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# NUTRITIONAL KNOWLEDGE AND CONSUMERS' PERCEPTION TOWARD MENU CALORIE LABELING USE IN SAUDI ARABIA

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## ABSTRACT

*Healthier menu choices are affected by the availability of nutritional information in restaurants' menu. A recent regulation of mandating food restaurants in Saudi Arabia to provide calorie labeling could be promising to help consumer select better food options. Subsequently, examining calorie labeling use and understanding among consumers in Saudi Arabia is needed. Therefore, the study aimed to assess the consumers' nutrition knowledge and determine the effect of demographic characteristics, lifestyle factors relative to nutritional knowledge and calorie labeling use. A cross-sectional study was performed on 454 restaurants' consumers, the period of the study was between February and May 2019. Information was collected via a questionnaire that included questions about demographic, nutritional knowledge, health status, and information about using of calorie labels. Statistical tests performed in this study included one-way ANOVA and independent samples t tests. The results revealed that the majority of the study participants were female (71%), in age 30-39 years (30%), bachelor degree (70.5%), employees (42%), high income (33 %), overweight (39%), and having no diseases (73.1%). About 45% of the sample reported their use of calorie labeling when purchasing meals from restaurants. Females had a higher score in nutritional knowledge than male. High education and high income resulted in higher scores in nutritional knowledge. Taste was the major aspect (79%) that determined participants' choice of food compared to cost or nutrition facts. Most of the participants' nutritional knowledge (66.1%) was very good/above average. There were significant (P< 0.05) associations between gender, level of education, health status, income, dieting, and exercising relative to nutritional knowledge. Participants who had high income, normal BMI, buying meal for tasting reasons, and who on dieting were more likely to use calorie labels when purchasing meals from restaurants. Participants who had excellent nutritional knowledge had the highest score for calorie labels use, whereas the participants who had very poor nutritional knowledge had the lowest score for calorie labels use during meals purchasing. This study recommends developing strategies to highlight the importance of educating people on how to utilize these new calories labels through health professionals and media. The addition of more nutrition information and/or interpretive of it on menus also may help people for choosing lower calorie options.*

**Keywords:** *Nutritional knowledge, demographic characteristics, life style, calorie labels.*

## INTRODUCTION

The prevalence of obesity in both developed and developing countries is increasing at an alarming rate around the world. It has become a major health problem, estimated to be the world's fifth leading cause of death (James et al., 2004). It is also a risk factor for many illnesses, including obesity, dyslipidemia, diabetes mellitus type II, some cancers, metabolic syndrome, and heart disease (Yang et al., 2009; Freedland et al., 2008). After oil exploration and the economic boom in the 1970s and 1980s, the rapid cultural and social changes in the Arab Gulf region were related to obesity (Carter et al., 2004; Al-Kandari, 2006). In the

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Kingdom of Saudi Arabia (KSA), obesity prevalence is significantly rising, makes it a major public health concern. In 2016, it was estimated that in KSA, obesity was 39.5% and 29.5% in females and males, respectively (WHO, 2016). Some studies revealed that the factors associated with obesity among KSA people increased dietary intake of processed meat and animal products at the expense of vegetables and fruits (Amin et al., 2008; Mahfouz et al., 2008) and unhealthy eating behaviors (Gasbarrini and Piscaglia, 2005). Frequent dining outside the home and in fast-food restaurants was correlated with increased calorie intake (Ellison et al., 2013 ; Rosenheck, 2008) and obesity (Anderson et al., 2011; Garcia et al., 2012; Goon et al., 2014). The percentage of food eaten in fast-food restaurants has been increased significantly (Nielsen et al., 2002).

These changes in diet were charged with increasing the prevalence of overweight and obesity observed in the last few decades among Saudi children, adolescents and adults (Al-Nozha et al., 2005; Al-Hazzaa, 2007). Obesity prevalence becomes urgent to study strategies that enable this tendency to be controlled (James et al., 2004). Eating habits are known as the primary determinants of this disease (Bassett et al., 2008). Dietary education has been debated as a strategy to embrace a healthier diet and thus reach a more appropriate weight for the population (Bates et al., 2009). Providing numbers of calories and other nutritional information on food restaurants' menus may encourage people to choose lower-calorie options (Bruemmer et al., 2012). A study showed that 79% of consumers would select healthier food options if available (Shori et al., 2017).

