

KNOWLEDGE, ATTITUDE AND PERCEPTION OF NUTRITION AND HEALTH CLAIMS ON PACKAGED FOOD AMONG ADULTS IN MALAYSIA

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Abstract

Food manufacturers are aggressively placing nutrition claims on their packaged food products; some have even gone as far as to make health claims. However, few studies have been conducted to assess consumers' knowledge, attitude, and perception of these nutrition and health claims. It is a huge matter of their understanding of food manufacturers' nutrition and health claims. To address this issue, this cross-sectional study aimed to determine the knowledge, attitude, and perception of adults in Malaysia towards nutrition and health claims on packaged food products. A cross-sectional design was employed, utilizing a self-administered online questionnaire completed by 223 participants who were chosen through convenience sampling and aged 18 years or older. The study's results, analyzed using SPSS version 26.0, showed that the median score for knowledge of nutrition claims was 4.00, while the median score for knowledge of health claims was 3.00, indicating that the participants had a higher level of knowledge about nutrition claims than health claims. The median scores for attitude and perception towards nutrition and health claims were 19.00 and 20.00, respectively, demonstrating a positive attitude and perception towards these claims. The correlation between attitude and perception of nutrition and health claims was moderate and positive, with correlation coefficients of $r_s = 0.686$, $N = 223$, $p = 0.000$ and $r_s = 0.652$, $N = 223$, $p = 0.000$, respectively. The results indicate that participants had a relatively good level of knowledge about nutrition claims but a lower level of knowledge about health claims. However, the participants had a positive attitude and perception towards both nutrition and health claims. In conclusion, the study provides a baseline for understanding nutrition and health claims among the adult population in Malaysia.

Keywords: Attitude, Health claim, Knowledge, Malaysian adults, Nutrition claim, Perception

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Abstrak

Pengeluar makanan dengan gigih menempatkan tuntutan pemakanan pada produk makanan mereka yang berpakej, dan sesetengah telah mengambil langkah sejauh membuat tuntutan kesihatan. Namun, hanya sedikit kajian yang telah dijalankan untuk menilai pengetahuan, sikap, dan persepsi pengguna terhadap tuntutan pemakanan dan kesihatan ini. Ini adalah perkara besar yang berkaitan dengan pemahaman mereka terhadap tuntutan pemakanan dan kesihatan yang dibuat oleh pengeluar makanan. Untuk mengatasi isu ini, kajian rentas-seksyen ini bertujuan untuk menentukan pengetahuan, sikap, dan persepsi orang dewasa di Malaysia terhadap tuntutan pemakanan dan kesihatan pada produk makanan yang berpakej. Reka bentuk rentas-seksyen digunakan, menggunakan soal selidik dalam talian yang diisi oleh 223 peserta yang dipilih melalui persampelan kemudahan dan berumur 18 tahun atau lebih. Hasil kajian, yang dianalisis dengan menggunakan SPSS versi 26.0, menunjukkan bahawa nilai median bagi pengetahuan tentang tuntutan pemakanan adalah 4.00, manakala nilai median untuk pengetahuan tentang tuntutan kesihatan adalah 3.00, menunjukkan bahawa peserta mempunyai tahap pengetahuan yang lebih tinggi tentang tuntutan pemakanan berbanding tuntutan kesihatan. Nilai median untuk sikap dan persepsi terhadap kedua-dua tuntutan pemakanan dan kesihatan adalah 19.00 dan 20.00, secara berturut-turut, menunjukkan sikap dan persepsi yang positif terhadap tuntutan ini. Korelasi antara sikap dan persepsi terhadap kedua-dua tuntutan pemakanan dan kesihatan adalah sederhana dan positif, dengan pekali korelasi $r_s = 0.686$, $N = 223$, $p = 0.000$ dan $r_s = 0.652$, $N = 223$, $p = 0.000$, secara berturut-turut. Hasil kajian menunjukkan bahawa peserta mempunyai tahap pengetahuan yang agak baik tentang tuntutan pemakanan, tetapi tahap pengetahuan tentang tuntutan kesihatan lebih rendah. Walau bagaimanapun, peserta mempunyai sikap dan persepsi yang positif terhadap kedua-dua tuntutan pemakanan dan kesihatan. Kesimpulannya, kajian ini memberikan landasan untuk pemahaman tentang tuntutan pemakanan dan kesihatan di kalangan populasi dewasa di Malaysia.

Kata Kunci: *Sikap, Tuntutan kesihatan, Pengetahuan, Orang dewasa Malaysia, Tuntutan pemakanan, Persepsi*

Introduction

Food packaging serves as a critical communication channel between consumers and producers, incorporating the Nutrition Information Panel (NIP), also known as nutrition labeling, which can be found on either the back or front of the packaging (Howard, 2012). The Food and Drug Administration (FDA) mandates nutrition labels on most beverages and packaged foods, known as the NIP or Nutrition Facts label. These labels provide consumers with information about the nutrient content of a food product, aiding them in making informed food choices. Labeling has been established since 1913 to safeguard consumers, with manufacturers legally required to list all

ingredients on packaging. The Nutrition Labelling and Education Act of 1990 further mandated the inclusion of nutrient information. The current role of nutrition labels is to furnish information that helps consumers make healthier choices, enumerates nutrition facts pertinent to common health issues such as diabetes and weight control, and guides those following specific diets (Bhattacharya et al., 2022).

Nutrition labeling on the package offers both public and private benefits. From a public health standpoint, nutrition labeling provides critical information that enables consumers to make better-informed choices when purchasing food items (Grunert, 2012). Although many customers are intent on selecting nutritious foods, they may not always be cognizant of the nutritional value of certain items. Therefore, nutrition labeling makes such information more accessible and supports healthier decision-making.

In Malaysia, the Ministry of Health has published Regulations on Nutrition Labelling and Claims, which permit three types of nutrition claims: nutrient content claims, nutrient comparative claims, and nutrient function claims (Abd Razak et al., 2010). A nutrient content claim describes the level of a nutrient in a food product. In contrast, a nutrient comparison claim contrasts the nutrient levels or energy content between two or more similar foods. A nutrient function claim delineates the physiological role of a nutrient in growth, development, and the body's regular functions. However, "health claims" are prohibited under the Malaysia Food Act 1983 and Food Regulations, as they must be substantiated by scientific evidence. Claims that cannot be substantiated or suggest that a balanced diet cannot provide adequate nutrients are also disallowed, along with misleading claims such as those concerning good hygienic practices or conditional claims (Loong, 2012).

