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Consumer knowledge and consumption pattern of chocolate in Malaysia

Abstract

In terms of socio-demographic, women scored higher in attitudes to chocolate questionnaires than male with significant relationship between genders and chocolate consumption pattern. Limited studies on the patterns of local consumer consumption such as consumer preference for chocolate types, frequency of chocolate consumption and chocolate buying factor are carried out. The objectives of this study are to determine the knowledge of chocolate and emulsifier among consumer in Malaysia, to identify consumers' chocolate consumption pattern and to assess the association between the knowledge on chocolate and emulsifier with the chocolate consumption pattern according to the socio-demographic profile. Online questionnaire using Google Form platform is used and validated with reliable Cronbach alpha obtained α=0.743. Half of the respondents (53.5%) had poor score on knowledge level about chocolate and emulsifier. On the other hand, most of consumers in Malaysia preferred milk chocolate (52.8%) the most compared to dark chocolate (35.8%) and white chocolate (11.4%). Craving and like the taste of chocolate are the significant factor ($p< 0.05$) affecting the chocolate consumption for age range and marital status of the Malaysia consumers. This study may benefit the local community to be more aware and knowledgeable regarding chocolate.

Keywords: Socio-demographic, emulsifier, dark chocolate, milk chocolate, online questionnaire

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Introduction

Background

Chocolate is a widely consumed food in the world. Humans have eaten foods and drinks made from Theobroma cacao tree (cocoa or cacao) since at least 460 AD.[1] Seligson et al.,[1] also stated that the first solid chocolate was produced by adding extracted cocoa butter to ground roasted beans and sugar. Dark chocolate was manufactured commercially from 1847, whereas the Swiss invented milk chocolate in 1876 by processing ground cocoa with sugar and dried milk. According to Young et al.,[2] chocolate is a worldwide increasingly popular agricultural product. The study reported that over the past 100 years, demand for cacao has increased by 3% every year. Today, there is an estimated five to six million cacao farmers. Mohamed Arshad and Ibragimov[3] reported that cocoa beans production in Malaysia underwent a complete 'life cycle' from the infant industry in the 1970s, matured in the early 1980s, peaked in the early 1990s, and then declined rapidly to its level in the 1970s. The study also found that at the beginning of 2002, prices continued to rise by an increasing curve, even with some degree of volatility, before reaching a peak in 2014. Despite the price increase, the area and production of cocoa beans did not respond as they should. The area of cocoa estate declined significantly from 201,615 ha in 1989 to a mere 827 ha in 2014, which means a decrease of 99%, whereas the smallholder area declined approximately 92% from 212,621 ha to 15,243 ha[3,4] Over the past 15 years, Western European cumulative volume growth of chocolate production has been 23% and 60% in terms of value.[5]

One of the reasons the demand for chocolate increases is its benefits for human health. It is generally associated with pleasure and excitement, and has a wide range of medicinal benefits.[6] Chocolate is best known as an indulgent confection but has traditionally been eaten for its supposed medicinal powers.[7] Cacao and chocolate also contain significant concentrations of theobromine, a stimulant of the central nervous system contributing to the chocolate's bitter taste.[8]

Cocoa or cacao is the fatty dried and fully fermented seed of the cocoa tree, *Theobroma cacao*.[8] According to Katz et al., [9] cocoa liquor is the paste made from ground cocoa beans, which are roasted, shelled and fermented, called nibs. It contains solids of non-fat cocoa, as well as cocoa butter. Cocoa liquor stated on food packages is referred to as percentage of cacao. Katz et al.,[9,10] also mentioned that cocoa powder is made of cocoa butter extracted from the liquor while chocolate is a solid food made from cocoa liquor, cocoa butter and sugar.

Over the last decade, many issues regarding chocolate among consumers have initiated the interest in this study. Nowadays, halal problem is one of the most heard issues in the media or internet. This issue came up because a few ingredients like emulsifiers doubtfully came from animal sources that could be from non-halal sources or slaughtered in the wrong way. According to Farouk et al.,[11] with the use of Polymerase Chain Reaction (PCR) technique, two chocolate samples taken from various local hypermarkets in Malaysia contaminated with pork material or ingredients unknowingly as emulsifiers. Said et al.,[12] concluded that the consumers' perceptions and their level of knowledge towards Halal food products differ, although Muslim is more than 94 % of the respondents. The Government agencies perceive Halal knowledge, information and education as lacking. In addition, the study also reported that approximately 40 to 50% of consumers are highly religious.

Specific issues and knowledge can be detailed and measured using close-ended questionnaire.[13] It is important to gather information such as socio-demographic characteristics to profile the knowledge level of a community in a survey. As mentioned by Roopa and Menta Satya,[13] respondents will only answered honestly if their identity is hidden and confidentiality is safely kept and secured, and when verified with other studies that have resources to pursue other data collection strategies, verifying with other findings as questionnaires can be helpful confirmation tools. Mu et al.,[14] reported that it was significantly correlated with "craving and emotional chocolate eating" in women however, it was not significantly correlated in

men. They also stated that the taste pleasure may be a stronger factor for women's desire for chocolate than for men, but not because of women's higher pleasure ratings. Van Gucht et al.,[15] reported that in terms of socio-demographic, women scored higher in attitudes to chocolate questionnaires on almost all scales, but the relationship between genders and chocolate intake are significant to each other. A study by Van Gucht et al.,[15] on the attitudes, psychometric properties and relationship with consumption, dieting, disinhibition and thought suppression, they generally concluded that although the cravings were exclusively related more to chocolate consumption, they were not associated with higher Body Mass Index (BMI). According to a study by Bancroft et al.,[16] in the pre-menstrual phase, chocolate is by far the most commonly desired food. Rousseau[17] examined the impact of income on consumer choice and found that the high income of consumers has a positive effect on the intention of acquiring certified chocolate.

