



## Awareness and usage of food labelling in purchasing pattern of pre-packed foods in Ampara District, Sri Lanka

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**Abstract** The awareness and attitude of the food label reading are related to the consumer's healthier food choices. The objective of this study was to evaluate the level of awareness and reading habits of food labels, and how these affect the consumers' food choices in Ampara district, Sri Lanka. The questionnaire study was employed to acquire data related to the socio-demographic details, degree of food label usage, awareness, and utilization of food labelling and nutrient labelling. There were 369 consumers in the Ampara district who participated in the questionnaire survey selected based on convenient sampling. The collected data were interpreted using descriptive statistics and a multinomial regression model. According to the results, most consumers (73.5%) bought the packet forms of pre-packed foods, and 52.4% preferred the box forms of pre-packed foods. The consumers (97.2%) read the food labels before purchasing, and most of them checked the label on every occasion (73.2%), followed by the few who occasionally checked (23.8%). Further, certain major tags were observed during the purchasing, including expiry/manufactured dates, price, ingredients, and brand in the packing. In addition, 56.7% of the consumers did not know about the traffic light labelling system. Consumers generally preferred products with moderate levels of sugar, salt, and fat. In conclusion, the analysis highlighted that socio-demographic factors played a significant role ( $p < 0.05$ ) in influencing the developed multinomial logistic model. These factors, including age, income, and education level, were found to shape both the understanding of information presented on food labels and the preferences for pre-packaged food products. The study revealed that most consumers in the Ampara district, Sri Lanka are aware of the importance of reading food labels before making purchases.

**Keywords:** Awareness survey, Consumer knowledge, Food labels, Pre-packed food, Traffic light labelling.

## 1 Introduction

Pre-packed foods refer to foodstuff that is partially or wholly packed in the packaging so that its content cannot be changed unless it is opened or damaged (Shishir *et al.*



2017). The pre-packed foodstuffs are generally produced with the food labels. The information available on the food label, which is important to consumers, includes the name of the food, ingredients, quantity of ingredients, nutritional values, shelf life, net quantity declaration, manufacturer's detail, allergic information, and storage directions (where required). Further, some labels mention the instructions for usage, country of production, and alcoholic strength (where alcohol level is more than 1.2% by volume). It may be varied from product to product and their specifications. The nutritional data contained in the label conveys the information on the ingredients and major micro and macronutrients that aids a consumer in preventing obesity while enhancing the nutrient intake (Kałuza, 2019).

Having clear and brief information on the food label makes it easy to understand by the consumers. An effective food labelling system can help the consumers and facilitate them in making healthier purchasing choices (Machín *et al.* 2018). It is also essential that all customers can comprehend the food labelling schemes (Carbone and Zoellner, 2012). The regulated labels should ensure accurate information and better communication between consumers and products. Therefore, they can monitor their food intake and avoid unnecessary products enriched with unnecessary nutrients, vitamins, and minerals that will be allergic or bad for individual health. In this regard, people with diabetes, hyperlipidemia (high cholesterol), and other food-related health issues are concerned with their food intake (Christoph *et al.* 2016). The food labels with the dates indicate how long a product is safe to eat. Therefore, it helps reduce the wastage of foodstuff and avoid getting sick from expired food. The food labels and brands attract consumers' attention. In addition, they are subjected to communication channels and statements of identity (Zoellner *et al.* 2009).

Consumers may maintain a healthy weight by keeping track of calories and saturated fats, limiting sugar and salt intake, and eating a well-balanced diet. All of these behaviors can aid in preventing diseases such as diabetes and some forms of heart disease (Hong *et al.* 2014). Thus, they can be secured from many illnesses and disorders (Norazlanshah *et al.* 2013). Instructions and information about utilizing a product, including storage and cooking directions, are essential for keeping food safe (Bandara *et al.* 2016). The food labels help to detect the ingredients that may cause harmful reactions in the healthy body. Certain people have allergic reactions to some ingredients used during food manufacturing, like glutamine. Consequently, the consumers can decide on buying products as they are concerned (Choi *et al.* 2015).