Recent studies on Malaysian adults' knowledge, attitudes, and perceptions of nutrition and health claims on packaged foods are sparse. Arfaoui et al. (2021) noted a dearth of research in this domain, particularly regarding food label usage. The Malaysian Adult Nutrition Survey (MANS) 2014 found that only about half of Malaysian adults read and understand product labels and nutrition information panels (Haque et al., 2016). This indicates a significant gap in consumers' engagement with packaged food information, which is concerning given the influence of such knowledge on dietary habits and health outcomes.

Producers and retailers, well-versed in market trends, often make claims on their food product packaging. Unfortunately, the same MANS study reported that only around half of the adult population in Malaysia reads and comprehends this information. This study, therefore, is vital to assess the current level of knowledge, attitudes, and practices regarding nutrition and health claims among the Malaysian population to prevent consumers from being misled by the food industry.

Food manufacturers have been known to exploit these claims, for instance, by rounding down the number of ingredients containing less than 0.5 grams per serving or using various terms for added sugars such as sucrose, dextrose, and maltose, which may not be familiar to all consumers. These tactics can mislead consumers into purchasing products to support a healthier lifestyle. With chronic diseases like diabetes and obesity on the rise, mainly due to inadequate physical activity and high sugar and fat consumption, the prevalence of diabetes in Malaysia increased from 11.2% in 2011 to 13.4% in 2015 (Jan 2015). Such non-communicable diseases (NCDs) jeopardize Malaysia's ability to achieve the UN Sustainable Development Goal target 3.4, which aims to reduce mortality from NCDs. Hence, the primary goal of this study is to determine the level of knowledge, attitude, and perception of nutrition and health claims for packaged food among adults in Malaysia.

Materials and Methods

Sampling location

Our research targeted adult populations from eight strategically chosen states across Malaysia to ensure a diverse and representative sample. Due to their varied economic statuses, we included Selangor and Perak in West Malaysia. For East Malaysia, Terengganu and Kelantan were selected to represent the cultural and dietary practices of the region. Kedah and Perlis represented northern Malaysia, while Melaka and Johor were chosen from the South for their unique mix of urban and rural populations. This selection aimed to encompass the broad spectrum of Malaysian dietary habits and awareness of nutrition and health claims.

Research design

A descriptive, cross-sectional study was formulated to ascertain the level of knowledge, attitudes, and perceptions concerning nutrition and health claims on packaged food. The study employed an online questionnaire distributed to 216 respondents aged 18 years and above. Each participant provided informed consent, and the study protocol received ethical approval from Universiti Malaysia Terengganu's Human Ethics Review Board with reference number UMT/JKEPM/2022/122, ensuring adherence to ethical research standards.

Sampling plan

The framework encompassed a balanced geographical representation by including states from each cardinal direction of Malaysia, facilitating a comprehensive analysis across different cultural and socioeconomic backgrounds. Employing the Cochran formula, we calculated a sample size that would be statistically valid for the population's estimated awareness level of nutrition and health claims. The formula

incorporated a standard error and confidence level to ensure precision and reliability in the results. Drawing on the findings from a previous survey by Benson et al. (2019), where only 50% of consumers were cognizant of nutrition and health claims, we set the expected proportion (p) at 0.50 for calculating the minimum sample size (N). Utilizing a Z statistic of 1.960 to correspond with a 95% confidence level and an assumed margin of error (e) of 0.07, the Cochran formula yielded an initial sample size of 196. Factoring in an anticipated attrition rate of 10% for survey-based studies, the final calculated sample size required for the study amounted to 216. Consequently, we determined that a sample of 216 Malaysian adults aged 18 and above would be requisite for our survey. Inclusion criteria for respondents were set as Malaysian adults aged 18 and above with the ability to provide informed consent. This age group was chosen as it is typically responsible for household food purchasing decisions, directly relating to the study's focus on packaged food claims. The data collection phase spanned two months, utilizing a Google Form survey to maximize reach and efficiency. The online format was selected for its convenience and ability to capture real-time data, which was critical given the study's cross-sectional nature.

Research instrument

The questionnaire was intricately structured into four segments to capture a multidimensional perspective on the respondents' interactions with food labeling:

1. Socio-Demographic Profile: Comprising eight queries, this section collated essential demographic information to investigate potential influences on the respondents' comprehension and attitudes towards food labeling.
2. Knowledge Assessment: This part, bifurcated into Sections 2A (Nutrition Claims) with six items and 2B (Health Claims) with three items, probed the participants' understanding of food packaging claims. Questions were deliberately phrased in straightforward language to ensure clarity.
3. Attitudinal Analysis: With a division into Sections 3A (Nutrition Claims) and 3B (Health Claims), each containing five statements, this portion evaluated the participants' sentiments towards the claims made on food packaging.
4. Perceptual Evaluation: The final segment, split into Sections 4A (Nutrition Claims) and 4B (Health Claims), each with five items, measured the participants' interpretations and value judgments of the nutrition and health claims.

The questionnaire was available in English and Malay to accommodate Malaysia's linguistic diversity. The survey was disseminated using a Google Form for self-administration by participants. The scoring system was bifurcated based on the nature of the questions:

- Knowledge: Responses were scored using a binary scale: 'Yes' (1), 'No' (0), and 'Not Sure' (0), with correct responses garnering one point each. The total possible score ranged from 0 to the number of knowledge-based questions,

with the following ranges indicating the level of knowledge: 0-1 points (Poor), 2-3 points (Moderate), 4-5 points (Good).

- Attitudes and Perceptions: These sections employed a five-point Likert scale, coded from 'Strongly Disagree' (1) to 'Strongly Agree' (5). The aggregate scores from these sections were classified into ranges that reflect the level of positive engagement with the claims: 5-11 points (Poor), 12-18 points (Moderate), and 19-25 points (Good).

The cumulative scores from each part provided an overall assessment of the participants' knowledge, attitudes, and perceptions regarding food labeling. The questionnaire's design and the established scoring system were anchored in research from seminal sources within the domain, ensuring the instrument was valid and reliable. This alignment with scholarly work also enhanced the findings' interpretability and relevance. The data were collected through an electronic survey distributed via multiple online platforms. This strategy was employed to quickly reach a broad audience and facilitate a high response rate. The survey link was promoted through social media and messaging apps, leveraging the network effect to increase participation.

Statistical analysis was performed using the latest version of SPSS software. The data underwent normality testing, and non-parametric inferential statistics were applied due to the non-normal distribution of the data. The analysis included exploring correlations and patterns within the data to understand the interplay between knowledge, attitudes, and perceptions regarding nutrition and health claims.

