

## Factors affecting Saudi consumers' decision to purchase food products containing food labels

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### Abstract

Food labels are widely attached to food products to help consumers make informed purchase decisions that fit their needs, health condition, or preference. The study aimed at exploring factors that influence consumers' purchase of food products containing no preservatives label, no artificial colour label, no added sugar label and sugar-free label. The study depended on cross-sectional data that was collected randomly from consumers living in the eastern region of Saudi Arabia. The binary logistic regression results showed that consumers' awareness as proxied by reading the product's ingredients and calories are associated with higher odds of purchasing food products contained in the mentioned food labels. Also, as consumers grow older, their odds of purchasing a sugar-free label and no added sugar label increase. Furthermore, diabetic consumers have two times higher odds of purchasing sugar-free labels and no added sugar labels compared to non-diabetic consumers. Nonetheless, consumers who concentrated on reading product prices were less likely to purchase any of the mentioned food labels.

## 1. Introduction

Saudi Arabia's vision for the future in 2030 deliberates for its community to live a healthy life with awareness and food culture. The Saudi Food and Drug Authority (SFDA) has developed strategies and laws aimed at reducing the consumption of unhealthy food containing too much fat, sugars, salts and unhealthy high calories food. This is because the frequent consumption of these nutrients may cause some diseases, most notably obesity, stress, diabetes and heart disease. The SFDA stated on its official website in 2021 that producing companies have to add nutritional facts information on the product cover as well as to show the amount of added sugar. Restaurant and café owners are also obliged to place calorie in detail and nutrients for each meal served by the end of 2018 (Tami and Al-Mahish, 2021).

The National Education and Label Act (NLEA) in 1994 issued a decision on the use of food cards in the United States of America (Cioffi *et al.*, 2015). In Saudi Arabia, the use of food nutrition labels was included in 2012 after a decision was issued in the Gulf Cooperation Council (GCC) regulation to disclose the components of food products and additional nutrients and materials. The reason for this decision is to increase the production and

consumption of processed food products. This has led to the need to provide nutritional information to the consumer to make it safer and educate what the individual consumes and promote healthy eating habits (Amital *et al.*, 2003; Sharf *et al.*, 2012).

Food nutrition labels issued from countries have several forms, the most famous of which are the GDA label and TL label. The GDA labels are digital posters showing the quantity per serving in addition to the percentage represented by the quantity. The TL label varies as it places the percentages per 100 grams of the product and symbolizes red, green and yellow colours for each level of food items as high, medium, and low, respectively. Some experimental studies have shown that TL labels are more effective to use by consumers (Zhang *et al.*, 2020). The importance of having a food card on the product cover is a way to help consumers know the nutrients and other information about food products, which is important in affecting consumers' decision to buy the product or replace it with another option (Mauludyani *et al.*, 2021). The use of labels such as 'food ads, neat labels' has increased in the previous years, as well as labels such as 'without addition' or 'does not contain'. These labels may be placed

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prominently on the product packaging and provide certain information about the characteristics of the product at a glance, unlike nutrients table that may be difficult to understand by the consumers or require some time to read and interpret their symbols (Sharf *et al.*, 2012; Hartmann *et al.*, 2018).

The information that the SFDA has added is the amount of sugar added to food. The large production of sugar-rich beverages and foods has attracted attention due to its negative effects. Food products that contain a large amount of sugar can cause excessive energy, tooth decay and type 2 diabetes. In 2015, the WHO recommended a reduction in the intake of added sugars to more than 10% of daily energy intake, preferably no more than 5% (Luo *et al.*, 2019). Additives that have been used frequently in recent years are intended to improve food products. They are added to the food product during the production stages directly or indirectly. They have several purposes, either to increase the product's life or to improve the food product's sensory properties. These additives are added in small quantities and are subject to laws and legislation. The most common use of additives is preservatives. In recent years researchers have indicated that they may negatively affect people in the future, and it is better to avoid consuming food additives (Abdulmumeen *et al.*, 2012).

The consumption of artificial colours in food products could cause hyperactivity and attention deficit. Thus, it is recommended to reduce the intake of artificial colours (Batada and Jacobson, 2016). The authors conducted a survey of female-only participants, with 572 participants from different health colleges. The aim of the study was to assess the level of nutritional knowledge of students, to assess the level of students' use of food cards, and the barriers which prevent students from using the food card at Princess Nora University in Saudi Arabia. The results show that some students indicated that there was no point in reading nutrition facts information and they were difficult to use.