According to Jašić et al., [18–20] an emulsifier is one of the most essential ingredients in chocolate production that contributes to textural and taste quality. Fernandes et al.,[21] informed that in terms of fat and non-fat cocoa solids, chocolate's structure and sugar content influence their rheological characteristics. In addition, the study found that cocoa butter and emulsifier also form one of the constituents of the fat phase of chocolate, and emulsifiers coat sugar particles in the chocolate matrix to form the flow in cocoa butter simultaneously, it helps in the even distribution of emulsion particles, and prevents agglomeration. Lecithin and Polyglycerol Polyricinoleate (PGPR) are emulsifiers commonly used in chocolate.[22,23] Rogovska & Čukanová[24,25] conducted a study on the Slovakian consumer consumption pattern such as consumer preference on type of chocolate and frequency of chocolate consumption. Almost half of the Slovakian consumers in the study do not know what functional foods were. None reported on local consumers awareness or knowledge on chocolate and ingredients used including emulsifier.

However, limited study has been conducted locally on consumer's awareness of the accurate information about chocolate and emulsifier used as ingredients and their consumption pattern. This study may benefit the local community to be more aware and knowledgeable regarding chocolate. Therefore, the objectives of this study were:

1. To determine the knowledge level of chocolate and emulsifier among consumer in Malaysia.

2. To identify consumers' chocolate consumption pattern.

3. To access the association between the knowledge on chocolate and emulsifier with the chocolate consumption pattern according to the socio-demographic profile.

Conceptual framework

Figure 1 shows the conceptual framework of the study which explains the variables that were measured in the study. Socio-demographic and chocolate consumption pattern were the independent variables while knowledge on chocolate and emulsifier was the dependent variable.

Materials and method

Study design

The study was conducted to determine the chocolate consumption behaviours among Malaysians and their knowledge level on composition and application of emulsifier in chocolate. The cross-sectional study design is the most suitable and appropriate study design to achieve the objectives of this study. According to Setia,[26] the design of the cross-sectional study is a type of observational study design, and the investigator measures the outcome and exposures in the participants of the study at the same. According to Brugha and Meltzer[27] the cross-sectional surveys examine the relationship between two variables, whereas prospective surveys allow the researcher to examine the problem of uncertain causality direction.

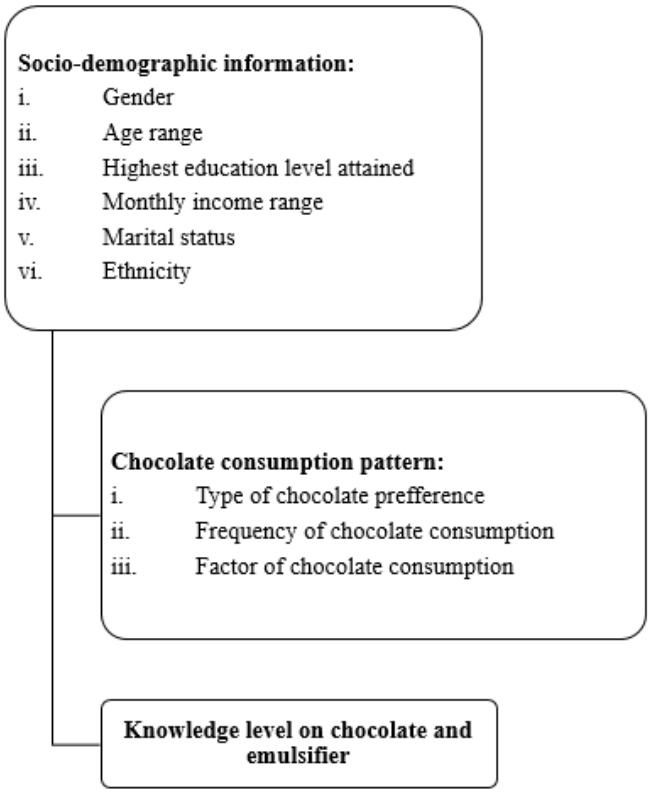

Figure 1 Conceptual framework on knowledge of chocolate and emulsifier among consumers in Malaysia

Survey and questionnaire

In this study, respondents were given a questionnaire with three sections. The first section covered was the actual choice experiment which consisted of a series of questions regarding knowledge about chocolate and emulsifier in chocolate. The second section concerned questions regarding the consumers' pattern of chocolate consumption such as type of chocolate preferences, how often they consume chocolate and chocolate eating factor. The third section is about socio-demographic questions such as gender, age, highest education level attained, monthly income range. Benton et al.,[28] Mu et al.,[14] Prete and Samoggia[29] Rousseau[17] and Thaichon et al.,[30] are the studies referred and adapted in developing the questionnaire of this study.

The survey was carried out online via Google form, and respondents were invited to take part in the study by email and WhatsApp. On 22 December 2020, about 15 individuals were asked to distribute the survey invitation to at least 5 other individuals. In total, the survey received 400 responses from all over the country.

Study duration

This study was carried out from February 2020 until February 2021 among the chocolate consumers in Malaysia.

Sampling

Study population

The study population was Malaysian citizens who consumed chocolate.

Inclusion criteria

Inclusion criteria were citizens of Malaysia aged 18 years old and above and consumed chocolate at least once in their lifetime.

Exclusion criteria

Malaysian citizens who were under 18 years old and non-Malaysian citizens were not included in the sample. Those who never consumed chocolate in their entire lifetime were not included in the sample as well.

Sampling unit

Sampling unit was a citizen of Malaysia who fulfil the inclusion criteria including 18 years and above and at least consumed chocolate once in their lifetime.

Quality control

Reliability of questionnaire

Before the actual data collection, the questionnaire was pre-tested among 30 respondents. Using the Cronbach alpha coefficient, internal consistency was analysed. A few adjustments were made after pre-testing the questionnaire by removing unnecessary items. The Cronbach alpha obtained was suitable and acceptable such as knowledge, α=0.743. For the two variables of the attitudes toward chocolate questionnaire, Van Gucht et al.,[15] calculated Cronbach's alpha, α was 0.91 (n = 407) for negative consequences and guilt, while α was 0.90 (n=413) for desire and emotional eating.