Results and Discussion

The sociodemographic background of respondents

The study's demographic analysis of 223 respondents revealed a predominance of female participants, making up 74% of the sample, while males accounted for 26%, as shown in Table 1. In terms of ethnicity, the vast majority identified as Malay (83.9%), with Chinese (11.2%), Indian (4.0%), and other races (0.9%) comprising the rest. Religiously, Islam was the most represented at 83.4%, followed by Buddhism at 11.7%, Hinduism at 4.0%, and other religions at 0.9%. A significant portion of the participants were young adults between 18 and 25 years old, accounting for 80.3% of the sample, with all other age groups not surpassing 20% of the population. Geographically, the respondents were mainly from Terengganu (28.6%) and Kelantan (26.5%), with Johor (15.7%) and Melaka (2.2%) also represented, among others. Educational attainment was high, with 73.5% holding a degree, and other levels of education such as SPM, foundation/diploma, and postgraduate degrees represented to a lesser extent. The monthly household income distribution showed a higher concentration in the lower income, with 35.8% earning less than RM 1,499, followed

by RM 1,500 – RM2,999 at 27.4%, RM 3,000 – RM 5,999 at 20.2%, and more than RM 6,000 at 16.6%. This demographic snapshot indicates a predominantly young, female, Malay, and Muslim cohort with a tendency towards higher education and lower income levels.

Table 1: Sociodemographic Background of Respondents

Socio-Demographic factor	Frequency (n=223)	Percentage (%)
Gender		
Male	58	26.0
Female	165	74.0
Races		
Malay	187	83.9
Chinese	25	11.2
Indian	9	4.0
Other	2	0.9
Religion		
Islam	188	83.4
Hindus	9	4.0
Buddhist	26	11.7
Others	2	0.9
Age		
18-25 years old	179	80.3
26-35 years old	17	7.6
36-45 years old	10	4.5
46-55 years old	9	4.0
Above 56 years old	8	3.6
State		
Terengganu	64	28.6
Kelantan	59	26.5
Johor	35	15.7
Melaka	5	2.2
Selangor	28	12.6
Perak	18	8.1
Kedah	10	4.5
Perlis	4	1.8
Educational level		
SPM and related	24	10.8
Foundation/ Diploma	28	12.6
Degree	164	73.5
Master / PhD	7	3.1

Table 1 (continues)

Socio-Demographic factor	Frequency (n=223)	Percentage (%)
Monthly household income		
Less than RM 1,499	80	35.8
RM 1,500 – RM2,999	61	27.4
RM 3,000 – RM 5,999	45	20.2
More than RM 6,000	37	16.6

*A monthly household income is based on the Household Income and Basic Amenities Survey Report 2019, Department of Statistics Malaysia

Knowledge of nutrition claims for packaged food among adults in Malaysia

The study involved 223 individuals, and their replies were recorded and examined. The findings demonstrated that most participants (86.1%) understood the definition of nutrition claims for packaged foods and were aware that Malaysia only permits three types of nutrition claims, as shown in Table 2. The criteria for nutritious content claims and low sugar claims were both well understood by the participants (49.8% and 65.5%, respectively). However, the criteria for comparing the sugar levels of two products were unknown to some participants (10.3%). The findings revealed that 25.6% of participants were unsure, whereas 63.7% of those polled were aware that juice products with 10 mg of vitamin C per 100 ml can be labeled as "sources of Vitamin C." The vast majority of participants (89.7%) were also aware that calcium promotes the growth of sturdy bones and teeth.

According to the study's findings, most participants understood the definition of nutrition claims for packaged foods. It was aware that Malaysia only permits three different forms of nutrition claims. This is a good indicator since it shows that people know the many nutrition claims made to market packaged food items. The findings also demonstrated that the participants had a solid grasp of the standards for nutrient and reduced sugar content statements. This indicates that the public is aware of the importance of reducing sugar intake, which is a concern in Malaysia, where the prevalence of obesity and type 2 diabetes is increasing. A possible explanation for this might be that most of the respondents' backgrounds were from tertiary education level (degree), 73.5% from the source of sociodemographic data. This study supports evidence from previous observations (e.g., Nurliyana et al., 2011; Mitic et al., 2015). Respondents with higher education levels were better informed about product and nutrition information. Results of the study indicate a need for better education and awareness of the criteria for making nutrition claims for packaged food products in Malaysia. This will help to ensure that the public can make informed choices about the food they consume and understand the benefits and limitations of different nutrition claims.

Table 2: Respondents Knowledge of Nutrition Claims for Packaged Food in Malaysia (n=223)

No.	Knowledge of nutrition claims for packaged food among adults in Malaysia	True	False	Not sure	Answer correctly
		n (%)	n (%)	n (%)	n (%)
1	A nutrition claim is any claim made on the label of a food product about its nutritional quality, and there are three types of nutrition claims allowed in Malaysia: nutrient content claim, nutrient comparative claim, and nutrient function claim	192 (86.1)	7 (3.1)	24 (10.8)	192 (86.1)
2	To claim a product has less sugar than the previous version, the nutrient content between the foods being compared must differ by at least 25 percent	111 (49.8)	23 (10.3)	89 (39.9)	111 (49.8)
3	If a food weighing 100 grams contains no more than 5 grams of sugar, the food is considered a "low" sugar product	146 (65.5)	27 (12.1)	50 (22.4)	146 (65.5)
4	Juice products containing 10 mg of vitamin C per 100 ml can be claimed to contain a "source of Vitamin C."	142 (63.7)	24 (10.8)	57 (25.6)	142 (63.7)
5	"Calcium aids in the development of strong bones and teeth."	200 (89.7)	8 (3.6)	15 (6.7)	200 (89.7)

Note: Consumer knowledge (Scale: Yes=1 marks, No and Not sure=0 marks)- sum up total marks for five questions with min. score=0; max. score=5

Knowledge of health claims for packaged food among adults in Malaysia

The results showed that most participants (51.6% to 65.5%) understood prohibited health claims for packaged food, as shown in Table 3. The most widely recognized prohibited health claim was "This product contains vitamin E, which helps prevent cancer," with 65.5% of respondents answering correctly. The least recognized prohibited health claim was "Iron can help reduce the risk of anemia," with only 46.2% of respondents answering correctly. Despite the overall good performance, a significant portion of respondents (32.3% to 34.5%) answered falsely to the questions. For example, for the statement "Iron can help reduce the risk of anemia," 34.5% of respondents answered falsely, indicating that there is still a need for improved consumer education and awareness in this area. Furthermore, many

respondents (16.1% to 26.5%) were unsure about the correct answers, further emphasizing the need for further education and awareness efforts.