There are many factors that can affect the level of consumer's understanding of information available on food labels. It has been proposed that a few socio-demographic factors impact label understanding. According to certain research, color-coded labels are more suited to increasing consumer understanding, particularly among people with poor socioeconomic position, educational level, nutrition understanding, and adherence to dietary guidelines (Hawley *et al.* 2013). The objective of this study is to evaluate the awareness and reading habits of food labels among consumers in the Ampara district of Sri Lanka, and to analyse how these habits influence their food choices.

## 2 Material and Methods

This study was carried out in supermarkets and retail shops located in the Ampara district from February to April 2021 (Figure 1). The sample size of 369 was calculated, assuming 60% of consumers were between the 15-60 age groups. Therefore, the total population size of adults between the ages of 15 and 60 in the Ampara district is 610,719 according to the 2012 Census, and the sample size selection was carried out from the following equation (1).

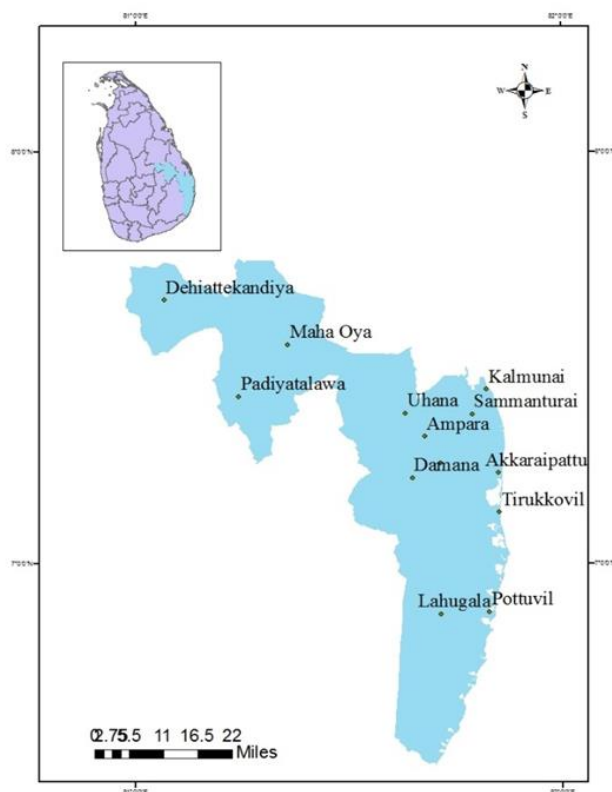
$$n = p (100-p) z^2/E^2 \quad (1)$$

n: required sample size,

p: percentage occurrence condition,

z: value corresponding to the level of confidence needed,

E: percentage maximum error required (Taherdoost 2017).



**Fig. 1. Locations of questionnaire survey employed.**

The socio-demographic information of the consumers, usage of the food labels, understanding of the food labels, awareness of the labels, and utilization of

nutrition labelling were administrated using a structured questionnaire. Initially, the questionnaire was pre-tested with 20 individuals. The consumers leaving the shops were chosen by Random sampling, and informed consent was acquired before administering the questionnaires. Verbal consent was obtained from the shop owners and participants in this study. The data were collected and analysed using the SPSS statistical package (Version 25.0, IBM). Descriptive statistics were used to define the consumers' socio-demographic characters.

The multinomial logistic regression model (MNRM) was applied to identify the significant factors influencing the level of understanding of the information available in the labeling. This analysis involved categorizing the level of understanding into three distinct categories. The dependent variable in this model is the level of understanding of the information available in the labels, while the independent variables include gender, age, level of education, occupation, and monthly income.