A calorie labeling is one of the tools to help educate customers about a meal that they purchased outside the home with nutritional information (Driskell et al., 2008). Menu labeling is one of the particular interest in the fight against obesity, especially in fast food restaurants because the intake of fast food is associated with obesity and other adverse health effects (Harnack et al., 2008). It has been suggested that knowledge of the calories in food is essential in choosing and eating an energy-balanced diet (Cowburn and Stockley, 2003). However, customers survey indicate a demand for calorie information at the point of purchase in restaurants (Fitch et al., 2009). The effectiveness of calorie labels needs to be investigated in Saudi Arabia. The Saudi Food and Drug Authority (SFDA) recently began mandating chain restaurants to post calorie content on menu items and to comply with the law by January 1, 2019 (Saudi Food and Drug Authority, 2018).

A study assessing consumer awareness of calorie use at restaurants in New York City found an increase of people reported seeing calorie information from 25% before the introduction of the policy to 64% after enforcement began (Dumanovsky et al., 2010). Another study aiming to determine the purchasing decision after mandatory menu labeling in Philadelphia reported that consumers at labeled restaurants selected foods with 155 fewer calories than consumers at unlabeled restaurants (Auchincloss et al., 2013). The recent regulation of calorie labeling in Saudi Arabia is promising since it provides a potential opportunity for people to select lower-calorie food choices at food establishments.

Nutritional knowledge plays an important role in raising public awareness of healthy food habits and in the prevention of non-communicable diseases (Eze et al., 2017). It is therefore important to establish a relationship between consumer awareness, attitudes and the use of nutrition labels in order to improve the type of information on labels and how consumers use it to make healthy dietary choices (Loureiro et al., 2006). A number of studies focused on the

relationship between some factors such as gender, age, health status, educational level, nutritional awareness, household size, occupation, and income level with the use and understanding of nutritional labels (Singla, 2010; Besler et al., 2012). Anthorstudy documented that a lower rate of using nutrition labels has been found among older people (Burton and Andrews, 1996). Other research demonstrated that women are more likely to use and understand the nutrition label than men (Grunert et al., 2010). In addition, the use of nutritional labels increases with increasing the level of education (Shine et al., 1997).

Objectives of the current study are to assess: (1) the nutritional knowledge of the participants in the study; (2) the main factors associated with the use of nutrition labels; and (3) the consumers' perception toward calorie label and their effect on food menu choices. To the best of our knowledge, this is the first study examining calorie labeling use in a sample of the Saudi community after the mandatory policy of the menu labeling in restaurants.

## METHODS

### Study design

The design of this research was a cross-sectional study, where the participants had been selected based on the inclusion and exclusion criteria set for the research. Once the participants have been selected the researchers follow the study to assess the nutrition knowledge and perception toward calorie labeling at restaurants and their impact on menu selection. The current study was conducted between February and May 2019.

### Study sampling

The study conducted with 454 participants selected randomly from both sexes. The sample ages ranged from 18 to >50 years old was done over a period of four months. The inclusion criteria included knowledge of their height and weight information, and purchasing a meal from outside the home. The exclusion criteria were participants less than 18 years and those who do not reside in Saudi Arabia.

### Data collection

The survey used during the study was divided into three sections as follows. The first section requested socio-demographic, anthropometric, and health status information. The second section included questions related to study objectives about the use of calorie labels at restaurants. The third section aimed to assess participants' nutritional knowledge. The nutritional knowledge questions developed by Parmenter and Wardle (1999) were used. It consisted of questions designed to assess people's awareness of dietary recommendations, food sources, and associations of diet and diseases. The performance ranking scale developed by Whatiet al. (2009) was utilized for results interpretation. For content validity, the questionnaire was initially translated into Arabic, which was modified according to the cultural proportional, pre-tested for question accuracy and clarity then converted back to English. To protect the privacy of participants, no personal documentation details were collected, anonymous and voluntary participation was ensured.

