

A survey to investigate the heterogeneity of food date labelling and the consumer's knowledge and practice on food date labelling in Bangi, Selangor, Malaysia

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Abstract

There are different types of food date labelling for different groups of food. However, many food retailers did not follow the regulation and make consumer confuse. Besides, consumers are also not aware of the food date labelling. This study aimed to investigate the heterogeneity of food date labelling and storage instruction in the hypermarket and to investigate the consumers' knowledge and practices on food date labelling. In this study, the usage of the expiry date of refrigerated food products which were pre-packed fruits and vegetables, cheese, milk, juices, cream, dessert, ice cream, yogurt, smoked beef, salami, roasted beef and meat, and chicken loaf and salad dressing were analyzed. The frequency of the shelf life label was enumerated. There were 44.3% of refrigerated food products using the 'best before' date while 23.9% used 'use by' date. Besides, there were 53.4% of the refrigerated food products with storage instructions while 14.9% of it did not have any storage instructions. Questionnaires were used to study the knowledge and practice of consumers towards food date labelling from 385 respondents in Hulu Langat, Selangor. Findings showed that 45.97% of the respondents were not aware about food date labelling but 47.01% of the consumer use shelf life label to judge the edibility of food products. There were 33.77% of the respondent who did not know the difference of food date labelling. Consumers should understand the difference of food date labelling to reduce the number of food waste and food borne disease. The number of consumers who are confused and not aware of food date labelling are worrying. It is recommended for the retailer to use the standardized label for food.

1. Introduction

The increasing demand for minimally processed foods leads to the increasing number of food-related diseases and mostly due to inappropriate handling and misunderstanding of shelf life labels (Robertson, 2016). There are numerous types of ready-to-eat foods sold at hypermarkets. Ready-to-eat food is very convenient as it is ready for consumption without any preparation or cooking. Ready to eat food is known for its perishability. Therefore, a shelf life label is important for ready-to-eat food to determine the edibility of the food besides appropriate handling (Boxstael *et al.*, 2014). Also, manufacturers need to provide information regarding shelf life labels and appropriate handling practices and

storage instructions to maintain the edibility of the food (Newsome *et al.*, 2014).

Food date labelling is a way of communication between manufacturer and consumer on the quality and shelf life of foods. There are three different kinds of shelf life label commonly used in the food industry which are 'use by' date, 'best before' date, and 'expired date' (Ababio *et al.*, 2012). However, some manufacturers simply use the label regardless of its function. Inconsistent in using shelf labels leads to confusion towards the consumer and might end up in food waste or health problems such as food poisoning. Dairy products and ready-to-eat food must have a shelf

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life label and storage instruction as it is perishable food products (Gunders, 2012).

Some consumers who still consume the ready-to-eat food even it passes the expiry date as they judge the edibility of the food product by the appearance of the foods. The growth of the bacteria that are present inside the food is unknown as we do not know the handling process and storage practice before consumption. The presence of microorganisms such as yeast, mold, and bacteria can cause the spoilage of the food, resulting in the occurrence of foodborne illness. The microbial load that is already present together with the mishandling and inappropriate storage practice may lead to a health crisis (Brook, 2011). Besides that, misunderstanding in food date labelling may lead to food waste. The food waste problem has increased recently at the retail and consumer level (Ceuppens *et al.*, 2016). This study aimed to investigate the heterogeneity of food date labelling and storage instruction in the hypermarket and to investigate the consumers' knowledge and practices on food date labelling.

2. Materials and methods

2.1 Identification of the types of food date labelling and storage instructions on refrigerated food product in Bangi, Selangor hypermarkets

To understand the scenario of food date labelling on food packaging, a survey on shelf life label on food packaging were performed with modifications based on the previous study as described by Ceuppens *et al.* (2016). Three different hypermarkets were visited in Bangi, Selangor from March – April 2018. Photo of shelf life label and storage instruction displayed on the packaging were taken and used to classify the type of shelf life label used (i.e 'use by' date or 'best before' date) and also the recommended storage conditions including both before and after opening. The food products were classified into different food categories. Overall, there are differences in food categories in these three different hypermarkets. There are cheese, milk, juices, yogurt, smoked beef, salami, roasted beef and meat and chicken loaf, and salad dressing. These are the food product which date marking is mandatory. The frequency of the shelf life label was analyzed.