Initially, the fitted model's validity was examined using various tests such as model adequacy tests and a summary measure of goodness of fit tests, and MLRM was then employed once the model's validity was verified. We need two logit functions in the three-outcome category model. In this study, the reference category is "cannot understand". Hence, it would take odds of 'cannot understand' vs. 'partially understand' and 'cannot understand' vs. 'can understand'. The three categories are denoted by the letters Y=1, 2, and 3. The reference category is picked initially; let's assume it's Y=1. The logits for the other categories are established by comparing Y=2 and Y=3 to Y=1. We assume p factors for developing the model.

$$\text{Logit}(\pi_{ij}) = \ln \frac{\pi_{ij}}{\pi_{i1}} = X_{ij}^T \beta_j, \text{ for } j = 2, 3$$

where  $\pi_{ij}$  is the probability expression of  $i^{\text{th}}$  response fitting in the  $j^{\text{th}}$  category,  $\pi_{ij} = \Pr \{Y_i = j\}$ ;  $j = 2, 3$ . The (J-1) logit equations are employed concurrently to estimate the parameters  $\beta_j$ . Once the parameter estimates  $\beta_j$  have been obtained, the linear predictors  $X_{ij}^T \beta_j$  can be calculated, where,  $X_{ij}^T \beta_j = \alpha_j + \sum_{p=1}^m \beta_{jp} X_{ip}$ ,  $\alpha_j$  is a constant,  $\beta_{jp}$  the regression coefficient for  $j = 2, 3$ , and  $X_{ip}$  ( $p = 1, 2, \dots, m$ ) are explanatory variables.

$$\hat{\pi}_{ij} = \hat{\pi}_{i1} \exp(X_{ij}^T \hat{\beta}_j) \text{ for } j = 2, 3$$

With the assumption of response categories being mutually exclusive, we can write,

$$\sum \hat{\pi}_{ij} = 1, \text{ and } \hat{\pi}_{ij} = \frac{\exp(X_{ij}^T \hat{\beta}_j)}{1 + \sum_{j=2}^3 \exp(X_{ij}^T \hat{\beta}_j)}, \text{ for } j = 2, 3$$

The parameters of the model are determined using the maximum likelihood estimation approach, which employs the Newton-Raphson iteration process (McCullagh and Nelder, 1989).

Hypothesis:

**H<sub>0</sub>:** All the  $\beta_{jp}$  ( $j = 1, 2; p = 1, 2, 3$  and  $4$ ) parameters are statistically equal to zero to the model

**H<sub>1</sub>:** At least one of the  $\beta_{jp}$  ( $j = 1, 2; p = 1, 2, 3$  and  $4$ ) parameters is statistically significant to the model.

### 3 Results and Discussion

The socio-demographic information of the respondents is indicated in Table 1.

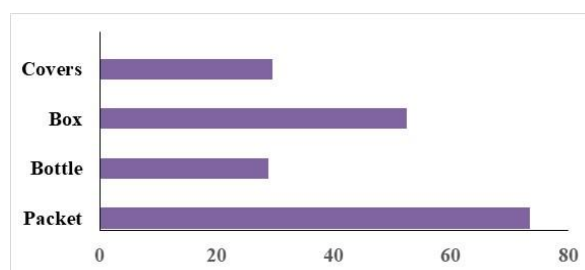
Table 1. Demographic characteristics of the consumers.

Features	Descriptions	Percentage
Gender	Male	56.8 %
	Female	43.2 %
Age	15-25 Years	26.5 %
	26-35 Years	21.9 %
	36-45 Years	36.2 %
	46-55 Years	9.7 %
	56-65 Years	5.4 %
	>65 Years	0.3 %
Level of education	Illiterate	0.3 %
	Up to O/L	23.5 %
	Up to A/L	38.1 %
	Graduate	23.0 %
	Postgraduate	15.1 %
Occupation	Student	21.4 %
	Unemployed	12.7 %
	Govt. Servant	39.2 %
	Private sector	26.8 %
Monthly income	<\$49.50 USD	18.2 %
	\$49.50 - \$99 USD	4.9 %
	\$99 - \$148.50 USD	19.5 %
	\$148.50 - \$198 USD	23.3%
	>\$198 USD	34.1 %

N=369 (Source; Field survey, 2021)

Men (56.8%), the age group of 36-45 (36.2%), and the literate people (99.7%) were represented in the sample prominently. The higher proportion of the respondents were government servants (35.2 %), and their monthly income was more than \$198.

The usage of the food labels during the purchasing indicates that most respondents (73.5%) bought flexible types of pre-packed foods, and 52.4% of consumers mentioned that they purchased box types of pre-packed food (Figure 2). These results agree with the previous findings of Hassan *et al.* (2012), who found out that packaging shape was positively related to the consumer purchase decisions for packaged food. This may be because the pre-packed food in packets or boxes can be easily utilized and disposed of.