Validity of questionnaire

The questionnaire was a validated questionnaire which was adapted from previous publications by Benton et al.,[28] Mu et al.,[14] Prete and Samoggia[29] Rousseau[17] and Thaichon et al.,.[30]

Data collection

The raw data were collected based on the three sections mentioned at Survey and questionnaire section 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. Respondents email addresses were collected if any further clarification was needed, doubt and problem.

Data analysis

For statistical analysis of experimental data, the SPSS version 21, Curve expert software and variance analysis (ANOVA) was used.[31] Rabie Ashkezary et al.,[31–34] also mentioned that due to the uneven levels of the emulsifiers used in the formulas, the significance of the difference between samples was examined by Nested following Duncan's multiple range tests for mean comparisons (Table 1).

Table 1 Statistical analysis according to objectives.

No.	Objectives	Statistical analysis
1	To identify the knowledge of chocolate and emulsifier among consumer in Malaysia.	Descriptive analysis
		ANOVA
2	To identify consumers' consumption pattern of the chocolate consumption.	Descriptive analysis
		ANOVA
3	To profile the knowledge on chocolate and emulsifier with the chocolate consumption pattern according to the socio-demographic profile.	Chi-square test of independence
		ANOVA

For descriptive objectives, the statistical analysis used was descriptive analysis. Equally important, frequency, mean and standard deviation were measured in some variables. In addition, Chi-square test was used to test the relationship between variables for bivariate ansalysis.

Results and discussions

Socio-demographic characteristics of respondents

The total number of respondents selected for this study was 1743 through online in order to reduce physical contact due to the pandemic. The response rate was 22.95% which relates to 400 responses. According to Fincham[35] the survey response rate should be calculated according to the number of questionnaires returned divided by the total sample initially sent. Silva[36] found that most people use the Internet for entertainment and leisure, making the requests for the participation in research surveys limited, leading to a low response rate. Types of analysis covered in this study were descriptive analysis, ANOVA and chi-square test of independence.

Socio-demographic indicators of chocolate consumers in Malaysia consisted of gender, age range, highest education level attained, monthly income range, marital statuses and ethnicity. From 400 respondents (Table 2), 69.0% of the respondents were female and 31.0% were male. Curtin et al.,[37] reported that women are more likely to participate in questionnaire compared to men. Malays outnumbered the rest of other ethnicity by 80.3%. According to Baharuddin and Sharifudin[38] the study found that Malays prefer sweeter foods to other ethnic groups in West Malaysia. The population of Bumiputera in Malaysia including Malay ethnic is 61.8% of 30 million and above population,[39] contributing to the highest number of Malay ethnic as the respondents in this study. Out of the 400 respondents 70.3% of them were still single. It is because single people tend to spend more time on their phone during this pandemic situation. Hertel et al.,[40] have stated that individuals have been seen as lonely, warmer and more caring than married people.

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Table 2 Socio-demographic profile of chocolate consumers in Malaysia.

Socio-demographic factors		Frequency (%) (n=400)
Gender	Male	124 (31.0)
	Female	276 (69.0)
Age	18-20	22 (5.5)
	21-30	265 (66.3)
	31-40	22 (5.5)
	41-50	55 (13.7)
	51-60	34 (8.5)
	Above 60	2 (0.5)
Highest education level attained	Primary school	0 (0.0)
	Secondary school	22 (5.5)
	Certificate/Diploma	85 (21.3)
	Bachelor's Degree	259 (64.8)
	Master's Degree	27 (6.8)
	Doctor of Philosophy	7 (1.7)
Monthly income range	Less than RM1000	230 (57.5)
	RM1000 – RM1999	33 (8.3)
	RM2000 - RM2999	25 (6.3)
	RM3000 – RM3999	14 (3.5)
	RM4000 – RM4999	21 (5.2)
	Above RM5000	77 (19.3)
Marital status	Single	281 (70.3)
	Married	119 (29.8)
Ethnicity	Malay	321 (80.3)
	Chinese	30 (7.5)
	Indian	11 (2.7)
	Sabah's native	15 (3.7)
	Sarawak's native	20 (5.0)
	Others	3 (0.7)

Descriptive analysis was used

Majority of the respondents attained Bachelor's Degree as their highest education level (64.8%). Curtin et al.,[37] stated that in general, more educated people are more likely to participate in surveys than less educated people. Meanwhile, respondents that earned monthly less than RM1000 were found the most (57.5%). Table 2 shows that age range 21-30 and income less than RM1000 had the highest number of respondents answering the questionnaire respondents since during the pandemic situation, people at that age range spend more of their time with their own gadget for online class, online meeting and social media. Since this survey is conducted via online Google Form to reduce the risk of infection of Covid-19, this survey reached them more easily contributing to the highest number of respondents.

Level of respondents knowledge towards chocolate and emulsifier

Table 3 shows that majority of the respondents (53.5%) had poor knowledge on chocolate and emulsifier. By using ANOVA test, out of 21 questions of knowledge on chocolate and consumers, respondents who scored 13 and above are counted as good score while respondents who scored 12 and below are counted as poor score. Rogovska and Čukanová[25] mentioned in their study that nearly half said that they did not know the meaning of functional food, and more than one third of those surveyed did not know what functional foods were. However, the study also concluded that more than half of the respondents know that chocolate is a functional food.

Table 3 Distribution of the knowledge level of respondents.

	Category	n (%)
Knowledge	Good (score ≥ 60%)	186 (46.5)
	Poor (score ≤ 60%)	214 (53.5)

Based on the result obtained, there were 4 out 400 respondents obtained 100% score on the knowledge regarding chocolate and emulsifier. As shown in Table 4, K3 (90.3%) has the highest number of correct answers compared to K1 (68.2%) and K2 (39.8%). They seem to be more aware on how chocolate improves brain functions as an energy booster. According to Shafi et al.,[41] flavanols in chocolate helps produce brain hormones called endorphins which helped prevent depression. The K7 also has the highest number of correct answer (85.0%) compared to the incorrect answers, meaning that majority of respondents knew that dark chocolate is the most bitter chocolate compared to the other types of chocolate. Some of the respondents might have taste dark chocolate so that they know dark chocolate is the most bitter chocolate. Shafi et al.,[41] stated that dark chocolate is synonyms to less sweet or bitter chocolate because it is high in percentage of cocoa solid.

