shows the percentage of respondents' attitude towards stingless bee honey with mean between 4.05±0.75 to 4.53±0.60. Mean is a common way to report the average value and variability of a dataset where mean indicates the average value of the dataset and standard deviation show how much the values in the dataset deviate from the mean. The attitude of respondents is measured by the percentage of score achieved by the respondents. In this study, respondents who scored 1-2 was grouped as "Poor", scored 3 grouped as "Neutral", and scored 4-5 was grouped as "Good". Higher Mean indicates stronger agreement or belief in the statement while lower standard deviation suggests greater consensus or agreement among respondents (Myers et al., 2010). Most of the respondents believed that stingless bee honey has many health benefits with mean (4.53±0.60). Followed by question number 3 which stated 'I believe in medicinal usage of stingless bee honey' with mean (4.41±0.63). This is because there are many studies which highlighted the health benefits of stingless bee honey. Gadge et al. (2024) stated that stingless bee honey has benefit like antimicrobial, antioxidant and anti-inflammatory. Zulkifli et al. (2023) reported that singles bee honey has potential to reduce the risk of chronic disease such as heart disease and cancer. However, question number 4 (I like the taste of the stingless bee honey) received the lowest with mean (4.05±0.75). This may define that they may not like the unique taste of stingless bee honey. Nowadays, many consumers are choosing foods for its health benefits rather than just for its taste because they are aware of how their diet affects health (Jayaraj and Sharma, 2024). The high percentage of "Agree" responses across the survey questions reflects positive consumer sentiment towards stingless bee honey, which is advantageous for the industry. The positive perception may also indicate a growing market demand, which benefits producers and sellers by driving up sales (Grunert, 2005). Additionally, positive consumer attitudes provide a solid foundation for effective marketing and promotional campaigns, which can attract new customers and enhance the product's market reputation (Kotler and Armstrong, 2010).

Table 4. *Percentage of respondents' attitude towards stingless bee honey.*

Question	SD	D	A/D	A	SA	M±SD
I trust the safety of stingless bee honey sold locally	0.0	4.0	12.6	54.2	29.2	4.09±0.76
I believe that the stingless bee honey produced in Malaysia is high in quality	0.3	1.3	9.3	55.8	33.2	4.09±0.68
I believe in medicinal usage of stingless bee honey	0.7	0.0	3.7	49.5	46.2	4.41±0.63
I like the taste of the stingless bee honey	0.3	2.3	17.3	52.2	27.9	4.05±0.75
I believe that stingless bee honey has many health benefits	0.7	0.0	1.0	42.9	55.5	4.53±0.60

Note: SD=Strongly Disagree; D=Disagree; A/D=neither Agree nor Disagree; A=Agree; SA=Strongly Agree; M=Means; SD=Standard Deviation.

Respondents' practice on stingless bee honey

There were 4 questions created to identify the consumer practice level. *Table 5* shows the percentage of respondents' practice and the mean score. The questions were all in objectives form, and the range of five scales, which consist of "Never", "Rarely", "Sometimes", "Frequently" and "Always". In this study, respondents who scored 1-2 was grouped as "Poor", scored 3 grouped as "Neutral", and scored 4-5 was grouped as "Good". In this study, respondents who scored 1-2 was grouped as "Poor", scored 3 grouped as "Neutral", and scored 4-5 was grouped as "Good". First question (How often do you consume stingless bee honey?) received the highest mean score (2.39±0.78) compared to other questions. However, the mean value is still considered as low, where lower mean score indicates respondents have a lower level of agreement in a particular statement (Myers et al., 2010). This moderate level of consumption indicates a need for increased awareness and promotion of the benefits of stingless bee honey to encourage more regular usage. Previous study state that effective awareness and promotion strategies can significantly influence consumer behaviour and practice towards a product. Third question (How often do you use stingless bee honey for home cooking?) received the lowest mean score (1.55±0.73). The unique taste of stingless bee honey can be a significant factor and has limited use for cooking because unlike regular honey, which has a sweet and mild flavour, stingless bee honey often has a tangier, slightly sour taste (Ng et al., 2024). Next factor also due to the price of the stingless bee honey which is a little expensive. Soh et al. (2021) stated that stingless bee honey is expensive due to its limited production and labour-intensive.