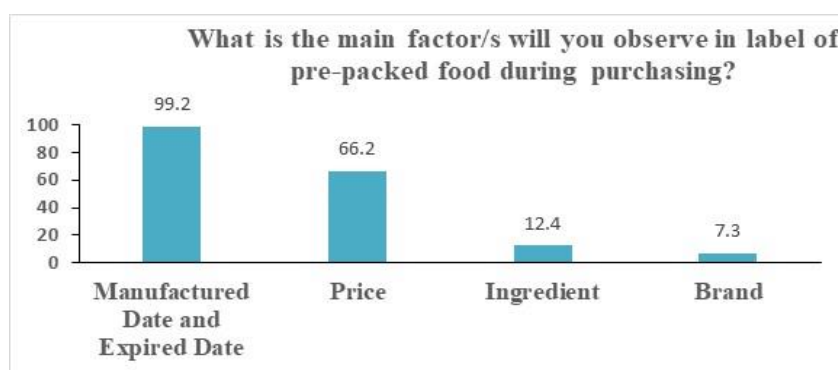
**Fig 2. Common types of pre-packed food purchased by people**

The consumers who read the food labels have well represented the sample, as 97.2% of the consumers indicated that they usually read food labels when buying pre-packed foods, while the rest would not read. This result agrees with the study of Bandara *et al.* (2015), which revealed that consumers mostly read food labels in Sri Lanka because they want to prevent from instances of food allergies, and to avoid toxic components. Further, most consumers (73.1%) indicated that they read the label every time, while 23.9% mentioned that they read food labels occasionally (Figure 3).



**Fig. 3. Frequency of checking food labels of pre-packed food.**

Most consumers (99.2%) reported that the expiry date was the most concerning factor in the label, which was observed during the purchasing. This result is also similar to the finding of Tessier *et al.* (2000), who mentioned that the expiry date on the label was the most commonly used information on food product labels amongst Scottish consumers. Moreover, Sabbe *et al.* (2009) reported that consumers mostly use expiration dates to hint at the freshness, shelf life, and food safety across a range of food. Further, the consumers reported that the price (66.2%), ingredient (12.4%), and brand (7.3%) were the other observable factors during the decision-making of the purchasing (Figure 4).



**Fig 4. Factors observed in food labelling during the purchasing**

The results showed that most consumers (80.6%) had a clear awareness of the labeling of the pre-packed foods, and 58.1% of them could understand the label contents very clearly. In comparison, 41.9% of the consumers could partially understand the information on the food labels. The consumers were asked whether reading food labels before purchasing is important or not; 97% of them reported as "Yes" and 3% of the respondents were as "No". Most consumers (96.2%) reported that the food label on pre-packed food was influenced by the purchasing point of the food products. The ingredients, price, and manufactured/expired date were the important factors at the purchasing point (Table 2).

Moreover, the questions regarding the utilization and awareness of nutrition labeling indicated that most (57%) of the consumers reported that they were not concerned about the nutrition label at the point of purchase. Further, few of them were concerned regarding the sugar level (32.1%), total calorie (27.5%), fat level (23.3%) rather than salt content (12.7%), food additives (12.4%), chemical preservative (9.2%) and micronutrient (7.8%). Most (56.7%) consumers reported no awareness of the traffic light labelling system. At the same time, 43.2% of the consumers reported that they knew the traffic light labelling on the food labels (Table 3). Further, most (99.5%) of the consumers were willing to gather information from the awareness programs by the relevant bodies.

Table 2. Awareness of the food labelling of pre-packed food.