A study was conducted using food products sold on campus with nutritional fact information and other food products without nutritional fact information. The aim was to assess the impact of food labels on purchases of pre-packaged food in the university's food facilities (Cioffi *et al.*, 2015). The results show that nutritional facts information had reduced the purchase of food products with high calories and fats and increased the purchase of food products containing lower calories and fats.

Amuta-Jimenez *et al.* (2019) conducted a national survey in the USA in the form of a sample questionnaire

representing 3,185 respondents. The study aims to find out the differences in the way food nutrition facts labels are used and read between those diagnosed with cancer and those who have not been diagnosed with cancer. Additionally, to know the link between how people with social and health conditions and literacy deal with nutrition information. The results show that there is a significant statistical association between health conditions and reading nutrition facts labels. Furthermore, the study found a significant association between reading nutrition facts labels and a reduction in the consumption of soft drinks and an increase in eating vegetables and fruits.

A study was conducted in Taiwan and China through a questionnaire distributed to 399 students. The study aims to assess the effects of the food safety course on the knowledge, behaviour and practice of sixth-graders compared to fifth-grade schoolchildren (Ioannidou *et al.*, 2021). It showed that about 70% of school students know that governments have regulations and laws on food additives added to food products. The study showed that more than half of students agreed that foods containing food additives are harmful (unhealthy food). About 20% of fifth graders and about 9% of sixth graders always choose food products that contain fewer food additives. Ellison *et al.* (2013) conducted a two-week survey of 138 observations, of which 55.8% were female diners. The aim was to answer an open question of whether symbolic information was more influential to consumers with limited nutritional knowledge at the Oklahoma State University campus restaurant. The researchers indicated that meals containing high calories have a big impact on people who lack knowledge and awareness. The authors concluded that using food labels may reduce meal (calories) intake. Messina *et al.* (2004) conducted a study aimed at finding out the attitudes of Italian teenagers towards healthy eating habits and examining the most important factors that cause the consumption of sugar-free foods. Nine public high schools were randomly selected from 256 schools located in Rome and surrounding areas (five from Rome, four from the surrounding areas). The study included 125 males and 108 females aged between 15-21. The parents' permission to participate in the food survey was requested through interviews, and then approved participants were asked to register all the foods and drinks they ate within four consecutive days over three periods of the school year. The researcher found that teenagers were unsure of their answers towards healthy foods, and they did not express a certain view regarding why they consume sugar-free products. Batada and Jacobson (2016) conducted a cross-sectional study in a supermarket in North Carolina through analysis of the proportion of canned food and non-canned food products

sold to children in the supermarket, which contains food colours (AFC compounds). The aim of the study is to understand the feasibility of recommendations for food colourings by investigating the spread of products targeting children containing AFC compounds in supermarkets by brands, products, categories and companies. Researchers found that four out of ten products contain at least one AFC compound making it difficult for families not to buy AFC-containing products.

This study aimed to fill the gap in the literature by revealing the characteristics of consumers that are more likely to purchase food commodities containing nutrition labels. Knowledge about consumers characteristic can help food producing companies in Saudi Arabia to make an informed decision to target consumers that are more likely to purchase their products.

## 2. Materials and methods

This descriptive study was conducted by e-questionnaire in April-May 2021 in Saudi Arabia, Eastern Province. Male and female respondents participated. The study used the Stephen Thompson equation to determine the sample size based on the size of the population in the Eastern Region of Saudi Arabia (Thompson, 2012).

$$n = \frac{N \times P(1-P)}{[(N-1) \times (d^2 + z^2)] + P(1-p)} \quad (1)$$

Where  $n$  is the sample size,  $N$  is the population size,  $P$  is a probability value that takes a value from 0 to 1,  $d$  is the desired precision, and  $Z$  is a standardized value equal to 1.96. Equation (1) indicates that the minimum sample size should not be less than 384 respondents.

The data was collected by distributing an electronic questionnaire that was randomly posted on social media apps. It consists of 3 sections. The first section is the socio-demographic information of participants, such as gender, age, income, education and employment status. The second section is general information about food labels. Section 3 is about the participant's purchase decision of food products. The collected data reached 425 observations. However, after the screening process, 24 participants were excluded because they did not live in the Eastern region of Saudi Arabia. Thus, the total number of observations reached 401 participants consisting of 100 males and 301 females.

The first section of Table 1 is concerned with the demographic and economic data of the participants, and it shows that the number of females participating in the research was higher than males, with 100 males and 301 females. The average age of the participants is 29 years.