Table 4 Distribution of respondents (%) according to knowledge items (n=400).

Code	Variable	Study group N=400		
		Correct (%)	Not sure (%)	Incorrect (%)
General knowledge on chocolate				
K1	Chocolates loaded with antioxidants which are excellent for health.	**273 (68.2)**	112 (28.0)	15 (3.8)
K2	Chocolate helps to lower the risk of cardiovascular diseases and cancer.	**159 (39.8)**	179 (44.8)	62 (15.5)
K3	Chocolate improves brain function and helps to boost energy and focus.	**361 (90.3)**	28 (7.0)	11 (2.8)
K4	Dark chocolate is low in calories and helps to reduce body weight.	**284 (71.0)**	96 (24.0)	20 (5.0)
K5	Dark chocolate is the healthiest chocolate among all the chocolate types.	**319 (79.8)**	75 (18.8)	6 (1.5)
K6	Dark chocolate must contain at least 70% cocoa in the ingredients.	**232 (58.0)**	158 (39.5)	10 (2.5)
K7	Dark chocolate is the most bitter chocolate among all the chocolate types.	**340 (85.0)**	46 (11.5)	14 (3.5)
K8	Milk chocolate must contain at least 10% cocoa in the ingredients.	**127 (31.8)**	244 (61.0)	29 (7.2)
K9	White chocolate contains 0% cocoa in the ingredients.	**117 (29.3)**	173 (43.3)	110 (27.5)
K10	White chocolate contains high level of fat and contributes to obesity problems.	**201 (50.2)**	178 (44.5)	21 (5.3)

Table 4 Continued...

K11	White chocolate contains the highest amount of sugar in the ingredients compare to the other type of chocolate.	**223 (55.3)**	160 (40.0)	17 (4.3)
General knowledge on emulsifier				
K12	Soy lecithin is widely used as an emulsifier in chocolate.	**192 (48.0)**	205 (51.2)	3 (0.8)
K13	Emulsifier such as soy lecithin is used in chocolate to prevent the separation of water and fat.	**201 (50.2)**	196 (49.0)	3 (0.8)
K14	The quality of the chocolate will not be affected by the absence of emulsifier.	97 (24.3)	200 (50.0)	**103 (25.8)**
K15	Emulsifier is also used in products other than chocolate such as sauces and beverages.	**260 (65.0)**	129 (32.3)	11 (2.8)
K16	Emulsifier is important in chocolate.	**248 (62.0)**	141 (35.3)	11 (2.8)
K17	Emulsifier acts as a sweetener in chocolate.	92 (23.0)	197 (49.3)	**111 (27.8)**
K19	Emulsifier is produced only from animals.	**52 (13.0)**	196 (49.0)	152 (38.0)
K20	The presence of emulsifier is written on the product packaging.	**269 (67.3)**	116 (29.0)	15 (3.8)
K21	Emulsifiers are also produced from plants and synthetic material.	**233 (58.3)**	159 (39.8)	8 (2.0)

Note: K= knowledge question, bolded numbers are the correct answers

On the general knowledge of emulsifier, majority of respondents (51.2%) answered (K12) not sure that soy lecithin is widely used as an emulsifier in chocolate which might refers to majority of them are not aware on the usage of soy lecithin in chocolate. Jašić et al.,[18] stated that soy lecithin is the most widely used emulsifier in the production of chocolate, mainly due to its low cost and unique characteristics in reducing chocolate viscosity. On the other hand, majority of the respondent obtained correct answer at questions K20 (67.3%) and K21 (58.3%) meaning that they are aware the presence of emulsifier is written in product packaging and they know that emulsifiers are also produced from plants and synthetic material. Overall, majority of the respondents know about emulsifier but they did not know that emulsifier is related to chocolate (K20 = 67.3%).

According to Deshmukh and Goyal[42] the food products' ingredients list are not read by 52.5% of customers. In the question K4 until K7, majority of them had higher number of the correct answer than wrong answer meaning that they understand better about dark chocolate. K14, K17 and K19 are the trap questions where these questions will measure whether the respondents know about general knowledge on emulsifier.

Level of chocolate consumption pattern among respondents

Chocolate type preferences

Majority of the respondents (Table 5) prefer milk chocolate (52.8%) and the second most preferred chocolate is dark chocolate (35.8%). The remaining respondents and the least preferred chocolate type is white chocolate (11.5%). Rogovska and Čukanová[25] reported that the most respondents consume milk chocolate (41.4%), while not far behind dark chocolate (31.3%) is the second most likely to consume by the respondents. According to Teo et al.,[43] the majority of food tastes in the Malaysian population are savoury fatty (53%) and neutral (29%). This could be the factor that majority of Malaysian chose milk chocolate as their most preferred chocolate type because milk chocolate taste creamier and more fatty compared to dark and white chocolate. Shiina et al.,[44] found a significant improvement in coronary circulation of flavonoid-rich chocolate in a healthy adult, compared to non-flavonoid white chocolate which did not have any such effects. A study by Gámbaro and Ellis[45,46] found a group of people that considered the dark chocolate as the healthiest, followed by milk chocolate, and white chocolate is considered unhealthy.

Table 5 Preferences on different types of chocolate among respondents.