Statement		Description	N %
Do you have a clear awareness about labelling in pre-packed foods?		Yes	80.6
		No	19.4
How much can you understand the information available in the labelling?		Can understand	56.2
		Partially understand	38.6
		Cannot understand	5.1
Do you think reading food labels before purchasing is important?		Yes	97.0
		No	3.0
Is labelling influencing you at the purchasing point?		Yes	96.2
		No	3.8
Which factor/s will be influenced during the purchasing of pre-packed food?	Health claim	Yes	35.4
		No	64.6
	Ingredient	Yes	61.4
		No	38.6
	Nutritional information	Yes	45.7
		No	54.3
	Country of origin	Yes	15.7
		No	84.3
	Price	Yes	91.6
		No	8.4
	Brand	Yes	59.2
		No	40.8
	Manufactured date and expired date	Yes	97.3
		No	2.7

N=369 (Source; Field survey, 2021)

Further, the consumers were primarily willing to consume a medium level of sugar (61.1%), salt (77.3 %), and fat (57.8 %) as the indications in the traffic labeling system (Table 3).



Table 3. Utilization and awareness of nutrition labelling.

Statements		Responses		N %
Do you check nutritional information during the purchasing?		Yes		43.0
		No		57.0
What factors will you check in the nutritional labeling?	Total Calories	Yes		27.6
		No		72.4
	Sugar level	Yes		32.2
		No		67.8
	Fat level	Yes		23.2
		No		76.8
	Salt content	Yes		12.7
		No		87.3
	Food additives	Yes		12.4
		No		87.6
	Chemical preservative	Yes		9.2
		No		90.8
	Micronutrient	Yes		7.8
		No		92.2
Do you know about the traffic light labelling system for sugar, salt, and fat?		Yes		43.3
		No		56.7
Which level of sugar content food do you prefer to purchase?		High		11.4
		Medium		61.1
		Low		27.6
Which level of salt content food do you prefer to purchase?		High		21.6
		Medium		77.3
		Low		1.1
Which level of fat content food do you prefer to purchase?		High		5.1
		Medium		57.8
		Low		37.0
Do you think awareness programs to explain food labelling are important for government and other institutions?		Yes		99.5
		No		0.5

N=369 (Source; Field survey, 2021)

To verify that there were no difficulties with multicollinearity, a linear model was initially run on the outputs as a function of the predictors; only predictors with variance inflation factors (VIF) < 2 were included in these models (Cea, 2012). Several model adequacy tests were evaluated to determine how well the fitted models matched the observed data. The model's overall goodness of fit was evaluated using the likelihood ratio test (LRT), which is based on the -2 Log Likelihood (LL). In this study, the -2LL value for a baseline model is 460.742, whereas the final model -2LL value is 379.302 (Table 4). After a chi-square distribution, the difference between these two numbers reveals how much the

regressors impact the outcome variable. The results of the chi-squared ratio test with a value of 101.440 ( $p < 0.001$ ), showing a good model fit reveals that at least one and possibly most of the coefficients are different from zero and indicates that all regressors have a significant contribution to predicting the level of understanding of the information available in the labelling (Table 4).

Table 4. Model fitting information.

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	df	Significance
Intercept Only	460.742			
Final	379.302	101.440	10	<0.001

Furthermore, the predictive capacity of the fitted model is described by looking at the pseudo  $R^2$  value, which indicates the proportion of variance in the categories of degree of comprehension of the information given in the labelling that can be explained by the model's predictors/regressors. The Nagelkerke  $R^2$  is determined to be 0.295 in this case, meaning that predictors in the model explain around 29.5% in the categories of level of comprehending the information given in the labels. Furthermore, the power of our logistic multinomial model was appropriate because it properly identified 68.3% of the cases (Table 5).

Table 5. Power of classification of level of understanding information on food label model.

Observed	Predicted			Percent Correct
	Can understand	Partially understand	Cannot understand	
Can understand	175	33	0	84.1%
Partially understand	65	77	0	54.2%
Cannot understand	4	15	0	0.0%
Overall Percentage	66.1%	33.9%	0.0%	68.3%

Table 6 displays the likelihood ratio tests for the model's and partials' effects, with p-values indicating that the variables in the model are highly significant at 95% confidence interval. Therefore, we can reject the null hypothesis, at 5% significant level and can argue that at least one of the  $\beta_{jp}$  ( $j = 1, 2; p = 1, 2, 3$  and 4) parameters is statistically significant to the model.

Table 6. Likelihood ratio tests for the effects of the model.