### Statistical analysis

All statistical analyses for the study variables were performed using the Statistical Package for Social Sciences (SPSS) software (version 24, SPSS, Inc). Frequencies were calculated for quantitative data and descriptive statistics (means and SD) for the continuous variables. One-

way ANOVA and independent samples t-tests with a 95% confidence level were used for statistical tests. All tests were considered statistically significant at P< 0.05.

## RESULTS

From Table (1) the data illustrated that the majority of the study participants were female (71%), while male participants were 29%. Concerning the age groups, most of the study participants were in 30-39 followed by 40-50, 18-29, and the least were in >50 years of age. The majority of participants were Saudi citizens (89%), while 11% of the total participants were residents. Most of the participants' education degree was bachelor 70.5%, while the least education level less than secondary was 3%. Study participants (42%) were employees, while 11% were students. The highest income average of the study participants was high (10,000-20,000 SR/month) (33%) while 7.5% of participants' income was over 20,000 SR/month. Regarding the BMI, most of the participants were overweight (39%), followed by normal weight (32%), obese (27%), and the least were underweight (2%). The majority of the study participants reported having no diseases (73.1%), while the other participants who reported having diseases including diabetes, hypertension/ cardiovascular, liver diseases/gallbladder, cancer, and renal diseases with the percentage of 52, 42, 14,8, and 6 %, respectively.

There were significant differences between gender, level of education, income and health status relative to nutritional knowledge score of the study participants (P< 0.05), while age group, nationality, employment status, and BMI showed non-significant differences relative to nutritional knowledge score. Females had a higher score in nutritional knowledge than males (66.4±9.9 versus 62.3±15.8, respectively). In addition, factors such as having high education and income resulted in higher scores in nutritional knowledge (70.8±17.3 and 74.2±12.8, respectively).

From Table 2 the data illustrated that most of the participants have been eating outside once a week (45%), and the least frequency of eating a meal outside was 5-7 times/week (3.5%). The taste was the major aspect (79%) that determined participants' choice of food when purchasing meals from restaurants as compared to the cost (9%) or nutrition facts including calories information. Concerning dieting 31.3% of the study participants were on a diet. Most of the participants (61 %) reported doing exercises. In addition, 45 % of consumers in this study reported using calorie labels when they purchase their meals from restaurants. Concerning the relationship between nutritional knowledge and lifestyle factors the data of the current study showed that there were significant differences between dieting, exercising, and calorie labels use relative to nutritional knowledge score of the study participants (P< 0.05), while frequency of "eat/buy meals outside" and reasons for buying meal did not show significant differences relative to nutritional knowledge score of the study participants (P< 0.05).

The study participants' nutritional knowledge was distributed from "very poor" to "excellent" as illustrated in Table (3). It was documented from Table (3) that most of the participants' nutritional knowledge (66.1%) was "very good/above average", and about only 6.6% had "excellent" in nutritional knowledge, whereas less than 0.4% had a "very poor" rating.

Table 1. Relationship between demographic characteristics and nutritional knowledge score of the study participants (n =454)

| Demographic characteristics | N (%) | Nutritional knowledge score (Mean ± SD) |
|---|---|---|
| **Gender** | | |
| Male | 132 (29%) | 62.3±15.8* |
| Female | 322 (71%) | 66.4±9.9* |
| **Age group (Y)** | | |
| 18-29 | 102 (23%) | 51.2±9.1 |
| 30-39 | 136 (30%) | 52.4±9.7 |
| 40-50 | 128 (28%) | 53.2±8.1 |
| > 50 | 88 (19%) | 51.5±11.8 |
| **Nationality** | | |
| Citizen | 404 (89%) | 51.9±9.4 |
| Resident | 50(11%) | 54.3±11.1 |
| **Level of education** | | |
| <Secondary | 14 (3%) | 54.5±15.8* |
| Secondary | 82 (18%) | 62.7±14.3* |
| Bachelor | 320 (70.5%) | 65.7±9.9* |
| High education | 38 (8.5%) | 70.8±17.3* |
| **Employment status** | | |
| Employee | 191(42%) | 52.9±10.3 |
| Unemployed | 136 (30%) | 50.9±8.3 |
| Retired | 76 (17%) | 52.4±10.5 |
| Students | 50 (11%) | 52.4±8.9 |
| **Income (SR)** | | |
| <5,000 | 134 (29.5%) | 63.6±10.9* |
| 5,000-10,000 | 136 (30%) | 64.3±11.8* |
| 10,000-20,000 | 150 (33%) | 65.5±12.3* |
| >20,000 | 34 (7.5%) | 74.2±12.8* |
| **BMI (Kg/m²)** | | |
| Underweight (<18.5) | 10 (2%) | 47.8±9 |
| Normal (18.5-24.9) | 144 (32%) | 51.5±9.8 |
| Overweight (25-29.9) | 176 (39%) | 53.3±8.6 |
| Obese (≥30) | 124 (27%) | 51.7±10.7 |
| **Health status** | | |
| Diseases free | 332 (73.1%) | 51.9±9.8* |
| Having diseases | 122 (26.9%) | |
| Diabetes | 52(%) | 53.5±9.6* |
| Hypertension/cardiovascular | 42(%) | 54.5±7.9* |
| Liver diseases/Gallbladder | 14(%) | 54±4.1* |
| Cancer | 8 (%) | 38±5.4* |
| Renal diseases | 6 (%) | 55.7±5.4* |