Table 5. *Percentage of respondents' practice.*

Question	N	R	S	O	A	M±SD
How often do you consume stingless bee honey	10.6	47.8	33.9	7.3	0.3	2.39±0.78
How frequent do you seek information on the benefits and uses of local stingless bee honey?	15.6	46.5	31.6	5.3	1.0	2.30±0.83
How often do you use stingless bee honey for home cooking?	58.8	27.2	14.0	0.0	0.0	1.55±0.73
How often do you use stingless bee honey as traditional medicine?	22.6	32.9	31.9	9.6	3.0	2.38±1.03

Note: N=Never; R=Rarely; S=Sometimes; O=Often; A=Always; M=Means; SD=Standard Deviations.

Mean comparisons of the knowledge, attitudes and practices of consumers based on demographic profile

The independent samples t-test and analysis of variance (ANOVA) were conducted to test statistical significance and compare the differences between mean values of the three variables, which are the knowledge, attitude, and practice between the variety of demographic characteristics of respondents. A one-way between-groups ANOVA is a statistical test used when you have one independent variable with three or more groups or categories, and to determine if there is a significant difference in a continuous outcome variable among these groups (Pallant, 2020).

Age

The differences in age groups were analyzed using ANOVA to compare the mean scores of these groups on three variables: knowledge, attitude, and practice regarding stingless bee honey. The F value represents the ratio of the variance between group means to the variance within groups. A higher F value indicates that the group means are more dispersed compared to the variability within the groups, implying a significant

difference between the groups. The P value indicates the likelihood that an observed difference arose purely by chance, aiding in assessing the statistical significance of the results. P value below 0.05 generally suggests that the differences observed are statistically significant and not attributed to random variation. The analysis from *Table 6* indicates that there is no significant difference between consumer knowledge and the different age groups (p=0.429), showing that different ages have a similar level of knowledge about stingless bee honey. However, there is a significant difference in both attitude and practice across the different age groups (*Table 6*). The oneway ANOVA revealed significant differences in attitudes (p=0.011) and practices (p<0.001) towards stingless bee honey. According to the post-hoc Tukey test, respondents aged 41-50 exhibited the highest level of positive attitude towards stingless bee honey with mean (21.87±2.117) and had the highest level of practice with mean (9.69±2.745). This suggests that individuals in this age range may have a greater appreciation for the benefits of stingless bee honey and are more likely to incorporate it into their daily routines, possibly due to increased health awareness and disposable income. Šedík et al. (2023) stated that older people higher tendency to purchase honey compared to youngster. In contrast, previous study by Wahab and Salahudin (2024) found no significant difference in consumer attitudes towards stingless bee honey based on age groups which are under 20 years old, 21-30 years old, 31-40 years old, 41-50 years old, and above 51 years old (p=0.81).

Table 6*. Comparison of consumer knowledge, attitude and practice towards stingless bee honey based on demographic profile.*

Category	A	B	C	D	E	F	G	H	I	J
Age			0.981	0.429					10.715	<0.001
18-20	5	7.80± 0.84			21.20± 2.17	3.015	0.011	9.00± 3.46		
21-30	166	7.30± 0.90			21.33± 2.31			7.54± 2.28		
31-40	30	7.47± 0.82			21.00± 2.63			7.69± 2.17		
41-50	39	7.51± 0.64			21.87± 2.12			9.65± 1.97		
51-60	55	7.47± 0.69			21.81± 2.55			9.33± 1.03		
Above 60	6	7.50± 0.84			17.83± 4.62			9.33± 1.03		
Gender			0.027	0.979		-1.172	0.242		-1.481	0.140
Male	141	7.39± 0.88			21.09± 2.59			8.16± 2.44		
Female	160	7.39± 0.79			21.43± 2.33			8.59± 2.52		
Ethnicity			0.643	0.423		0.401	0.527		6.966	0.009
Malay	278	7.38± 0.81			21.29± 2.47			8.50± 2.47		
Non-Malay	23	7.52± 1.04			20.96± 2.33			8.61± 2.40		
Educational Level			2.206	0.068		3.322	0.011		3.819	0.005
Primary school	0	0.00± 0.00			0.00± 0.00			0.00± 0.00		
Secondary school	47	7.74± 0.96			21.36± 2.48			8.37± 2.48		
Certificate/Diploma	47	7.71± 1.06			20.53± 2.61			7.94± 2.67		
Bachelor's Degree	216	7.44± 0.81			21.13± 2.32			8.54± 2.61		
Master’s Degree	21	7.62± 0.92			21.26± 2.65			9.42± 2.61		
Doctor of Philosophy	2	7.00±1. 41			22.06± 0.68			3.91± 0.68		
Income Group			1.247	0.287		1.247	0.287		3.260	0.007