These results are disappointing considering the efforts made by the Malaysian government to educate the public on the importance of making effective use of nutrition information on food labels. The critical message 14 in the Malaysian Dietary Guidelines 2020 (MDG) was intended to encourage the wise use of the nutrition information panel (NIP) when making food choices. However, the significant number of respondents who answered "not sure" in the survey suggests that they are not well-informed about the health claims made on packaged food. As noted by Hasif Rafidee (2019), consumers place great value on nutrition information as it enables them to make better food choices. Accurate and accessible nutrition information can help consumers make informed, efficient, and correct decisions when comparing food products. Therefore, the government and relevant organizations must continue educating the public on the importance of nutrition information and improving consumer knowledge of health claims on packaged food. Further efforts are needed to ensure that consumers are adequately informed and equipped to make informed decisions about their food. Such efforts will help promote consumer protection and ensure that the food industry operates responsibly.

Table 3: Distribution of Respondents Responses on Knowledge of Health Claims for Packaged Food among Adults in Malaysia (n=223)

No.	Items	True	False	Not sure	Answer correctly
		n (%)	n (%)	n (%)	n (%)
1	Any health claims, such as treating and curing diseases, are not permitted in Malaysia	115 (51.6)	72 (32.3)	36 (16.1)	115 (51.6)
2	"This product can help reduce diabetes". This claim is prohibited	135 (60.5)	48 (21.5)	40 (17.9)	135 (60.5)
3	"This product contains vitamin E, which helps prevent cancer." This claim is an example of a prohibited health claim	146 (65.5)	27 (12.1)	50 (22.4)	146 (65.5)
4	"Iron can help reduce the risk of anemia." This claim is prohibited	103 (46.2)	77 (34.5)	42 (18.8)	103 (46.2)

Table 3 (continues)

No.	Items	True	False	Not sure	Answer correctly
		n (%)	n (%)	n (%)	n (%)
5	"Soy protein can reduce the risk of heart disease." This claim is prohibited	102 (45.7)	62 (27.8)	59 (26.5)	102 (45.7)

Note: Consumer knowledge (Scale: Yes=1 marks/No and Not sure=0 marks)- sum up total marks for five questions with min. score=0; max. score=5

Attitude of nutrition claims for packaged food among adults in Malaysia

The results indicate that the majority of respondents in Malaysia had a positive attitude towards nutrition claims on packaged food. The majority either agreed (4) or strongly agreed (5) with the items in the questionnaire, as shown in Table 4. Fewer respondents who gave answers other than 4 or 5 may have a less favorable attitude towards packaged food. This aligns with the findings of Nurliyana et al. (2011), who suggest that negative attitudes towards packaged food may be due to a lack of trust in food labels and a lack of awareness and understanding of the products. According to Mitic et al. (2015), a negative attitude toward claims may be influenced by a high distrust of food labels and a lack of awareness and understanding of the products. However, the current study provides evidence to the contrary, with most respondents having a positive attitude towards nutrition claims on packaged food. This contradicts previous research suggesting that a negative attitude toward claims may be due to a lack of understanding of using the nutritional information label or an unattractive label. The results of the current study highlight the importance of continuing efforts to educate the public on the benefits of using nutrition information on packaged food.

Table 4: Distribution of Respondents Responses to Attitude Toward Nutrition Claims for Packaged Food among Adults in Malaysia (n=223)

No.	Attitude of nutrition claims	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree	Median
		n (%)	n (%)	n (%)	n (%)	n (%)	
1.	When we eat foods that include nutrition claims, we can lead a healthy lifestyle	4 (1.8)	9 (4.0)	40(17.9)	83 (37.3)	87(39.0)	4.0
2.	It gives me pleasure to take care of my health by eating foods with nutrition claims	2 (0.9)	8 (3.6)	34 (15.2)	90 (40.4)	89 (39.9)	4.0

Table 4 (continues)

No.	Attitude of nutrition claims	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree	Median
		n (%)	n (%)	n (%)	n (%)	n (%)	
3.	For a healthy person, nutrition claims on packaged food are worthless	33 (14.8)	40 (17.9)	52 (23.3)	51 (22.9)	47 (21.1)	3.0
4.	Using food with nutrition claims is entirely safe and healthy	4 (1.8)	18 (8.1)	54 (24.2)	79 (35.4)	68 (30.5)	4.0
5.	I am willing to pay more on nutrition information and claims on food packaging	7 (3.1)	25 (11.2)	48 (21.6)	77 (34.5)	66 (29.6)	4.0

Note: Respondents attitude was rated on 5- point Likert scale, from 1=strongly disagree to 5=strongly agree

Attitude of health claims for packaged food among adults in Malaysia

This survey's findings indicate that most respondents (223 adults in Malaysia) had a favorable opinion of health claims on packaged foods. Most respondents—close to two-thirds—agreed or strongly agreed (31.4%) with the claim that the health claims on food packaging are a reliable source of information, as shown in Table 5. Similar percentages of respondents (33.2% and 28.3%, respectively) agreed or strongly agreed that they were not wary of any food that made health claims. However, fewer respondents agreed that they could prevent disease by regularly eating foods with health claims (19.3%), and only 19.7% of respondents agreed that they only eat foods with beneficial effects. In addition, slightly less than one-fifth of respondents (17.9%) strongly agreed that they were confident that health claims kept their promises. The findings of previous studies on gender differences in the use of nutrition information on food labels have been inconsistent.

Blitstein and Evans (2006) found that males were less likely to use this information than females. However, Nurliyana et al. (2011) reported the opposite, observing that males were more likely to use food labels during their food purchasing decisions. The limited time to read food labels may factor in these inconsistent findings. Williams (2015) reported that most people believe that health claims on food packaging can help them make healthier eating decisions. Vanasse (2016) also noted that displaying health claims on food packaging may attract health-conscious consumers. The median rating for all five statements was 4.0, which suggests a positive overall attitude toward health claims on packaged food.

This study's results align with the findings of Nurliyana et al. (2011), who found that adults in Malaysia had a positive attitude towards nutrition claims on packaged food. However, this study did not support the findings of Mitic et al. (2015), who found that a negative attitude toward claims may be influenced by a high distrust of food labels and a lack of awareness and understanding of the products. The results of this study suggest that adults in Malaysia have a generally positive attitude towards health claims on packaged food, with most respondents agreeing or strongly agreeing that they are trustworthy sources of information. The study expected to find that people in Malaysia have a negative attitude towards foods that make health claims. This is because it is against the law in Malaysia to make health claims on food products. Despite this expectation, the study's results may have shown otherwise, indicating that people in Malaysia do not hold a uniformly negative view of health claims on food products.