Type of chocolate	Frequency (%)
Dark chocolate	143 (35.8)
Milk chocolate	211 (52.8)
White chocolate	46 (11.4)

Frequency of chocolate consumption

Based on the data obtained, majority of the respondents occasionally consumed chocolate (38.8%) in a month similarly to Rogovska and Čukanová[25] among Slovakian consumers which might related to a study by Prete and Samoggia,[29] the health factor has not been studied widely in the chocolate consumption research because of high calories of chocolate is considered to be an unhealthy food. Therefore, many people are consuming less chocolate because chocolate is considered as junk food. There were 27% (Table 6) of the respondents who consumed chocolate on weekly basis. Moreover, there were 16.8% and 15.7% of the respondents that consumed chocolate monthly and rarely respectively. The minority of the respondents consumed chocolate on daily basis (1.8%). According to Rogovska and Čukanová,[25] chocolate is consumed by the majority of respondents several times a month (36.4%) or several times a week (34.3%). According to Mai,[47] many consumers are willing to pay more for certified products than for non-certified products.

Table 6 Frequency of chocolate consumption among respondents

Frequency of chocolate consumption	Frequency (%)
Daily	7 (1.8)
Weekly	108 (27)
Monthly	67 (16.8)
Occasionally	155 (38.8)
Rarely	63 (15.7)

Reason for chocolate consumption

Majority of the respondents (Figure 2) chose like the taste of the chocolate as their strongest reason of their chocolate consumption (39.8%). Indulgent confection is a well-known term in chocolate according to Dillinger et al.,[7] and according to Shafi et al.,[41] chocolate usually is sweet in taste and the taste varied according to the type of chocolate. According to McShea et al.,[8] cacao and chocolate contain significant concentrations of theobromine, a stimulant of the central nervous system contributing to the chocolate's bitter taste. Meanwhile,

craving factor is also one of the top pick as the strongest reason of the respondents' chocolate consumption (35.8%). Osman and Sobal[48] stated that chocolate was mostly reported by both male (41%) and female Spanish (65%) students and female American (48%) students as their most wanted food.

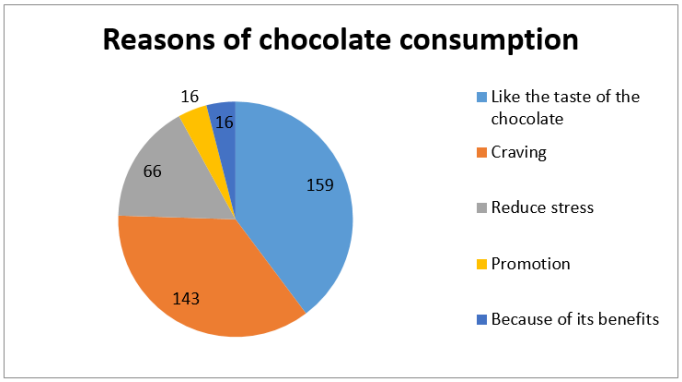

Figure 2 Reason of chocolate consumption among respondents

There were 16.5% of the respondents who consumed chocolate when they want to reduce their stress. According to Shafi et al.,[41] chocolate has great advantage since flavanols in chocolate may contribute to the production of endorphins, as endorphins play a key role in prevention of depression and other mental disorders. Due to pandemic in 2020, many people were affected including lost their jobs and forced to stay at home which contributed to stress.

However, promotion and chocolate's nutritional benefits picked the least as the reason of the chocolate consumption with 4% each. Many studies have shown that chocolate flavonoids reduced the risk of a heart attack by around 37%, while strokes were 29% lower when chocolate was consumed.[41] However, based on Table 4, majority of the respondents scored poor knowledge on chocolate which contribute to the reason why chocolate nutritional benefits is picked as the least reason of chocolate consumption. Prete and Samoggia,[29] informed that in chocolate consumption study, the health factor was not widely researched because high in calories chocolate is considered as an unhealthy food. Thus, people consume less chocolate because chocolate is known as junk food. Stamer et al.,[49] reported that conscious buyer, with higher career expectations value quality and brand of the chocolate more, while Thaichon et al.,[30] informed that the price is not as important as the taste to Cadbury Dairy Milk consumers. By referring to socio-demographic characteristics in Table 2, majority of the respondents' income range were less than RM1000. At the same time, majority of them also attained Bachelor's Degree as their highest education level which means they are financially can afford to pursue the study and buy the chocolate without promotion on price.

Association between socio-demographic characteristics and knowledge of respondents towards chocolate and emulsifier

Chi-square test (Table 7) revealed that there is a significant different between gender and knowledge of respondents towards chocolate and emulsifier ($X^2 = 3.778$, df = 1, $p < 0.05$). Overall, female had significantly ($p < 0.05$) better score on knowledge (50.0%) regarding chocolate and emulsifier compared to male (39.5%). According to Liu et al.,[50] women with higher education level had better knowledge on food and nutrients and they were very thoughtful on what they consume. Since the majority of the respondents are from Bachelor's degree level, their level of education is high. According to Osman and Sobal,[48] that almost half of Spanish males (41.0%) and American males (18.0%) were more likely to crave chocolate, as compared to female. In terms of ethnicity, Sarawak native's had higher percentage on good knowledge level (65.0%) compared to other ethnicity. Baharuddin and Sharifudin,[38] stated that Borneo's people had a high intake of sweet food compared to the Malay ethnic in Malaysia.

Table 7 Distribution of relationship between socio-demographic characteristics and knowledge of respondents towards chocolate and emulsifier.