Less than RM1000	124	7.33± 0.94	21.43± 2.43	7.73± 2.32
RM1000–RM1999	19	7.21± 0.92	22.11± 2.11	8.05± 2.30
RM2000–RM2999	29	7.28± 0.59	20.17± 2.16	7.14± 2.45
RM3000–RM3999	11	7.82± 1.17	19.36± 3.23	8.73± 2.69
RM4000–RM4999	18	7.39± 0.78	21.17± 2.12	8.61± 2.40
Above RM5000	100	7.48± 0.66	21.46± 2.47	9.56± 2.28

Note: A=Frequency (N); B=Mean±Standard Deviation; C=Knowledge F or t-value (between group); D=p-value (between group); E=Mean±Standard Deviatin; F=Attitude F or t-value (between group); G=p-value (between group); H=Mean±Standard Deviatin; I=Practice F or t-value (between group); J=p-value (between group).

Gender

An independent samples t-test was performed to investigate the differences in knowledge, attitudes, and practices regarding stingless bee honey between male and female participants. An independent-samples t-test is a statistical method used to compare the mean scores of continuous variables between two groups of participants (Pallant, 2020). The analysis from *Table 6*, indicated that there was no statistically significant difference between males and females in terms of knowledge (p=0.979), attitude (p=0.242), and practice (p=0.140) towards stingless bee honey. These findings suggested that both male and female participants possess similar levels of knowledge, hold comparable attitudes, and exhibit equivalent practices regarding stingless bee honey. This aligns with previous study by Wahab and Salahudin (2024), who found no significant differences in attitudes towards stingless bee honey between genders (p=0.93). This study across studies highlighted that gender did not play a significant role in influencing individuals' perceptions and behaviours towards stingless bee honey.

Ethnicity

The differences between ethnic Malay and non-Malay groups regarding their knowledge, attitudes, and practices towards stingless bee honey were analyzed using ANOVA. *Table 6* shows that there is no significant difference in knowledge (p=0.423) and attitude (p=0.527) towards stingless bee honey between these groups. This indicates that both Malay and non-Malay respondents possess similar levels of knowledge and attitudes regarding stingless bee honey. However, a significant difference was found in the practice of consuming stingless bee honey between the two groups (p=0.009) as shown in *Table 6*. The post-hoc Tukey test indicated a statistically significant difference in practice, with Malay respondents showing a higher level of practice with mean (8.50±2.465) compared to non-Malay respondents with mean (7.09±2.410). This suggests that Malay ethnic is more likely to incorporate stingless bee honey into their daily routines, which may be influenced by cultural factors, traditional practices, or greater awareness of its benefits within the Malay community. Previous study by Wahab and Salahudin (2024) also found no significant difference in consumer attitudes towards stingless bee honey based on ethnicity (p=0.19).

Educational level

This study used a one-way ANOVA analysis to investigate the differences in knowledge, attitude, and practice towards stingless bee honey among different educational levels. The analysis from *Table 7* showed no significant difference in knowledge across educational backgrounds (p=0.068), indicating that knowledge about stingless bee honey is consistent regardless of educational attainment. However, there was a significant difference in attitudes towards stingless bee honey (p=0.011) in *Table 7*. According to the post-hoc Tukey test, respondents with a bachelor's degree had the highest level of positive attitude with mean (21.50±2.375), closely followed by those with a master's degree with mean (21.48±2.657). This suggests that higher educational attainment may be associated with a more favourable attitude, potentially due to greater exposure to information about the health benefits of stingless bee honey. Moreover, *Table 6* identified a significant difference in the practice of consuming stingless bee honey across different educational levels (p=0.005). The post-hoc Tukey test revealed that respondents with a master's degree exhibited the highest level of practice with mean (8.90±2.606), suggesting that individuals with advanced education are more likely to incorporate stingless bee honey into their routines, possibly due to increased health consciousness and better access to information. In contrast, previous study by Wahab and Salahudin (2024) found no significant difference in consumer attitudes towards stingless bee honey based on educational level (p=0.19), highlighting potential differences in findings across various contexts or populations.