The majority of respondents hold a bachelor's degree and represent 63% of the total participants. Also, participants with a monthly income of less than SAR 4,000 make up the highest number of respondents, with 62%. The second part of the survey was about consumer knowledge of the food nutrition label and the number of participants reading the food nutrition labels listed on the food products 62% of total participants indicated that one-third of the respondents do not read the nutrition labels. Furthermore, most participants do not suffer from diabetes and claim that they know the purpose of the food nutrition labels. It has also been found that almost half of the participants cannot understand the symbols and numbers included in the food nutrition labels and do not know what additives are added to food products. This gives a clear signal to the importance of raising food awareness among consumers in Saudi Arabia with regard to reading and interpreting food nutrition labels. However, the majority of participants agree that additives used in food products should be written. Also, most respondents are confident that when a food company mentions the word "without adding a specific substance", the product does not contain that substance. Conversely, a study in Iran indicated that 79.2% of college students do not believe the information on the food nutrition label (Malek Mahdavi *et al.*, 2012).

The third section of the questionnaire revolves around the behaviour of reading the food nutrition labels and respondents' purchase decisions. Out of the 299 participants, 299 knew the difference between a sugar-free label and a "no added sugar" label. Also, 265 participants preferred to buy products that contained a "no preservatives" label, and 303 preferred to buy products that contained a "no added colours" label. Moreover, almost two-thirds of the respondents prefer to buy products that contain a "sugar-free" label and a "no added sugar" label, respectively.

In order to examine the associations between the categorical variables in Table 1, the Chi-Squared test or Fisher's exact test was used if the condition of the Chi-Squared test was not met. In order to reveal the factors that affect consumers' purchase decisions of food products that contain food labels, we will use the binary logistic regression model expressed below:

$$L_i = \ln\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \beta_1 X_1 + \dots + \beta_k X_k \quad (2)$$

Where  $L_i$  is the logit for food products bearing food label  $i$ ,  $\ln\left(\frac{P_i}{1-P_i}\right)$  is the log of odds ratio,  $\beta_0$  is the intercept,

$\beta_1 \dots \beta_k$  is the parameters to be estimated,  $X_1 \dots X_k$  is the vector of explanatory variables that are expected to influence consumers' decision to purchase a certain food product containing food label  $i$ .

Table 1. Demographic and consumers' behaviour towards food labels

Variable	N	%	Food nutrition labels reading behaviour and purchase decision			
			Yes		No	
			N	%	N	%
<b>Gender:</b>						
Male	100	25%				
Female	310	75%				
<b>Age:</b>						
10-20 years	36	9%				
20-30 years	248	62%				
30-40 years	71	18%				
40-50 years	33	8%				
50-60 years	10	2%				
>60 years	3	1%				
<b>Residence:</b>						
Al-Ahsa	324	81%				
Dammam/Khobar/Dharan	49	12%				
Abqaiq	21	5%				
Jubail	6	1%				
Qatif	1	0%				
<b>Educational Degree:</b>						
Uneducated	2	0%				
Secondary degree and below	76	19%				
Diploma	37	9%				
Bachelor	251	63%				
Post-graduate	35	9%				
<b>Employment Status:</b>						
Unemployed	121	30%				
Student	42	10%				
University student	127	32%				
Employed	111	28%				
<b>Monthly Income:</b>						
Less than 4000	248	62%				
4000-7999	55	14%				
8000-11999	35	9%				
More than 12000	63	16%				
<b>Measurement of consumers awareness about food nutrition facts</b>						
			Yes		No	
			N	%	N	%
Read food nutrition label	248	62%	153	38%		
I have diabetes.	40	10%	361	90%		
The purpose of food nutrition label is to give information about the nutritional contents of the Product	360	90%	41	10%		
I can understand and know the meaning of the symbols and numbers listed on the food nutrition label	218	54%	183	46%		
I know what food additives added to food commodities.	213	53%	188	47%		
Food additives should be written on the food nutrition label	333	83%	68	17%		
When "No added" is listed to food nutrition label, it means the product is free from the mentioned item	316	79%	85	21%		