2.2 Investigation of the awareness about food date labelling

2.2.1 Research population and data collection

To understand the awareness of the consumers on food labelling, a survey was conducted in three different hypermarkets in a selected areas in Selangor from March until June 2018 to approach consumers who are going to buy the groceries at those selected hypermarkets. A total

of 385 consumers participated and data were collected through a questionnaire. All of the respondents were given ample time to answer the questionnaire.

2.2.2 Questionnaire design

The questionnaire contained closed-end questions and consisted of three parts based on a preliminary study from Boxstael *et al.* (2014). For the first part, the consumer's profile including age, gender, household income, household size, the highest level of education and occupation were collected. Besides, the frequency of purchasing the selected food product was used as a profile to determine the rate of certain food products being purchased. For the second part, four questions were used to test the knowledge of the consumer towards food date labelling. The questions included the awareness of the 'use by' date, 'best before' date, the ability to differentiate between 'use by' date and 'best before' date, and the differences between 'use by' date and 'best before' date. For the third part, consumers were asked about the practices of consumers towards food date labelling on food packaging. The practice of consumers in checking the date labelling and storage instruction of the food product before buying and the approach of the consumer in determining the edibility of the food products were surveyed.

2.2.3 Data analysis

The data were analyzed using SPSS software version 22.0. The socio-demographic of the respondent and the knowledge and practice were analyzed chi-squared test.

3. Results

3.1 Identification of the types of food date labelling and storage instructions on refrigerated food product in Bangi hypermarkets

Table 1 shows the percentage of the food product that is labeled with 'use by' date and 'best before' date. The result showed that 64.93% (n = 137) of the refrigerated food products are labeled with 'best before' date while 35.07% (n = 74) of the refrigerated food products are labeled with 'use by' date.

Table 1. Percentage of refrigerated food products carrying 'use by' date and 'best before' date.

Food date Label	Frequency	Percentage (%)
Use By	74	35.07
Best Before	137	64.93
Total	211	100.00

In Table 2, it shows that 78.20% (n = 165) of refrigerated food product labeled 'use by' date displays the storage instruction while 21.8% (n = 46) of the refrigerated food product carrying 'use by' label does not

display any storage instruction.

Table 2. Percentage of storage instruction displayed on refrigerated food packaging carrying 'use by' date.

Storage instruction displays on packaging carrying 'use by' date	Frequency	Percentage (%)
Present	165	78.20
Absent	46	21.80
Total	211	100.00

3.2 Investigation of the awareness about food date labelling

As shown in Table 3, among 385 consumers, only 20.78% (n = 80) of them were aware of the presence of the food date labelling while 45.97% (n = 177) are not aware of it. However, 33.25% (n = 128) of the consumer are sometimes aware of the food labelling and sometimes are not aware. Furthermore, of all 385 respondents, only 43.38% (n = 167) will check on the food date labelling before purchasing while 35.84% (n = 138) of them do not check the expiry date (Table 4).

Table 3. Percentage of consumer awareness on food date labelling.

Aware of food labelling	Frequency	Percentage (%)
Yes	80	20.78
No	177	45.97
Sometimes	128	33.25
Total	385	100.00

Table 4. Percentage of the consumer who checks the food date labelling before purchase.

Check food labelling before purchase	Frequency	Percentage (%)
Yes	167	43.38
No	138	35.84
Sometimes	80	20.78
Total	385	100.00

Table 5 shows the percentage of respondents who can differentiate between 'use by' date and 'best before' date. The result showed that there were 19.22% (n = 72) of the respondent can differentiate between 'use by' date and 'best before' date while 33.77% (n = 130) of the respondent were unable to differentiate between 'use by' date and 'best before' date.