***Table 7**. Summary of respondents' preferences towards stingless bee honey.*

Question	Answer	Frequency (N)	Percentage (%)
How did you know about stingless bee honey?	Friends	64	21.3
	Family	90	29.9
	Online articles	26	8.6
	Television	17	5.6
	Books or magazines	10	3.3
	Social media	75	24.9
	Local stores	19	6.3
What is the most significant factor influencing your choice?	Health benefits	168	55.8
	Social influence	17	5.6
	Unique flavour	18	6.0
	Availability and accessibility	89	29.6
	I prefer imported honey	9	3.0
Where do you usually purchase stingless bee honey?	Supermarket	39	13.0
	Specialty health food store	55	18.3
	Farmers' market	66	22.6
	Online store	26	8.6
	Directly from beekeepers	113	37.5
Do you prefer raw or processed honey?	Raw honey	229	76.1
	Processed honey	72	23.9
What type of packaging do you prefer?	Glass bottle	276	91.7
	Plastic bottle	25	8.3
Which volume or size of the bottle do you prefer when buying stingless bee honey?	50 ml	50	16.6
	100 ml	102	33.9
	250 ml	123	40.9
	300 ml	19	6.3
	500 ml	7	2.3

Income

Based on the *Table 6* analysis, it was found that there is no significant difference on the knowledge of stingless bee honey among different income groups (p=0.287), showing that people with different income have a similar level of knowledge about stingless bee honey. However, the analysis from *Table 6* revealed a statistically significant difference in attitudes towards stingless bee honey (p=0.007). The post-hoc

Tukey test indicates that respondents with an income range of RM1000-RM1999 displayed the highest level of positive attitude towards stingless bee honey with mean (22.11±2.105). This could be due to the perception of stingless bee honey as an affordable yet beneficial health product within this income bracket. Furthermore, there was a significant difference in the practice of consuming stingless bee honey among different income groups ($p<0.001$) in *Table 6*. The post-hoc Tukey test revealed that respondents with an income exceeding RM5000 had the highest level of practice concerning stingless bee honey consumption with mean (9.56±2.284). This suggests that higher-income individuals are more likely to incorporate stingless bee honey into their diets, possibly due to greater disposable income and increased health awareness. This finding is similar with Wahab and Salahudin (2024), who also found a significant difference between consumer attitudes and income groups ($p<0.04$).

Respondents' preference towards stingless bee honey

Based on the data obtained from previous table, 29.9% of the respondents know about stingless bee from their family. Almeshal and Almawash (2023) stated that family members play a significant role in spreading knowledge and awareness. Next, 24.9% of the respondents know about stingless bee from social media. Social media is an excellent platform for sharing information quickly and widely because people may see posts from their friends, influencers, or advertisements that introduce them to stingless bee honey (Sikder et al., 2024). A few respondents knew it from their friends with a small percentage of 21.3%. Word-of-mouth among peers also help to spread knowledge and awareness Almeshal and Almawash (2023). For example, friends might share their personal experiences on consumption of the stingless bee honey, recommend it during conversations, or as a gift. Only a small percentage of respondents know about stingless bee honey from online articles, local stores, television, from books or magazines which are 8.6%, 6.3%, 5.6% and 3.3%. In this study, the most significant factor that influences respondents to consume stingless bee honey is health benefits with the percentage of 55.8%. This shows that more than half of the respondent believe that consuming stingless bee honey can positively impact their health. Saludin et al. (2019) stated that stingless bee honey is gaining popularity among Malaysian people due to its health benefits, like high in antioxidant and anti-inflammatory activities. The second significant factor that influences respondents is availability and accessibility which the percentage is 29.6%. This means that over a quarter of the respondents will choose to consume stingless bee honey if it's readily available and easy to purchase. Lim et al. (2020) mention that availability and accessibility of honey will influence customer practice. If they can find it in nearby stores, online shops, or local markets without much hassle, they're more likely to buy and use it. For example, if stingless bee honey is stocked in their regular grocery stores or offered at affordable prices, it becomes a convenient option for them. However, factors such as social influence and unique flavour only contribute a small percentage which are 5.6% and 6.0%. Only 3.0% percent of the respondents that prefer imported honey compared to our local stingless bee honey.