Variables	Knowledge (n = 400)		p-value	95% CI	
	Good (%)	Poor (%)		Lower	Upper
Gender			0.052	1.26	1.36
Male	49 (39.5)	75 (60.5)			
Female	138 (50.0)	138 (50.0)			
Age			0.533	2.44	2.66
18-20	10 (45.5)	12 (54.5)			
21-30	125 (47.2)	140 (52.8)			
31-40	10 (45.5)	12 (54.5)			
41-50	32 (58.2)	23 (41.8)			
51-60	8 (23.5)	26 (76.5)			
Above 60	2 (100.0)	0 (0.0)			
Education level			0.747	1.56	1.78
Secondary school	12 (54.5)	10 (45.5)			
Certificate/ Diploma	34 (40.0)	51 (60.0)			
Bachelor's Degree	125 (48.3)	134 (51.7)			
Master's Degree	15 (55.6)	12 (44.4)			
Doctor of Philosophy	1 (14.3)	6 (85.3)			
Income monthly			0.411	1.81	2.09
Less than RM1000	104 (45.2)	126 (54.8)			
RM1000 – RM1999	14 (42.4)	19 (57.6)			
RM2000 – RM2999	14 (56.0)	11 (44.0)			
RM3000 – RM3999	8 (57.1)	6 (42.9)			
RM4000 – RM4999	10 (47.6)	11 (52.4)			
More than RM5000	37 (48.1)	40 (51.9)			
Marital status			0.427	1.66	1.75
Single	135 (48.0)	146 (52.0)			
Married	52 (43.6)	67 (56.4)			
Ethnicity			0.113	4.42	4.64
Malay	146 (45.5)	175 (54.5)			
Chinese	16 (53.3)	14 (46.7)			

Table 7 Continued...

Indian	3 (27.3)	8 (72.7)			
Sabah's native	8 (53.3)	7 (46.7)			
Sarawak's native	13 (65.0)	7 (35.0)			
Others	1 (33.3)	2 (66.7)			

*p-value (significant at $p < 0.05$) = Chi-square test

Lastly, married respondents had lower percentage of good knowledge (43.6%) compared to the single respondents (48.0%). Hertel et al.,[40] stated that single individuals were seen as being more lonely, less warm and caring than married individuals. Therefore, they have more time for them self to study or read some information to obtain knowledge. Overall, gender significantly ($p < 0.05$) affected the knowledge level on chocolate and emulsifier.

Association between chocolate consumption pattern and knowledge of respondents towards chocolate and emulsifier

Chi-square test showed that there is a significant different between the frequency of chocolate consumption and knowledge of respondents towards chocolate and emulsifier. ($X^2 = 11.299$, df = 4, $p < 0.05$).

Based on Table 8, respondents who preferred dark chocolate had higher percentage of good knowledge level (51.0%) compared to respondents who preferred milk chocolate (44.1%) and white chocolate (45.7%). The respondents prefer dark chocolate even though the taste of dark chocolate is bitter, because they appreciate that dark chocolate as the healthiest chocolate. As mentioned by Shafi et al.,[41] dark chocolate is the most bitter compared with milk and white chocolate. The study also stated that dark chocolate has the most flavanols compared to milk and white chocolate. In term of frequency of chocolate consumption, respondents who consumed chocolate daily had higher percentage of good knowledge (71.4%). They eat the chocolate daily which relates to their exposure towards chocolate and emulsifier is high thus contributing to their high level of knowledge on chocolate and emulsifier. On the other hand, respondents who rarely consumed chocolate had the least percentage of good knowledge (38.1%) because their exposure towards chocolate and emulsifier are low whereas respondents who eat chocolate daily tend to read composition on packaging more about chocolate before they buy the products. According to Deshmukh and Goyal,[42] half of the world's consumer understand what they are reading on food labelling of products. In contrast, respondents who rarely eat chocolate will also rarely get the chance to read composition on packaging about chocolate and even touch the chocolate. Thaichon et al.,[30] stated that packaging is one of the most important roles in chocolate purchasing behaviour. The quality of the chocolate is therefore as important as the packaging that wraps it.[29] The most pleasant packaging will be chosen by the consumer who consumes chocolate rarely if the consumer is not familiar with the product as stated by Thaichon et al.,[30] in his study about purchasing behaviour of chocolate.

Table 8 Distribution of relationship between chocolate consumption pattern and knowledge of respondents towards chocolate and emulsifier.

Variables	**Knowledge (n = 400)**			**95% CI**	
	Good (%)	**Poor (%)**	**p-value**	**Lower**	**Upper**
Chocolate preferences					
Dark chocolate	73 (51.0)	70 (49.0)	0.43	1.69	1.82
Milk chocolate	93 (44.1)	118 (55.9)			
White chocolate	21 (45.7)	25 (54.3)			
Frequency of chocolate consumption					
Daily	5 (71.4)	2 (28.6)	***0.023**	3.39	3.60
Monthly	42 (62.7)	25 (37.2)			
Occasionally	67 (43.2)	88 (56.8)			
Rarely	24 (38.1)	39 (61.9)			
Weekly	49 (45.4)	59 (54.6)			

*p-value (significant at $p < 0.05$) = Chi-square test

Association between socio-demographic characteristics and factor of chocolate consumption

Gender

As shown in Table 9, male respondents (6.4%) consumed chocolate because of its higher benefits compared to female respondents (3.0%). In contrast, female respondents had higher percentage of chocolate craving (38.4%) compared to male respondents (30.0%). According to a study by Bancroft et al.,[16] in the pre-menstrual phase, chocolate is by far the most commonly desired food. Due to pre-menstrual stage, women are likely to crave chocolate due to the hormonal factor while men are not related to the pre-menstrual stage. Majority of male (41.1%) and female (39.1%) respondents like the taste of chocolate contributing to the reason of chocolate consumption. As mentioned by McShea et al.,[8] The chocolate and cacao contain essential theobromine, which is a central nervous system stimulant contributing to the bitter taste of the chocolate.

Table 9 Distribution of relationship between gender and factor of chocolate consumption.

	Variables	Factor					p-value	95% CI	
		Because of its benefit (%)	Craving	Like the taste of the chocolate	Promotion	Reduce stress		Lower	Upper
Gender	Female	8 (3.0)	106 (38.4)	108 (39.1)	10 (3.6)	44 (15.9)	0.285	1.26	1.36
	Male	8 (6.4)	37 (30.0)	51 (41.1)	6 (4.8)	22 (17.7)			

*p-value (significant at $p < 0.05$) = Chi-square test

On the other hand, 3.6% of female respondents consumed chocolate when there were promotions on chocolate compared to 4.8% of male respondents. According to Stamer et al.,[49] the prices of chocolate are more highly priority for lower-medium social classes with no career oriented and large uninformed families. Male respondents had higher percentage of consuming chocolate to reduce stress (17.7%) compared to female respondents (15.9%). Due to current pandemic situation, many people especially men affected by the situation including forced to stay at home.