Table 5. Percentage of the consumer who knows the differences of shelf life label.

Can differentiate shelf life labels	Frequency	Percentage (%)
Yes, Know both	74	19.22
Only Know "Use By"	128	33.25
Only Know "Best Before"	53	13.76
Neither of the two	130	33.77
Total	385	100.00

The percentage of respondents who used shelf life labels to judge the edibility of the food products is shown in Table 6. The results showed that 47.01% (n = 181) of

the respondents use the shelf life label to judge the edibility of the food product while 39.48% (n = 152) do not use shelf life label to judge the edibility of the food products and 13.50% (n = 52) of them rarely use the shelf life label to judge the edibility.

Table 6. Percentage of the consumer who uses shelf life labels to judge edibility.

Use shelf life to judge edibility	Frequency	Percentage (%)
Yes	181	47.01
No	152	39.48
Sometimes	52	13.50
Total	385	100.00

There were 2.86% (n = 11) of the consumer think that it is not confusing while 4.94% (n = 19) of them take it as confusing (Table 7). Besides, of all 385 respondents, only 39.48% (n = 152) will check the storage instruction on packaging while 49.87% (n = 192) of them do not do so and 10.65% of them pointed out that they were not checking the storage instruction all the time (Table 8). Besides, they also were asked whether they know the temperature on their refrigerator. Only 20.52% (n = 79) know their temperature is set less than 4°C, 24.68% (n = 95) of them know it is 4°C while 54.81% (n = 211) of them do not know their refrigerator temperature (Table 9).

Table 7. Percentage of the consumer who thinks the food date labelling is confusing.

Thinking food labelling is confusing	Frequency	Percentage (%)
Strongly Disagree	11	2.86
Disagree	90	23.28
Neutral	66	17.14
Agree	199	51.69
Strongly Agree	19	4.94
Total	385	100.00

Table 8. Percentage of the consumer who reads the storage instruction on the packaging.

Read storage instructions	Frequency	Percentage (%)
Yes	152	39.48
No	192	49.87
Sometimes	41	10.65
Total	385	100.00

Table 9. Percentage of the consumer who knows the temperature of the refrigerator.

The consumer knows the temperature of the refrigerator	Frequency	Percentage (%)
Less than 4° Celsius	79	20.52
4° Celsius	95	24.68
Have no idea	211	54.81
Total	385	100.00

Table 10 shows that 24.94% (n = 96) of them will

throw the food away immediately while 74.29% (n = 289) of them will check the condition of the food first if they notice the food has passed the expiry date.

Table 10. Percentage of the action taken by the consumer if the food passes expiry date.

Action is taken if food passes expiry date	Frequency	Percentage (%)
Throw it away automatically	96	24.94
Check the condition of the food first	289	74.29
Total	385	100.00

Age, gender, the highest level of education, and household income were tested using chi-square test to study their relation towards the knowledge of shelf life label. Based on Table 11, there is a significant association ($p < 0.05$) between age, gender, the highest level of education, and household income towards the knowledge of storage = practice.

4. Discussion

For perishable food products, it is compulsory to carry 'use by' date label as once it comes to the expiry date, it is not suitable anymore to be consumed. This is because most of the perishable food products are convenient for the growth of bacteria. Some foods can be consumed after the expiry date provided that the food product is stored based on the storage instruction to use 'best before' date. However, it is advisable to check on the condition of the food like smell, taste, and appearance is crucial before consuming.

Storage instruction is compulsory for perishable food. This is to ensure the consumers follow the instruction in maintaining the quality of the food and preventing food deterioration. In this study, out of 211 refrigerated food products only 78.19% of the food product labeled with 'use by' date displayed storage instruction while 21.80% of them does not display the storage instruction.