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Significance
Intercept	365.944	10.642	2	0.005
Gender	359.090	3.788	2	0.150
Age	365.396	10.094	2	0.006
Level of education	396.898	41.596	2	<0.001
Occupation	372.007	16.705	2	<0.001
Monthly income	357.290	1.988	2	0.370

Table 7 illustrates the odds ratios, confidence intervals, and p-value of the response variables for each category. The odd ratios for the gender are 1.105 (CI: 0.395-3.092) and 1.729 (CI: 0.635-4.708) for 'can understand' and 'partially understand', respectively, compared to 'cannot understand'. The odd ratio indicates that for every one unit increase on gender variable, the odds of individuals understanding the food labels' information are changed by the factor of 1.105 and 1.729 respectively for the 'can understand' and 'partially understand' categories. The odds ratios for the age variable are 0.532 (CI: 0.336-0.842) and 0.742 (CI: 0.489-1.128) for 'can understand' and 'partially understand', respectively, compared to 'cannot understand'. In other words, for every one unit increase in age variable, the odds of individuals understanding the food labels' information are changed by the factor of 0.532 and 0.742, respectively, for the 'can understand' and 'partially understand' categories.

Table 7. The estimation of parameters for the level of understanding of the information available in the labels

Variable	'Can Understand'				'Partially Understand'			
	Estimated Coefficient	p-value	Odds Ratio ( $e^{\beta}$ )	95% CI of OR	Estimated Coefficient	p-value	Odds Ratio ( $e^{\beta}$ )	95% CI of OR
Gender	0.10	0.849	1.105	0.395-3.092	0.548	0.284	1.729	0.635-4.708
Age	-0.63	0.007	0.532	0.336-0.842	-0.298	0.163	0.742	0.489-1.128
Level of education	1.16	0.002	3.182	1.509-6.710	0.242	0.524	1.274	0.604-2.686
Occupation	1.35	0.001	3.849	1.707-8.682	1.078	0.009	2.940	1.314-6.581
Monthly income	-0.22	0.315	0.801	0.509-1.235	-0.290	0.175	0.748	0.492-1.138

\*Reference category is 'cannot understand'

For an increasing unit of education level, the odds of individuals understanding the information on the food labels are increased by the factor of 3.182 (CI: 1.509-6.710) and 1.274 (CI: 0.604-2.686) respectively for the 'can understand' and 'partially understand' categories compared to 'cannot understand'. In the case of occupation, the odds of individuals understanding the information on the food labels are increased by a factor of 3.849 (CI: 1.707-8.682) and 2.940 (CI: 1.314-6.581), respectively, for the 'can understand' and 'partially understand' categories compared to 'cannot understand'. But, for increasing unit of monthly income, the odds of individuals understanding the information on the food labels are decreased by the factor of 0.801 (CI: 0.509-1.235) and 0.748 (CI: 0.492-1.138) respectively for the 'can understand' and 'partially understand' categories compared to 'cannot understand'. The significant predictors ( $p < 0.01$ ) in the model for level of 'can understanding' are age, education, and occupation, whereas, in the level of partially understanding information on food labels, only occupation is the model's significant predictor ( $p < 0.01$ ).

Against this backdrop, there are few limitations in this study. The understanding level of information on the food label by the consumers were assessed with the socio-demographic factors only. Since there could be other associated factors could have affected the level of understanding of food labels, in future studies, other relevant factors could be incorporated. Further, this study is limited to the locations in Ampara district. Thus, further studies should be conducted in a broader perspective to fill the gap in the understanding of food labeling, and educating the consumers regarding the importance of food labels is a very important mission in present decades.

#### 4 Conclusions

In conclusion, while consumers in this study demonstrated awareness of the importance of reading food labels, there was a lack of awareness regarding nutritional information. Key factors observed during purchasing included the date, brand, ingredients, and prices on food labels. Furthermore, certain demographic factors such as gender, age, level of education, occupation, and monthly income were found to influence the level of understanding of food label information. Specifically, age, level of education, and occupation significantly ( $p < 0.05$ ) affected the comprehension of food label information, as determined by the developed model. Despite significant investments by producers in packaging and labeling, many consumers are not effectively utilizing this information.

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