Table 5: Distribution of Respondents Responses to Attitude Toward Health Claims for Packaged Food among Adults in Malaysia (n=223)

No.	Attitude of health claims	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree	Median
		n (%)	n (%)	n (%)	n (%)	n (%)	
1.	Statements of health on food packaging are trustworthy sources of information	4 (1.8)	24 (10.8)	61 (27.4)	70 (31.4)	62 (28.7)	4.0
2.	I am skeptical of any food that makes health claims	3 (1.3)	9 (4.0)	74 (33.2)	74 (33.2)	63 (28.3)	4.0
3.	I can prevent disease by eating foods with health claims regularly	13 (5.8)	29 (13.0)	70 (31.4)	68 (30.5)	43 (19.3)	3.0
4.	I only eat foods that have beneficial effects	11 (4.9)	30 (13.5)	71 (31.8)	67 (30.0)	44 (19.7)	3.0
5.	I am confident that health claims keep their promises	13 (5.8)	38 (17.0)	59 (26.5)	73 (32.7)	40 (17.9)	4.0

Note: Respondents attitude was rated on 5- point Likert scale, from 1=strongly disagree to 5=strongly agree

Perception of nutrition claims for packaged food among adults in Malaysia

The results show that most respondents positively perceive nutrition claims on food packaging. The highest number of respondents (39.9%) agreed that food packaging with a nutrition claim on the product ensures quality, as shown in Table 6. A similar number of respondents (48%) believed that health is more assured with food packaging with a nutrition claim. Additionally, 43% of respondents believed that it is essential for a food product to be labeled with a nutrition claim. This can be evidenced by the previous findings, which also found that most people have more positive perceptions of the product with claims that they are familiar with and interested in purchasing (Steinhauser et al., 2019).

Regarding belief in the nutritional claims made on Malaysian food products, 27.8% of respondents agreed, while 32.3% were familiar with the nutritional claims labeled on food products. On the other hand, only 2.2% of respondents disagreed that food packaging with a nutrition claim on the product ensures the quality of the product. Similarly, 0.9% of respondents disagreed that health is more assured with food packaging with a nutrition claim. In conclusion, most adults in Malaysia have a positive perception of nutrition claims on food packaging. This suggests that nutrition claims on food packaging play a significant role in consumers' purchasing decisions in Malaysia.

Table 6: Distribution of Respondents Responses to the Perception of Nutrition Claims for Packaged Food among Adults in Malaysia (n=223)

No.	Perception of nutrition claims	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree	Median
		n (%)	n (%)	n (%)	n (%)	n (%)	
1.	Food packaging with a nutrition claim on the product ensures the quality of the product	5 (2.2)	12 (5.4)	44 (19.7)	89 (39.9)	73 (32.7)	4.0
2.	Health is more assured with food packaging that has a nutrition claim on the product	2 (0.9)	14 (6.3)	45 (20.2)	107 (48.0)	55 (24.7)	4.0

Table 6 (continues)

No.	Perception of nutrition claims	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree	Median
		n (%)	n (%)	n (%)	n (%)	n (%)	
3.	A food product needs to be labeled with a nutrition claim	3(1.3)	9 (4.0)	38 (17.0)	77 (34.5)	96 (43.0)	4.0
4.	I believe in the nutrition claims made about Malaysian food products	3 (1.3)	17 (7.6)	62 (27.8)	79 (35.4)	62 (27.8)	4.0
5.	I am familiar with the nutrition claims labeled on food products	4 (1.8)	17 (7.6)	55 (24.7)	75 (33.6)	72 (32.3)	4.0

Note: Respondents perception was rated on 5- point Likert scale, from 1=strongly disagree to 5= strongly agree

Perception of health claims for packaged food

The survey results of 223 adults in Malaysia show their perception of health claims on food packaging. When asked about the relationship between food packaging with health claims and the quality of the product, the majority of respondents (30.5%) agreed that it had a strong connection. 29.1% of respondents had a neutral perception, while 9.0% and 2.2% somewhat disagreed and strongly disagreed, respectively, as shown in Table 7. Regarding the perception of food packaging with a health claim having higher value assurance, 25.6% of respondents strongly agreed. 42.2% of respondents agreed that this was somewhat the case, while 25.1% had a neutral perception. 3.1% and 4.0% of respondents disagreed and somewhat disagreed, respectively. When asked about the importance of labeling a food product with a health claim, 31.4% of respondents strongly agreed it was essential. 39.0% of respondents agreed it was somewhat essential, while 22.9% had a neutral perception. 3.6% and 3.1% of respondents somewhat disagreed and disagreed, respectively.

The results of the survey suggest that a majority of adults in Malaysia have a positive perception of health claims on food packaging. Most respondents agreed that food packaging with a health claim is connected to the product's quality and has a higher value assurance. Additionally, a significant proportion of respondents agreed that it is essential for food products to be labeled with health claims and that they trust health claims given for Malaysian food products. The results also showed that most

respondents are familiar with health claims on food packaging. It was observed that a considerable proportion of respondents have a positive perception of health claims on packaged food. However, given that the use of health claims on food packaging is prohibited in Malaysia, more respondents would have been expected to have a more skeptical attitude towards these claims. The results suggest that despite the ban on health claims in Malaysia, a significant portion of the population still holds a favorable view of them. Further research is needed to understand why this is the case and to determine what measures can be taken to ensure that the public is better informed about the restrictions on health claims in Malaysia.

Table 7: Distribution of Respondents Responses to the Perception of Health Claims for Packaged Food among Adults in Malaysia (n=223)

No.	Perception of health claims	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree	Median
		n (%)	n (%)	n (%)	n (%)	n (%)	
1.	Food packaging with a health claim on the product ensures the quality of the product	5 (2.2)	20 (9.0)	65 (29.1)	65 (29.1)	68 (30.5)	4.0
2.	Food packaging that includes a health claim on the product has a higher assurance of value	7 (3.1)	9 (4.0)	56 (25.1)	94 (42.2)	57 (25.6)	4.0
3.	It is essential that a food product labeled with a health claim	7 (3.1)	8 (3.6)	51 (22.9)	87 (39.0)	70 (31.4)	4.0
4.	I trust health claims given for a Malaysian food product	7 (3.1)	24 (10.8)	64 (28.7)	76 (34.1)	52 (23.3)	4.0
5.	Health claims on food packaging are something I am familiar	5 (2.2)	12 (5.4)	54 (24.2)	90 (40.4)	62 (27.8)	4.0