I know the difference between "no added sugar label" and "sugar-free label"	299	75%	102	25%
When I buy a food product, I read the following (You can choose more than one option)				
Price	332	83%	69	17%
Production and expiry date	356	89%	54	13%
List of ingredients	172	43%	229	57%
Manufacturer	156	39%	245	61%
Net weight	51	13%	350	87%
Permit and distribution number	81	20%	383	96%
Calories	213	53%	188	47%
Types of food additives	133	33%	268	67%
Before buying the food product I read food nutrition label				
Always	77	19%		
Sometimes	278	69%		
Never	46	11%		
I buy food products that have "without preservatives" label	265	66%	145	36%
I buy food products that have "no artificial colours" label	303	76%	98	24%
I buy food products with "sugar-free" label.	243	61%	158	39%
I buy food products with "no added sugar" label	273	68%	128	32%

### 3. Results and discussion

The results of the association tests between food label purchase decisions, awareness, health condition and other factors are shown in Table 2. The association tests in Table 2 were conducted using R software. The results show that there is a statistically significant association between diabetes and purchasing sugar-free as well as no added sugar label. However, the alternative hypothesis that diabetes and consumers' knowledge about sugar-free and no added sugar label are independent was accepted. This could indicate that diabetic patients do not know the difference between a sugar-free label and no added sugar label. Conversely, a statistically significant association at the one per cent level was found between diabetes and understanding nutrition facts labels. Furthermore, Fisher's exact tests show that diabetes and monthly income are associated.

A statistically significant association between consumers' knowledge about food additives and reading food additives information was found. This gives importance to consumers' awareness as it makes them vigilant in purchasing food products that contain additives. The results indicate a statistically significant association between reading manufacturer information and products' prices as well as monthly income. This

Table 2. Association Test

Variables	Test Type	P-Value
Diabetes and Buying Sugar Free label	$\chi^2 = 7.005$	0.0081***
Diabetes and Buying No Added Sugar label	$\chi^2 = 5.854$	0.0155**
Diabetes and knowing the difference between sugar free and no added sugar label	$\chi^2 = 0.099$	0.7521
Diabetes and understanding nutrition facts label	$\chi^2 = 11.77$	0.0006***
Diabetes and monthly income	Fisher's Exact Test	0.0046***
Knowledge about food additives and reading food additives information	$\chi^2 = 22.57$	0.00002***
Reading manufacturer information and price information	$\chi^2 = 7.13$	0.0075***
Reading manufacturer information and monthly income	$\chi^2 = 10.82$	0.0127**

Note: \*\*\* and \*\* denote significance level at the one and five percent levels.

could indicate that consumers purchase specific food products manufactured by certain manufacturers due to price considerations. Also, this may indicate that consumers' income level plays a significant role in consumers' decisions to purchase a food product from a certain manufacturer.

The factors influencing consumers' decision to purchase a food product containing a sugar-free label, no added sugar label, no artificial colour label, and no preservatives label are revealed using the logistic regression equation (Equation (2)). The logistic regression model was estimated using R software, and the estimated parameters are reported in Table 3. The results in Table 3 shows that for every additional increase in consumers' age, the consumers will be more likely to purchase food products containing no added sugar label and sugar-free label. In addition, food label use was found to be higher among older participants in a cross-sectional study in North Carolina, USA (Satia *et al.*, 2005). This is attributed to the fact that as consumers get older, their awareness about consuming food products containing sugar increases. Hence older consumers will probably refrain from consuming food products with a high amount of sugar. On the other hand, the results show that income does not influence consumers' decision to purchase a specific food label. This result is consistent with Pérez-Escamilla and Haldeman (2002), who found that income does not improve dietary quality. Moreover, male consumers were found to have 70% higher odds than female consumers of buying no artificial colour label. Conversely, Drichoutis *et al.* (2008) indicated that young females are more likely to use food labels compared to men.

Furthermore, the product's price was found to have a statistically significant negative impact on consumers' decision to purchase food products containing no preservatives label, no artificial colour label, no added sugar label, and sugar-free label. As a result, a consumer who reads a product price will have lower odds of purchasing food products containing any of the mentioned labels compared to consumers who do not

focus on the product's price. Additionally, the likelihood of purchasing a food product containing a food label increases as products prices decrease (Steinhauser *et al.*, 2019).

Moreover, consumers who read the product ingredients and calories are more likely to purchase food products containing food labels. Thus, consumer awareness plays a significant role in guiding consumers to healthy food selections. On the other hand, health conditions such as diabetes can force consumers to choose food products that are consistent with their health condition. This fact is revealed in Table 3 since the results show that the odds of diabetic consumers purchasing food products containing sugar-free labels or no added sugar labels is two times the odds of non-diabetic consumers. This result is consistent with (Lewis *et al.*, 2009) findings that participants with a chronic disease check food labels more compared to healthy participants. In addition, consumers who differentiate between sugar-free labels and no added sugar labels are more likely to purchase no added sugar labels and no artificial colour labels compared to consumers who do not.