*All comparisons were significant at P < 0.05.

Table 2. Relationship between the lifestyle and nutritional knowledge Score of the study participants (n =454)

| Lifestyle | N (%) | Nutritional Knowledge Score (Mean ± SD) |
|---|---|---|
| **Frequency of eating/buying meals outside** | | |
| Always (5-7 times/w) | 16 (3.5%) | 64.1±13.7 |
| Usually (2-4 times/w) | 100 (22%) | 66.1±10.0 |
| Sometime (1 time/w) | 204 (45) | 66.4±10.3 |
| Rarely (1 time/m) | 134 (29.5%) | 62.8±15.0 |
| Never | 0 (0%) | - |
| **Reasons for buying a meal** | | |
| Taste | 358 (79%) | 51.9±10 |
| Price values | 40 (9%) | 53.5±10.6 |
| Suitablecalorie | 56 (12%) | 52.9±5.6 |
| **Dieting** | | |
| Yes | 142 (31.3%) | 66.8±9.9* |
| No | 312 (68.7%) | 64.5±12.8* |
| **Exercising** | | |
| Everyday | 20 (4%) | 53±9.4* |
| 5-6 times/week | 48 (11%) | 46.3±10* |
| 2-3 times/week | 96 (21%) | 52.6±8* |
| 1 time/week | 114(25%) | 54.3±10.6* |
| Never | 176 (39%) | 52±9.2* |
| **Calorie labels use** | | |
| Yes | 204 (45%) | 70.5±10.4* |
| No | 250 (55%) | 60.9±11.6* |

*All comparisons were significant at $P < 0.05$.

Table 3. Distribution of the study participants according to the nutritional knowledge score (n =454)

| Nutritional knowledge | Frequency | (%) |
|---|---|---|
| Very poor | 2 | 0.4 |
| Fair/below average | 18 | 4 |
| Good/average | 104 | 22.9 |
| Very good/above average | 300 | 66.1 |
| Excellent | 30 | 6.6 |

Participants were asked to what extent calorie labeling affected their meal choices at restaurants, 31.3% answered it was “somewhat useful and hard to understand”. While 59.9% reported that calorie content was “very useful and easy to understand”, 26.9% of those respondents claimed great influences on their food purchasing decision. However, only 8.8% of respondents claimed that calorie content was not useful to them, and 8.4% of them reported no influences on their purchasing decision (Table 4).

Table 4. Percentage distribution of consumers' perception of calorie use and its influence on their purchasing behavior

| The usefulness of calorie information provided on the menu in a food restaurant | Degree of how calorie information in the menu affecting purchasing behavior | | | |
|---|---|---|---|---|
| | Not at All | Little | Somewhat | Greatly |
| Not useful at all | 8.4 | 0.4 | 0 | 0 |
| Somewhat useful and hard to understand | 7.9 | 8.8 | 9.3 | 5.3 |
| Very useful and easy to understand | 4.4 | 5.7 | 22.9 | 26.9 |

Table 5 showed that there were significant (P <0.05) associations between calorie labels use relative to income and BMI, while the other demographic factors including gender, age group, nationality, level of education, employment status and health status showed no significant association. Participants who had high income and normal BMI were more likely to use calorie labels when purchasing meals from restaurants.