Table 10 Distribution of relationship between age range and factor of chocolate consumpti

	Variables	Factor					p-value	95% CI	
		Because of its benefit (%)	Craving (%)	Like the taste of the chocolate (%)	Promotion (%)	Reduce stress (%)		Lower	Upper
Age range	18-20	0 (0.0)	9 (40.9)	6 (27.3)	1 (4.5)	6 (27.3)	***0.001**	2.44	2.66
	21-30	8 (3.0)	107 (40.4)	102 (38.5)	5 (1.9)	43 (16.2)			
	31-40	0 (0.0)	7 (31.8)	9 (40.9)	2 (9.1)	4 (18.2)			
	41-50	2 (3.6)	14 (25.5)	24 (43.6)	4 (7.3)	11 (20.0)			
	51-60	6 (17.6)	6 (17.6)	16 (47.1)	4 (11.8)	2 (5.9)			
	Above 60	0 (0.0)	0 (0.0)	2 (100.0)	0 (0.0)	0 (0.0)			

*p-value (significant at $p < 0.05$) = Chi-square test

Age

Based on Table 11, chi-square test revealed that the age range and factor of chocolate consumption is significant to each other ($X^2 = 44.838$, $df = 20$, $p < 0.05$).

In term of benefits of chocolate as the factor of chocolate consumption, age range 51 to 60 had the highest percentage of respondents (17.6%) compared to the other age range. According to Whitelock and Ensaff,[51] older people tend to have the efforts to avoid foods that are considered unhealthy and not good for their body. Shafi et al.,[41] stated that chocolate has many health benefits towards human body including keeping the heart healthy, help reduce the risk of Alzheimer's disease and can lower the blood pressure. On the other hand, age range 18 to 20 (40.9%) and 21 to 30 (40.4%) had the higher score in term of craving as the reason of chocolate consumption. As mentioned before, for women, age range 18 to 30 is the age of active menstruation and the pre-menstrual stage contribute to the chocolate craving as mentioned by Bancroft et al.[16] However for men, the age range of 18 to 30 is an active period where they tend to do physical activity or exercise and as stated by Shafi et al.,[41] by consuming chocolate half of square chocolate each day, it can help boost the energy to do physical activity and exercise.

Overall, respondents who aged above 60 had the highest percentage (100.0%) in term of like the taste of chocolate as the factor of chocolate consumption. While respondents aged 51 to 60 had the higher percentage (11.8%) in term of promotion as the factor of chocolate consumption. According to Whitelock and Ensaff,[51] older people tend to buy food products that has promotion because they had a problem on the food affordability, referring to the cost of food, the cost of shipping food, and the cost of eating out. Lastly, in term of reduce stress as the factor of chocolate consumption, respondents who aged 18 to 20 had higher percentage (27.3%) compared to the other age range including 21 to 30 (16.2%), 31 to 40 (18.2) and 41 to 50 (20.0%). Age range 18 to 20 might be stress because of their study and they are at the age of knowing and entering new environment. Chen et al.,[52] reported that young adults are most likely to report stressors associated with school (Table 10).

Education

By referring Table 11, generally, in term of benefit of chocolate as the factor of chocolate consumption, respondents that in the level of secondary school had higher percentage (13.6%) compared to the other education level. Nowadays, Malaysian secondary school level education is slightly higher and more focus on daily life application. Meanwhile, in term of craving as the factor of chocolate consumption, respondents with Bachelor's Degree had the higher percentage (37.5%) than other education level. This group of respondents are easier to get stress from works and assignments. Miriam et al.,[53] informed that high level of craving is caused by high level of stress. Consuming chocolate can reduce the craving and stress at the same time.[41]

On the other hand, respondents with Certificate or Diploma level had the higher percentage in term of like the taste of the chocolate as the factor of chocolate consumption. While, in term of reduce stress as the factor of chocolate consumption, respondents with Doctor of Philosophy level had the highest percentage (57.1%) among the other level of education attained.

Table 11 Distribution of relationship between highest education levels attained and factor of chocolate consumption

Variables		Factor					p-value	95% CI	
		Because of its benefit (%)	Craving (%)	Like the taste of the chocolate (%)	Promotion (%)	Reduce stress (%)		Lower	Upper
Education	Secondary school	3 (13.6)	6 (27.3)	6 (27.3)	2 (9.1)	5 (22.7)	0.052	1.56	1.78
	Certificate/ Diploma	0 (0.0)	30 (35.3)	36 (42.4)	3 (3.5)	16 (18.8)			
	Bachelor's Degree	12 (4.6)	97 (37.5)	105 (40.5)	8 (3.1)	37 (14.3)			
	Master's Degree	1 (3.7)	9 (33.3)	11 (40.7)	2 (7.4)	4 (14.9)			
	Doctor of Philosophy	0 (0.0)	1 (14.3)	1 (14.3)	1 (14.3)	4 (57.1)			

*p-value (significant at $p < 0.05$) = Chi-square test

Income

As shown in Table 12, respondents who gained income of RM2000 to RM2999 had higher percentage (12.0%) in term of chocolate benefits as the factor of chocolate consumption compared to other monthly income range. Also, there were 42.8% of respondents gained RM4000 to RM4999 choose craving as their factor of chocolate consumption. Majority of the respondents that gained RM4000 to RM4999 are female (85.7%). Zellner et al.,[54] reported that women crave for sweet foods including ice cream, chocolate and cake.