Note: Respondents perception was rated on 5- point Likert scale, from 1=strongly disagree to 5= strongly agree

Total score for knowledge, attitude, and perception for nutrition claims and health claims (n=223)

The median (IQR) values are given for each construct. The minimum and maximum possible scores are also provided. For knowledge, the median score for nutrition claims is 4.000, with a minimum score of 0 and a maximum score of 5. The median score for health claims is 3.000, with the same minimum and maximum possible scores. For attitude, the median score for nutrition claims is 19.000, with a minimum score of 5 and a maximum score of 25. The median score for health claims is 18.000, with the same minimum and maximum possible scores. For perception, the median score for nutrition claims is 20.000, with a minimum score of 5 and a maximum score of 25. The median score for health claims is 19.000, with the same minimum and maximum possible scores. The results in Table 4.8 show the total scores for knowledge, attitude, and perception regarding nutrition and health claims among a sample of 223 participants. The median score for knowledge of nutrition claims was 4.000, while the median score for knowledge of health claims was 3.000.

This indicates that the participants had a relatively good level of knowledge about nutrition claims but a lower level of knowledge about health claims. The median scores for attitude and perception towards nutrition and health claims were 19.000 and 20.000, respectively. This indicates that the participants had a positive attitude and perception towards both nutrition and health claims. It is important to note that the scores for knowledge, attitude, and perception ranged from a minimum of 0 to a maximum of 5 for knowledge and from a minimum of 5 to 25 for attitude and perception. These scores provide insight into the participants' understanding and beliefs regarding nutrition and health claims and can be used to identify areas for improvement in future studies. It is worth mentioning that the scores for knowledge, attitude, and perception ranged from 0 to 5 for knowledge and from 5 to 25 for attitude and perception. These scores provide a comprehensive view of the participants' beliefs and understanding of nutrition and health claims. They can be used as a benchmark for future studies to improve knowledge, attitudes, and perceptions in this area.

Table 8: Total scores of knowledge, attitude, and perception for nutrition and health claims (n=223)

Construct	Nutrition claims score	Health claims scores
	Median (IQR)	Median (IQR)
Knowledge	4.000	3.000
Attitude	19.000	18.000
Perception	20.000	19.000

*Knowledge of nutrition and health claims: min. score= 0, max. score= 5

*Attitude and Perception for nutrition and health claims: min. Score 5, max. score= 25

Relationship between knowledge, attitude, and perception of nutrition and health claims for packaged food among adults in Malaysia

The findings show the relation between knowledge, attitude, and perception of packaged food nutrition claims among 223 Malaysian adults. The Spearman correlation coefficient (r_s value) and the p-value were used to evaluate the association. With a p-value of 0.121, the r_s value for the correlation between knowledge and attitude towards nutrition claims was -0.104. This suggests that knowledge of and attitude regarding nutrition claims are negatively correlated, though not significantly. Therefore, having a greater understanding of nutrition claims does not necessarily translate into having a more favorable opinion. The r_s value for the relationship between knowledge and perception towards nutrition claims was -0.122, with a p-value of 0.068.

This suggests a non-significant negative relationship between knowledge and perception towards nutrition claims. This suggests that a higher level of knowledge about nutrition claims does not necessarily lead to a more positive perception of these claims. On the other hand, the results show a moderate and positive relationship between attitude and perception of nutrition claims, with a r_s value of 0.686 and a p-value of 0.000**. This indicates that a more positive attitude towards nutrition claims is associated with a more positive perception of these claims. In conclusion, the results of this study suggest that the relationship between knowledge, attitude, and perception of nutrition claims for packaged food is complex and multifaceted. While a higher level of knowledge about these claims does not necessarily lead to a more positive attitude or perception, a positive attitude towards nutrition claims is associated with a more positive perception of these claims.

Table 9: Relationship between knowledge, attitude, and perception of nutrition claims for packaged food among adults in Malaysia (n=223)

Variables	r_s value	p-value
Knowledge and attitude of nutrition claims	-0.104	0.121
Knowledge and perception of nutrition claims	-1.22	0.068
Attitude and perception of nutrition claims	0.686	0.000**

*Spearman correlation is significant at the 0.05 level (2-tailed)

Table 10: Relationship between knowledge, attitude, and perception of health claims for packaged food among adults in Malaysia (n=223)

Variables	r_s value	p-value
Knowledge and attitude toward health claims	-0.25	0.708
Knowledge and perception of health claims	0.019	0.773
Attitude and perception of health claims	0.652	0.000*

*Spearman correlation is significant at the 0.05 level (2-tailed)

The relationship between knowledge and attitude toward health claims was measured using the Spearman correlation coefficient of -0.25 with a p-value of 0.708. This indicates no significant relationship exists between the respondents' knowledge and attitude toward health claims. Similarly, the relationship between knowledge and perception of health claims was measured using the Spearman correlation coefficient, which was 0.019 with a p-value of 0.773. This suggests that no significant relationship exists between the respondents' knowledge and perception of health claims. However, the relationship between attitude and perception of health claims was measured using the Spearman correlation coefficient, which was 0.652 with a p-value of 0.000*. This indicates a significant positive relationship between attitude and perception of health claims among the respondents. This suggests that respondents who had a positive attitude towards health claims also had a positive perception of health claims for packaged food. In conclusion, this analysis suggests that while knowledge of health claims does not appear to significantly influence attitudes or perceptions towards health claims for packaged food among adults in Malaysia, a positive attitude towards health claims does appear to have a positive impact on the perception of these claims.

Conclusion

Results of the study revealed that Malaysian adults possess moderate levels of knowledge, a positive attitude, and a favorable perception towards these claims. These findings have significant implications for improving the nation's overall health and understanding of nutrition and health claims on food labeling. It suggests that adult diets, lifestyles, and behavior may improve after being better informed about the relevance of nutrition and health claims through proper food labeling. Additionally, this research can serve as a tool for educating Malaysian adults on how to read food labels and make healthier food choices from various food groups. The findings of this study also provide valuable insights into consumer behavior towards food products with nutrition and health claims.

Food manufacturers and businesses can use this information to make informed decisions about improving the appearance of nutrition and health claims and prioritize the quality of their products to attract customers. This could lead to more significant innovation and better presentation in the food industry. It is recommended that future surveys related to nutrition and health claims for packaged food be designed and concisely, with clearly defined content, to effectively assess adults' knowledge, attitude, and perception levels.