#### 4. Conclusion

Food labels are widely attached to many food products for plenty of purposes. For instance, some companies use food labels as a marketing tool to promote their products, they can be used as a regulatory standard imposed by food regulators, and they can be used to help consumers make an informed, healthy choice. This study is a cross-sectional study conducted on a random sample of consumers living in the eastern region of Saudi Arabia. The results of association tests showed that there is a statistically significant association between diabetes and buying sugar-free label and no added sugar label. Also, a statistically significant association between consumers' knowledge about food additives and reading food additives information was obtained. This indicates that consumers who are unfamiliar with food additives are unlikely to read food

Table 3. Factors influencing consumers' food labels purchase

Variables	Model (1) No Preservatives Label	Model (2) No Artificial colour Label	Model (3) Sugar Free Label	Model (4) No Added Sugar Label
Intercept	-0.4311 (0.6716) [0.649]	-0.1079 (0.7876) [0.897]	-1.1121 (0.7060) [0.328]	-1.5304** (0.7732) [0.216]
Income Level:				
Less than 4000	0.1789 (0.3417) [1.196]	-0.2645 (0.4132) [0.767]	-0.2289 (0.3648) [0.795]	0.2533 (0.3888) [1.288]
4000-7999	0.4320 (0.4234) [1.540]	0.1455 (0.5183) [1.156]	-0.3441 (0.4318) [0.708]	0.5171 (0.4736) [1.677]
8000-11999	0.040 (0.4634) [1.040]	-0.5362 (0.5419) [0.585]	-0.4107 (0.4897) [0.663]	-0.0001 (0.5207) [0.999]
Age	0.0219 (0.0141) [1.022]	0.0262 (0.0166) [1.026]	0.0405*** (0.0152) [1.041]	0.0377** (0.0165) [1.038]
Gender:				
Male	0.0233 (0.2599) [1.024]	0.5333* (0.3145) [1.704]	0.1177 (0.2673) [1.125]	0.1639 (0.2892) [1.178]
Reading Product's Price	-0.5981* (0.3071) [0.549]	-0.6802* (0.3667) [0.506]	-0.6253** (0.3059) [0.535]	-0.6908** (0.3426) [0.501]
Reading product's ingredients	0.4489* (0.2365) [1.566]	0.7708*** (0.2810) [2.161]	0.5923** (0.2389) [1.808]	0.9556*** (0.2675) [2.600]
Reading product's Calories	0.8480*** (0.2285) [2.335]	0.8429*** (0.2620) [2.323]	1.0352*** (0.2331) [2.815]	1.3784*** (0.2538) [3.968]
Diabetes	0.3313 (0.3941) [1.392]	-0.0533 (0.4513) [0.948]	0.8195* (0.4403) [2.269]	0.8904* (0.4933) [2.436]
Knowing the Difference between Sugar Free and No Added Sugar Label	0.0769 (0.2470) [1.080]	0.6827** (0.2675) [1.979]	0.3698 (0.2525) [1.447]	0.6417** (0.2655) [1.899]

Note: \*\*\*, \*\*, \* denote significance levels at the 1%, 2%, and 3% levels respectively. Numbers in parentheses () are standard errors, and the numbers in square brackets [] are odds ratios.

additives information. The paper also used a binary logistic regression model to unveil the factors affecting consumers' purchase of food products containing no preservatives label, no artificial colour label, no added sugar label, and sugar-free label. The results show that the odds of buying sugar-free food labels and no added sugar food labels increase as consumers get older. Furthermore, consumers' awareness about food ingredients and food calories is very important because consumers who read calories and ingredients information are more likely to purchase food products containing no preservative label, no artificial colour label, no added sugar label, and sugar-free label. Conversely, reading product prices was associated with lower odds of buying all the food labels that were investigated in the study. Thus, food marketers and manufacturers need to clarify to consumers that food labels are not associated with a

price increase. In addition, the odds of diabetic consumers purchasing sugar-free labels and no added sugar labels are two times the odds of non-diabetic consumers. Thus, food manufacturers and food marketers need to manufacture sugar-free or no added sugar labels to target diabetic consumers. Lastly, food regulators should make sure that food labels are authentic and not solely used as a marketing tool to deceive consumers.

### Conflict of interest

The authors declare no conflict of interest.

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