A previous study showed that 30% of food was

discarded due to the expiry date. The consumer believed that expired food is considered inedible (Brook, 2011). Furthermore, in Sweden, more than 9.2% of food was discarded because it passed the 'best before' date (Wikström *et al.*, 2014). Food waste cases have been increasing globally. About 1.3 billion tons of food was wasted globally. Jarjusey and Chamhuri (2017) reported that Malaysian generated 0.76 kg of waste per person per day, where 45% of the waste was food waste and around 30% of the waste was recyclable or edible waste. Statistic showed that approximately RM225 worth of food was wasted every month. In this case, food waste means the food was discarded due to expiry date and uneaten food served in a hotel or during occasions or festivals. According to Lipinski *et al.* (2013), one of the initiatives to reduce food waste is optimizing the usage of food shelf life labels (Lipinski *et al.*, 2013).

The European Commission (EC) had emphasized two types of shelf life labels which are 'use by' date and 'best before' date. These two types of labels are used to prevent the consumer from being exposed to foodborne illness and to reduce food waste globally. 'Best before' date is used for minimal durability which means once the food passes its expiry date, it is still edible but not in its best form or quality provided storage instructions is followed. The 'use by' date, is used for perishable food products to maintain the quality of food products. The product that passed 'use by' date cannot be sold or consumed because the consumer might be expose to the risk of foodborne illness. The storage instruction must be displayed on the packaging for perishable food products with 'use by' date, to show the appropriate method of storage. The storage instructions were influenced by the shelf life of food especially perishable food products (Department for Environment, Food and Rural Affairs, 2011).

A study by Boxstael *et al.* (2014) shows that 50.7% of the Belgian consumers determine the edibility of the food product even though they do not understand the differences between these two terms ('best before' and 'use by'). This habit of generalizing the edibility of the

Table 11. Chi-Squared test to test if there is an association between knowledge and demographic.

	Age			Gender			Highest level of education			Household income		
	Value	df	Asymp. Sig. (2-sided)	Value	df	Asymp. Sig. (2-sided)	Value	df	Asymp. Sig. (2-sided)	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	59.995 ^a	12	0.000	13.610 ^b	3	0.003	268.494 ^c	12	0.000	45.332 ^d	9	0.000
Likelihood Ratio	65.451	12	0.000	15.124	3	0.002	231.496	12	0.000	53.689	9	0.000
Linear by-linear Association	12.09	1	0.001	5.138	1	0.023	50.312	1	0.000	12.938	1	0.000
N of valid cases	385			385			385			385		

^a5 cells (25.0%) have expected count less than 5. The minimum expected count is 0.28.

^b0 cells (0.0%) have expected count less than 5. The minimum expected count 17.35.

^c3 cells (15.0%) have expected count less than 5. The minimum expected count is 2.06.

^d4 cells (25.0%) have expected count less than 5. The minimum expected count is 1.51.

food based on shelf life label may lead to the consumption of perishable food products which have been exposed to *Listeria monocytogenes* contamination or other pathogenic bacteria (Boxstael *et al.*, 2014). Besides, it can cause unnecessary food waste. Thus, interpretation of the shelf life label plays an important role to prevent foodborne illness and reduce food waste (Ceuppens *et al.*, 2016).

According to Ababio *et al.* (2012), the factor that influences the consumer to buy food product is the expiry date (Ababio *et al.*, 2012). A previous study showed that consumers can differentiate the meaning and the usage between 'use by' date and 'best before' date (Ababio *et al.*, 2012; Boxstael *et al.*, 2014). Surprisingly, in this study, the result showed that only 19.22% knew how to differentiate the differences between and the usage between these two labels, 33.25% know the usage of 'use by' date while 13.77% know 'best before' date while 33.77% of the respondents have no idea about his label.