Table 5. Relationship between demographic characteristics and calorie labels use of the study participants (n =454)

| Demographic characteristics | N (%) | Calorie labels use (Mean ± SD) |
|---|---|---|
| **Gender** | | |
| Male | 132 (29%) | 1.59±0.49 |
| Female | 322 (71%) | 1.53±0.50 |
| **Age group** | | |
| **18-29** | 102 (23%) | 1.50±0.50 |
| **30-39** | 136 (30%) | 1.49±0.50 |
| **40-50** | 128 (28%) | 1.39±0.49 |
| **> 50** | 88 (19%) | 1.41±0.49 |
| **Nationality** | | |
| Citizen | 404 (99%) | 1.46±0.50 |
| Resident | 50(11%) | 1.35±0.48 |
| **Level of education** | | |
| <Secondary | 14 (3%) | 1.43±0.51 |
| Secondary | 82 (18%) | 1.39±0.49 |
| Bachelor | 320 (70.5%) | 1.45±0.50 |
| High education | 38 (8.5%) | 1.58±0.50 |
| **Employment status** | | |
| Employee | 191(42%) | 1.49±0.50 |
| Unemployed | 136 (30%) | 1.43±0.50 |
| Retired | 76 (17%) | 1.37±0.49 |
| Students | 50 (11%) | 1.48±0.50 |
| **Income (SR)** | | |
| <5,000 | 134 (29.5%) | 1.36±0.48* |
| 5,000-10,000 | 136 (30%) | 1.49±0.50* |
| 10,000-20,000 | 150 (33%) | 1.48±0.50* |
| >20,000 | 34 (7.5%) | 1.59±0.50* |

| | | |
|---|---|---|
| **BMI (Kg/m²)** | | |
| Underweight (<18.5) | 10 (2%) | 1.40±0.52* |
| Normal (18.5-24.9) | 144 (32%) | 1.53±0.50* |
| Overweight (25-29.9) | 176 (39%) | 1.43±0.49* |
| Obese (≥30) | 124 (27%) | 1.31±0.46* |
| **Health status** | | |
| Diseases free | 332 (73.1%) | 1.44±0.50 |
| Having diseases | 122 (26.9%) | 1.48±0.50 |
| Diabetes | 52(%) | 1.50±0.50 |
| Hypertension/cardiovascular | 42(%) | 1.43±0.50 |
| Liver diseases/Gallbladder | 14(%) | 1.71±0.47 |
| Renal diseases | 6 (%) | 1.67±0.52 |
| Cancer | 8 (%) | 1.75±0.46 |

*All comparisons were significant at P < 0.05.

There were significant associations between calorie labels use and all lifestyle parameters including frequency of "eat/buy meals outside", reasons for buying a meal, dieting, and exercising. Consumers who are buying meals for tasting reasons, who on dieting, as well as participants who are doing exercise 5-6 times a week were more likely to concern about calorie labels when purchasing meals from restaurants (Table 6).

**Table 6. Relationship between lifestyle factors and calorie labels use of the study participants (n =454)**

| Lifestyle | N (%) | Calorie labels use (Mean ± SD) |
|---|---|---|
| **Frequency of eating/buying meals outside** | | |
| Always (5-7 times/w) | 16 (3.5%) | 1.38±0.50* |
| Usually (2-4 times/w) | 100 (22%) | 1.40±0.49* |
| Sometime (1 time/w) | 204 (45) | 1.49±0.50* |
| Rarely (1 time/m) | 134 (29.5%) | 1.43±0.50* |
| Never | 0 (0%) | - |
| **Reasons for buying a meal** | | |
| Taste | 358 (79%) | 1.63±0.48* |
| Price values | 40 (9%) | 1.47±0.51* |
| SuitableCalorie | 56 (12%) | 1.04±0.19* |
| **Dieting** | | |
| Yes | 142 (31.3%) | 1.66±0.47* |
| No | 312 (68.7%) | 1.37±0.48* |
| **Exercising** | | |
| Everyday | 20 (4%) | 1.40±0.50* |
| 5-6 times/week | 48 (11%) | 1.65±0.48* |
| 2-3 times/week | 96 (21%) | 1.42±0.50* |
| 1 time/week | 114 (25%) | 1.46±0.50* |
| Never | 176 (39%) | 1.67±0.47* |

*All comparisons were significant at P < 0.05.