To further improve the surveys, it would be beneficial to include additional details, examples, and visuals to help participants understand the questions. To increase the impact and reach of these surveys, it is suggested that future studies collaborate with government agencies such as the Minister of Health, health institutions,

manufacturers, or other relevant parties to ensure that the findings are acknowledged and acted upon, thereby increasing awareness of nutrition and health claims among the public.

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Ethical statement

Ethical approval of this study was obtained from the University's Human Ethics Review Board of University Malaysia Terengganu (UMT) with reference number UMT/JKEPM/2022/122.

Conflict of interest

The authors declare no conflict of interest.

References

- Abd Razak, Z., Mohamed Idris, J., Bee Koon, P., Karupaiah, T., Boey, C., & Azlan, A. (2010). *Expert Committee on Nutrition, Health Claims and Advertisement*. 1–44.
- Aggett, P. J., Hathcock, J., Jukes, D., Richardson, D. P., Calder, P. C., Bischoff-Ferrari, H., Nicklas, T., Mühlebach, S., Kwon, O., Lewis, J., Lugard, M. J. F., & Prock, P. (2012). Nutrition issues in Codex: a conference report: health claims, nutrient reference values, and WTO agreements. *European Journal of Nutrition*, 51(S1), 1–7. <https://doi.org/10.1007/s00394-012-0306-8>
- Atm Emdadul Haque, Noor, M., Azalizam Bin Abdullah, & Haque, M. (2016, September 22). Assessment Of Knowledge, Attitude, and Practices About Nutritional Supplements Of The Staff And Students Of... ResearchGate; unknown. https://www.researchgate.net/publication/306407621_Assessment_Of_Knowledge_Attitude_And_Practices_About_Nutritional_Supplements_Of_The_Staff_And_Students_Of_Universiti_Kuala_Lumpur_Royal_College_Of_Medicine_Perak_Malaysia
- Bhattacharya, S., Saleem, S. M., & Bera, O. P. (2022). Prevention of childhood obesity through appropriate food labeling. *Clinical Nutrition ESPEN*, pp. 47, 418–421. <https://doi.org/10.1016/j.clnesp.2021.12.010>

- Benson, T., Lavelle, F., McCloat, A., Mooney, E., Bucher, T., Egan, B., & Dean, M. (2019). Are the claims to blame? A qualitative study to understand the effects of nutrition and health claims on perceptions and consumption of food. *Nutrients*, 11(9). <https://doi.org/10.3390/NU11092058>
- Blitstein, J. L., & Evans, W. D. (2006). Use of Nutrition Facts Panels among Adults Who Make Household Food Purchasing Decisions. *Journal of Nutrition Education and Behavior*, 38(6), 360–364. <https://doi.org/10.1016/j.jneb.2006.02.009>
- Charan, J., & Biswas, T. (2013). How to Calculate Sample Size for Different Study Designs in Medical Research? *Indian Journal of Psychological Medicine*, 35(2), 121. <https://doi.org/10.4103/0253-7176.116232>
- Coles R. (2003). Introduction. In: Coles R, McDowell D, Kirwan MJ, editors. Food packaging technology. London, U.K.: Blackwell Publishing, CRC Press. p 1–31
- Crosbie, E., Gomes, F. S., Olvera, J., Rincón-Gallardo Patiño, S., Hoepfer, S., & Carriedo, A. (2022). A policy study on front-of-pack nutrition labeling in the Americas: Emerging developments and outcomes. *The Lancet Regional Health - Americas*, 100400. <https://doi.org/10.1016/j.lana.2022.100400>
- Dewie Ratnasari, Nazir, F., La, & Djarwani Soeharso Soejoko. (2016, March). The correlation between effective renal plasma flow (ERPF) and glomerular filtration rate (GFR) with renal... ResearchGate; IOP Publishing. https://www.researchgate.net/publication/299402589_The_correlation_between_effective_renal_plasma_flow_ERPF_and_glomerular_filtration_rate_GFR_with_renal_scintigraphy_99m_Tc-DTPA_study
- Donovan, C. M., O'Donovan, C. B., O'Mahony, S., Lyons, O. C., Flynn, M. A. T., & Collins, N. A. (2020). True or false – the Irish consumer's attitude to nutrition and health claims. *Proceedings of the Nutrition Society*, 79(OCE3). <https://doi.org/10.1017/s0029665120007557>
- Examination of Front-of-Package Nutrition Rating Systems and Symbols. (2010). *National Academies Press*. <https://doi.org/10.17226/12957>
- FAO-WHO Regional Conference on Food Safety for Asia and the Pacific. (2023). <https://www.fao.org/3/ad698e/ad698e.htm#:~:text=The%20objective%20of%20the%20Food,Health%20and%20the%20Local%20Authorities.>
- Foluke Adenike Olatona, Nwankwo C.O, Ogunyemi, A. O., & Kelechi Ebere Nnoaham. (2019, March 25). Consumer knowledge and utilization of food labels on prepackaged food products in Lagos State. ResearchGate; unknown.

https://www.researchgate.net/publication/331982127_Consumer_knowledge_and_utilization_of_food_labels_on_prepackaged_food_products_in_Lagos_State

Grunert, K. G. (2012). Nutrition Labeling. *Encyclopedia of Human Nutrition*, 3–4, 315–319. <https://doi.org/10.1016/B978-0-12-375083-9.00200-2>

Gupta, R. K., & Dudeja, P. (2017). Food packaging. *Food Safety in the 21st Century: Public Health Perspective*, 547–553. <https://doi.org/10.1016/B978-0-12-801773-9.00046-7>

Hasif Rafidee. (2019). *Nutritional Level: Do Consumers in Kota Bharu, Kelantan Understand?* Academia.edu.https://www.academia.edu/72573704/Nutritional_Level_Do_Consumers_in_Kota_Bharu_Kelantan_Understand

Hui, Y., And, Y., Nur', S., & Jaafar, A. (2019). Consumers' Knowledge, Perception, and Attitude towards Nutrition and Health Claims on Dairy Products and Purchase Intention in Johor Bahru. *Universiti Malaysia Terengganu Journal of Undergraduate Research*, 1(2), 92–102. <https://doi.org/10.46754/UMTJUR.V1I2.71>

Jan, J. B. (2015). Prevalence and Determinants of Overweight, Obesity, and Type 2 Diabetes Mellitus in Adults in Malaysia - Hamid Jan B. Jan Mohamed, Roseline Wai Kuan Yap, See Ling Loy, Shane A. Norris, Regien Biesma, Jens Aagaard-Hansen, 2015. *Asia Pacific Journal of Public Health*. <https://journals.sagepub.com/doi/abs/10.1177/1010539514562447?journalCode=apha>