The largest group of respondents which are 37.5%, prefers to buy stingless bee honey directly from the beekeepers. This shows that many people trust the beekeepers for the freshest and most authentic honey. According to Roman et al. (2013) consumer prefer buying honey directly from beekeepers because they believe it ensures freshness, authenticity, and the opportunity to taste test the product. Next, about 22.6% of

respondents purchase their stingless bee honey from farmers' markets. This is because sometimes beekeepers sell their honey at the farmers' markets. Another 18.3% buy their honey from specialty health food stores. People might choose these stores for their reputation of carrying pure and organic products. Lower percentage than specialty health food stores, 13.0% of respondents, get their stingless bee honey from supermarkets. The smallest group of respondents which is 8.6%, prefers to buy their honey online. Furthermore, high number of respondents (76.1%) prefer raw honey. This may reflect that many people like honey in its natural, unprocessed form. A smaller portion of respondents which is 23.9%, prefer processed honey. For the packaging of stingless bee honey, 91.7% of the respondents prefer glass bottle packaging and only 8.3% of the respondents prefer plastic bottle packaging. This show that respondents have good knowledge about the packaging materials. According to Yiğit et al. (2024), glass is a non-reactive material which it does not react with the honey and helps preserve its natural flavour and quality. Regarding the preferred bottle size for purchasing stingless bee honey, most respondents showed a preference for the 250 ml bottle, with 40.9% had chosen this size. followed by the 100 ml bottle; 33.9% of the participants. A smaller portion of respondents preferred the 50 ml bottle, accounting for 16.6%. The 300 ml bottle was less popular, with only 6.3% of respondents selecting it, and the 500 ml bottle was the least preferred, chosen by just 2.3% of the participants. These findings suggest that consumers generally prefer medium-sized bottles of stingless bee honey, likely due to a balance between cost, quantity, and convenience. Significantly lower preference for larger bottles might be due to higher costs or the desire for freshness by purchasing smaller amounts more frequently.

Conclusion

This study aimed to identify consumer knowledge, attitudes, and practices (KAP) towards stingless bee honey in Klang Valley, Malaysia, as well as to examine the effect of demographic factors on its consumption pattern. This study indicates that most respondents have some knowledge on the benefits of stingless bee honey but there were notable areas where their understanding is lacking. Specifically, only 22.3% were aware of its high moisture content, and 85.6% mistakenly believed that it did not require refrigeration for preservation. These results highlight the need for education initiatives on stingless bee honey to correct the misunderstandings and improve consumer awareness of the distinctive characteristics of stingless bee honey. Consumer attitudes toward stingless bee honey were generally positive, with significant trust in its safety, quality, and medicinal benefits. However, the actual practices did not reflect these attitudes, as the average consumption frequency was quite low, with a mean score of 2.39. Moreover, the usage of stingless bee honey in traditional medicine and cooking was minimal, likely due to its tangy taste and higher cost compared to other types of honey. This gap between positive attitudes and limited practices highlights the need for initiatives that not only to raise consumer awareness but also to address the issues of affordability and taste to encourage more regular use. Demographic factors influence the consumption patterns of stingless bee honey. The highest levels of positive attitudes and practices were observed among respondents aged 41-50, likely due to greater health awareness and disposable income. Malay respondents exhibited higher consumption practices, reflecting their cultural familiarity and traditional use of the product. Higher educational levels were linked to more favourable attitudes and better practices,

indicating that access to health-related information is influential. Income also affected practices, with those earning over RM5000 consuming more frequently due to increased affordability. These findings underscore the need for marketing and education strategies that account for demographic differences to effectively enhance consumption. As for recommendations, conducting research in regions outside of Klang Valley could yield a more comprehensive understanding of consumer Knowledge, Attitude, and Practices (KAP) across Malaysia. Future research should focus on individuals who are employed to gain a better understanding of this demographic's knowledge, attitudes, and practices. To enhance the accuracy of future research, improvements are needed. The current study had a limited sample size of only 23 respondents from non-Malay ethnic groups. Expanding the sample size and diversity in future studies will provide more reliable and representative results.

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Conflict of interest

The authors confirm that there is no conflict of interest involve with any parties in this research study.

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