Table 12 Distribution of relationship between monthly income and factor of chocolate consumption

Variables		Factor					P-value	95% CI	
		Because of its benefit (%)	Craving (%)	Like the taste of the chocolate (%)	Promotion (%)	Reduce stress (%)		Lower	Upper
Income	Less than RM1000	7 (3.0)	92 (40.0)	90 (39.1)	3 (1.3)	38 (16.6)	0.093	1.81	2.09
	RM1000-RM1999	0 (0.0)	10 (30.3)	14 (42.4)	3 (9.1)	6 (18.2)			
	RM2000-RM2999	3 (12.0)	9 (36.0)	8 (32.0)	1 (4.0)	4 (16.0)			
	RM3000-RM3999	0 (0.0)	5 (35.7)	4 (28.6)	1 (7.1)	4 (28.6)			
	RM4000-RM4999	1 (4.8)	9 (42.8)	9 (42.8)	1 (4.8)	1 (4.8)			
	Above RM5000	5 (6.5)	18 (23.4)	34 (44.2)	7 (9.1)	13 (16.8)			

*p-value (significant at $p < 0.05$) = Chi-square test

In term of reduce stress as the factor of chocolate consumption, respondents who gained monthly income above RM5000 had the highest percentage (16.8%) among the other income range. High income people usually have a lot of work to be done and lead to stress. According to Kahneman and Deaton,[55] high income people stress more than people that earn lower income. Shafi et al.,[41] stated that chocolate consumption can reduce stress and boost the brain to become more productive.

Marital status

By referring Table 13, chi-square test revealed that the marital status and the factor of chocolate consumption is significant to each other ($X^2 = 16.030$, df = 4, $p<0.05$).

Table 13 Distribution of relationship between marital status and factor of chocolate

Variables		FACTOR					p-value	95% CI	
		Because of its benefit (%)	Craving (%)	Like the taste of the chocolate (%)	Promotion (%)	Reduce stress (%)		Lower	Upper
Marital status	Single	8 (2.8)	112 (39.9)	110 (39.2)	6 (2.1)	45 (16.0)	*0.003	1.66	1.75
	Married	8 (6.6)	31 (26.1)	49 (41.0)	10 (8.1)	6 (18.2)			

*p-value (significant at $p < 0.05$) = Chi-square test

Overall, married respondents had higher percentage (6.6%) in term of chocolate benefits as the factor of chocolate consumption compared to single respondents (2.8%). According to data, married respondents are at the age range of 40 to 60 and above. Whitelock and Ensaff,[51] informed that older people tend to care about their health more and carefully choose food that they are about to consume. In contrast, single respondents choose craving as the factor of chocolate consumption had higher percentage (39.9%) than married respondents (26.1%). Based on the data, single respondents are at the age range of 18 to 30 and female. According to Bancroft et al.,[16] pre-menstrual stage contributes to crave for chocolate among women.

Ethnicity

Based on Table 14, Indian respondents (54.5%) are likely to consume chocolate because of craving while Chinese respondent (60.0%) consume chocolate because they like the taste of the chocolate. According to data obtained, majority of Indian respondents are female (72.7%). Women are more likely to crave sweet food such as chocolate.[54] According to Baharuddin and Sharifudin,[38] Chinese people always prefer the intensity of the medium taste in foods. On the other hand, majority of Sabah's native (40.0%) consumed chocolate to reduce stress. Baharuddin and Sharifudin,[38] reported that Borneo people prefer to consume sweet food more than West Malaysia people. Due to current pandemic situation at Sabah, Sabah's people tend to get stress easier contributing chocolate consumption to reduce stress. According to Shah et al.,[56] during Malaysian movement control order, Most companies work from home, and some people have stopped working.

Table 14 Distribution of relationship between ethnicity and factor of chocolate consumption.

Variables		FACTOR					p-value	95% CI	
		Because of its benefit (%)	Craving (%)	Like the taste of the chocolate (%)	Promotion (%)	Reduce stress (%)		Lower	Upper
Ethnicity	Malay	12 (3.7)	120 (37.4)	122 (38.0)	14 (4.4)	53 (16.5)	0.097	4.42	4.64
	Chinese	2 (6.7)	6 (20.0)	18 (60.0)	1 (3.3)	3 (10.0)			
	Indian	0 (0.0)	6 (54.5)	5 (45.4)	0 (0.0)	0 (0.0)			
	Sabah's native	0 (0.0)	4 (26.7)	5 (33.3)	0 (0.0)	6 (40.0)			
	Sarawak's native	2 (10.0)	7 (35.0)	9 (40.0)	0 (0.0)	3 (15.0)			
	Others	0 (0.0)	0 (0.0)	1 (33.3)	1 (33.3)	1 (33.3)			

*p-value (significant at $p < 0.05$) = Chi-square test

In general, craving and like the taste of chocolate are the significant factor ($p < 0.05$) affecting the chocolate consumptions for different age range and marital status of the Malaysian consumers.[57–62]

Conclusion

The overall aim of this study was to determine the distribution of knowledge level and chocolate consumption pattern among consumers in Malaysia using online questionnaire. By referring previous related studies, the questionnaire on attitudes to chocolate has been developed and published to the consumers all around Malaysia.

The majority of the respondents had poor knowledge on chocolate and emulsifier which is significantly related to low awareness because people keep thinking that chocolate is an unhealthy food and they tend to pay less attention towards the benefits and advantages of chocolate. According to the result obtained, 46.5% of the respondents obtained good score while 53.5% of the respondents obtained poor score on knowledge regarding chocolate and emulsifier. Also, over than half of respondents (52.8%) preferred milk chocolate compared to dark (35.8%) and white (11.4%) chocolate. Overall, female respondents (50.0%) had higher good score on knowledge regarding chocolate and emulsifier compared to male respondents (39.5%). The result showed that female respondents consume chocolate because of craving more than male respondents. The study has covered the local consumers' knowledge and awareness on chocolate and emulsifier, and consumption pattern such as chocolate type preference, frequency of chocolate consumption and factor of chocolate consumption. This study can benefit the local community in terms of chocolate awareness and knowledge.

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Conflicts of interest

The authors declare that there are no conflicts of interest.

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