Based on this questionnaire, the purpose of the shelf-life label on food packaging is not thoroughly understood by the consumer. Determining the edibility of the refrigerated food product without considering other aspects such as shelf life label shows that the consumer is still lacks in food safety knowledge. According to Levy *et al.* (2008) the real percentage of the consumer who understands the concept of shelf life labels might be lower as there are consumers who overvalue their real self-knowledge (Levy *et al.*, 2008).

Boxstael *et al.* (2014) also mention that there were 82.5% of the consumer who determined the edibility of the food by the appearance and olfactory, while 67.5% were used the shelf life label as a guideline. Also, findings pointed out that 50.4% of the consumer determine the edibility of the food by tasting (Boxstael *et al.*, 2014). Brook (2011) mentioned that in United Kingdom, majority of the consumer has the ability in understanding the real meaning of 'best before' date as a quality indicator while 'use by' date as safety indicator. Based on the findings from Brook (2011), the shelf life label based on EU system is still below the optimal standard of its function. As Malaysia is a developing country compare to European Union, this can be explained why most of Malaysians are unable to differentiate the differences between the labels and follow the storage instructions.

Shelf life label is used to ensure that the consumer is able to consume the food product safely before the expiry date. This is because, within the shelf life label period, the food condition is still guaranteed by the manufacturer. Consumers are easily tempted during the

sale season and they will buy the food product in bulk as it comes at a lower price. This kind of practice may cause difficulty to the consumers to consumed all the food product within the allocated time and thus leading to food waste or increasing the chance for foodborne illness (Parfitt *et al.*, 2010). Therefore, when the food had passed its expiry date and the consumers were asked which food they will consume, the consumer would determine the edibility by shelf life label regardless of its use (Boxstael *et al.*, 2014).

To decide which product should carry 'use by' date or 'best before' date, it is mainly through the possibility of the food to support the growth of the microorganism. Uyttendaele *et al.* (2004) pointed out that the growth of microorganisms in the food depends on many aspects including the processing technique, formulation, and microbial ecology. Besides, the initial flora of the microorganism should be considered (Fu and Labuza, 1993; Mahakarnchanakul and Beuchat, 1999; Kilcast and Subramaniam, 2000). Thus, once the products have been decided on a specific term, the consumer must follow and apply the usage of a shelf life label to reduce the risk of infection and food waste.

About 21.3% of the consumers were ready to prepare the raw refrigerated poultry product after the expiry date. Consumer believed that it is safe to consume as it is refrigerated. Besides, the consumer also believed that it is safe to consume as the poultry are not eaten raw and must be cooked before consumption. Based on Hu *et al.* (2012), poultry is considered rich in nutrients to support the growth of the bacteria which can help in proliferation to occur. Furthermore, the handling process and storage practice at the consumer level is questionable. In this study, 54.81% of the respondents do not know about their household refrigerator temperature.

Results also showed that education and household income play significant factor towards knowledge of shelf-life label. It may affect the food safety knowledge and handling practices. High household income has better knowledge in shelf-life label and handling practices compared to those from low income. Result also shows that those that have high higher level in education can understand shelf-life label and handling practice better than those from low education level. This result correlate with other studies that explain education is important in improving shelf-life label knowledge and practices.

5. Conclusion

Perishable food products should be label with 'use by' date since the possibility of contamination and spoilage in a short time is high especially ready-to-eat

food provided appropriate handling and good storage is practiced. The food spoilage can occur before the expiry date due to inappropriate handling and storage during post-processing at the manufacturer, retailer or consumer level. For non-perishable food products, it is recommended to label with 'best before' date as it can be last longer but still, the appropriate storage and handling is needed to apply. Consumers need to check their refrigerator temperature as the correct temperature for the fridge is less than 4°C while temperature for the freezer is 0°C and below. Consumers also need to consider many aspects to determine the edibility of the food including, shelf life label, appearance and olfactory, and the way it is stored. All food products are recommended to have storage instruction as it helps the consumer to keep their food safe and reduce the microbial load that might be the reason of foodborne disease.

Conflict of interest

The authors declare no conflict of interest.

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