Loong, C. (2012). Information on Food Labeling Requirements in Malaysia. UCSI University, pp. 1–15. [http://www.mfca.org.my/articles/Information on Food Labeling Requirements in Malaysia.pdf](http://www.mfca.org.my/articles/Information%20on%20Food%20Labeling%20Requirements%20in%20Malaysia.pdf)

Marsh, K., & Bugusu, B. (2007). Food Packaging—Roles, Materials, and Environmental Issues. *Journal of Food Science*, 72(3), R39–R55. <https://doi.org/10.1111/J.1750-3841.2007.00301.X>

Masson, E., Debucquet, G., Fischler, C., & Merdji, M. (2016). French consumers' perceptions of nutrition and health claims: A psychosocial-anthropological approach. *Appetite*, 105, 618–629. <https://doi.org/10.1016/j.appet.2016.06.026>

Mhurchu, C. N., & Gorton, D. (2007). Nutrition labels and claims in New Zealand and Australia: a review of use and understanding. *Australian and New Zealand Journal of Public Health*, 31(2), 105–112. <https://doi.org/10.1111/j.1753-6405.2007.00026.x>

- MN Md. Norazmir, M.A. Noor Hasyimah, A. Siti Shafurah, & H. Norazlanish. (2012, February). Knowledge and Practices on Food Safety among Secondary School Students in Johor Bahru, Johor, Malaysia. ResearchGate; Asian Network for Scientific Information.
https://www.researchgate.net/publication/273413744_Knowledge_and_Practices_on_Food_Safety_among_Secondary_School_Students_in_Johor_Bahru_Johor_Malaysia
- Mitić, S., & Gligorijević, M. (n.d.). Consumers' attitudes, knowledge, and consumption of products with nutrition and health claims 1 - ProQuest. Retrieved June 6, 2022, from
<https://www.proquest.com/docview/1766260486/E5A208B63EF84F02PQ/9?accountid=45905>
- Niva, M. (2016). Can we predict who adopts health-promoting foods? Users of functional foods in Finland. *Scandinavian Journal of Food and Nutrition*.
<https://www.tandfonline.com/doi/full/10.1080/11026480600655378>
- Nurliyana, G., Norazmir, M. N., & Khairil Anuar, M.I. (2011). Knowledge, Attitude, and Practices of University Students Regarding the Use of Nutritional Information and Food Labels. *Asian Journal of Clinical Nutrition*, 3(3), 79–91.
<https://scialert.net/fulltext/?doi=ajcn.2011.79.91>
- Nur Nasihah, A., Asma, A., & Noor Salihah, Z. (2018). Assessing Food Insecurity and Its Association with Nutritional Status of Children in Pengkalan Kubor, Kelantan. *International Conference on Food Science and Nutrition 2017*, March 10–15.
<https://www.researchgate.net/publication/323700717>
- Paek, S. H., Kwak, Y. H., Noh, H., & Jung, J. H. (2019). A survey on the perception and attitude changes of first-line healthcare providers after child abuse education in South Korea. *Medicine*, 98(2), e14085.
<https://doi.org/10.1097/md.00000000000014085>
- Riley, M. D., Bowen, J., Krause, D., Jones, D., & Stonehouse, W. (2016). A survey of consumer attitude towards nutrition and health statements on food labels in South Australia. *Functional Foods in Health and Disease*, 6(12), 809.
<https://doi.org/10.31989/ffhd.v6i12.306>
- Sainani, K. L. (2012). Dealing With Non-Normal Data. *PM&R*, 4(12), 1001–1005.
<https://doi.org/10.1016/j.pmrj.2012.10.013>

- Shammakh, M., Ali, R. T., & Shaari, T. (2020). The relationship of health and nutrition claims towards purchasing choices among consumers in Shah Alam, Selangor. *Journal of Nutritional Science and Vitaminology*, 66, S222–S225. <https://doi.org/10.3177/jnsv.66.S222>
- Steinhauser, Janssen, & Hamm. (2019). Who Buys Products with Nutrition and Health Claims? A Purchase Simulation with Eye Tracking on the Influence of Consumers' Nutrition Knowledge and Health Motivation. *Nutrients*, 11(9), 2199. <https://doi.org/10.3390/nu11092199>
- Swarnakar, S., Sc, M., & Mogra, R. (2022). Consumers perception towards nutrition and health claims on food products and their purchasing behaviour. ~ 253 ~ the Pharma *Innovation Journal*, 4, 253–258. <https://www.thepharmajournal.com/archives/2022/vol11issue5S/PartD/S-11-4-152-970.pdf>
- Tee, E. S., Tamin, S., Ilyas, R., Ramos, A., Tan, W. L., Lai, D. K. S., & Kongchuntuk, H. (2002). Current status of nutrition labelling and claims in the South-East Asian region: are we in harmony? *Asia Pacific Journal of Clinical Nutrition*, 11(2), S80–S86. <https://doi.org/10.1046/J.1440-6047.2002.00004.X>
- The Environmental Impact of Food Packaging. (2020, November 13). FoodPrint; FoodPrint. <https://foodprint.org/issues/the-environmental-impact-of-food-packaging/#:~:text=Each%20form%20of%20packaging%20uses,or%20sludge%20containing%20toxic%20contaminants>
- US), M., Wartella, E. A., Lichtenstein, A. H., & Boon, C. S. (2022). History of Nutrition Labeling. Nih.gov; *National Academies Press* (US). <https://www.ncbi.nlm.nih.gov/books/NBK209859/>
- Vedavalli Sachithananthan. (2021, April 23). A study on the consumer awareness of food additives in packaged food and their effects on health in Abha... ResearchGate; unknown. https://www.researchgate.net/publication/351073677_A_study_on_the_consumer_awareness_of_food_additives_in_packaged_food_and_their_effects_on_health_in_Abha_region_Saudi_Arabia
- Wang, J., & Geng, L. (2019). Effects of Socioeconomic Status on Physical and Psychological Health: Lifestyle as a Mediator. *International Journal of Environmental Research and Public Health*, 16(2), 281. <https://doi.org/10.3390/ijerph16020281>

- Warunpun Kongsom, & Chaiwat Kongsom. (2016). Consumer Behavior and Knowledge on Organic Products in Thailand. *International Journal of Economics and Management Engineering*, 10(8), 2612–2616. <https://publications.waset.org/10004971/consumer-behavior-and-knowledge-on-organic-products-in-thailand>
- Williams, P., & Ghosh, D. (2008). Health claims and functional foods. *Nutrition & Dietetics*, 65(SUPPL. 3), S89–S93. <https://doi.org/10.1111/J.1747-0080.2008.00268.X>