From Table 7, the data revealed that there was a significant relationship between nutritional knowledge and calorie labels use of the study participants as significance was evidenced in Table 2. The participants who had excellent nutritional knowledge had the highest score for calorie labels use, whereas the participants who had very poor nutritional knowledge had the lowest score for calorie labels use during a meal purchasing.

**Table 7: Relationship between nutritional knowledge and calorie labels use of the study participants (n =454)**

| Nutrition knowledge | N(%) | Calorie labels use (Mean ± SD) |
|---|---|---|
| Very poor | 2 (0.4%) | 1.0±0.01* |
| Fair/below average | 18 (4%) | 1.3±0.48* |
| Good/average | 104 (22.9%) | 1.2±0.39* |
| Very good/above average | 300 (66.1%) | 1.5±0.50* |
| Excellent | 30 (6.6%) | 1.9±0.25* |

*All comparisons were significant at P < 0.05.

## DISCUSSION

The study evaluated the relationship between demographic characteristics and nutritional knowledge. Based on the results,there were significant differences between gender, level of education, income, and health status relative to nutritional knowledge score of the study participants (P< 0.05), while there were no significant differences between the age group, nationality, employment status, and BMI relative to nutritional knowledge score of the study participants (P< 0.05). Regarding the nutritional knowledge, the data of the research indicated that females had a higher score in nutritional knowledge than males. This may be due to that females are interested in eating a healthier diet for perfect weight and size that may further encourage them to educate themselves regarding nutrition to achieve this objective, and this finding is corroborated in a number of previous studies (Girois et al., 2001; Hendrie et al., 2008; Parmenter et al., 2000; Smith et al., 2000). According to Nayga (1999) comparing to females, males generally pay less attention to nutrition and health matters than women.

In addition, factors such as having high education and high income resulted in higher scores in nutritional knowledge (Nayga, 1999). The high level of awareness in this study could be explained by the fact that the Food and Drug Authority and the Ministry of Health in Saudi Arabia were always emphasized public health promotional campaigns and continue providing nutritional information to the population *via* public workshops, website, and media (Ministry of Health, 2011; Saudi Food and Drug Authority, 2018).

The findings of the study align with previous studies that have shown individuals with a higher level of education have greater nutrition knowledge levels (Hendrie et al., 2008; Cannoosamy et al., 2014; Nayga, 1996). Participants with a higher educational level are more likely to be exposed to different sources of health and nutrition information (Nayga, 1996). Similarly, the finding of the current study is consistent with previous research in showing that a higher mean score for nutritional knowledge was significantly associated with higher income levels (Cannoosamy et al., 2014). According to Kamphuiset al. (2015) who demonstrated that high-

income people tend to choose a healthy meal with high quality more relevant than low-income ones, that may relate to those meals offered at higher prices.

Concerning the relationship between nutritional knowledge and lifestyle factors. The data of the current study showed that there were significant differences between dieting, exercising and calorie labels use relative to nutritional knowledge score of the study participants (P <0.05), while frequency of "eating/buying meals outside" and reasons for buying meal were non-significant differences relative to nutritional knowledge score of the study participants (P <0.05). The link between following diet and nutritional knowledge was significant in this study, the results of the research are consistent with previous studies, which demonstrated that people were more likely interested in nutritional information hoping to accomplish their goal of dieting (Asakura et al., 2017; Spronk et al., 2014).

The current survey finding showed that participants with moderate visiting to restaurants reported higher nutritional knowledge than other participants. The reason for this finding could be due to their knowledge of high calories containing restaurants' meals; therefore, their use of restaurants is moderate and proportional to their nutritional needs (Hoefkens et al., 2011). The recent results showed that increased nutritional perception or taste expectation led consumers to more frequently pick a target product. This comes in line with other previous studies (Lee and Cranage, 2007; Seo, 2005).

The relationship between demographic characteristics and calorie labels used by the study participants was documented in this study. The results showed that there were significant differences (P <0.05) between calorie labels use and both income and BMI, while the other demographic characteristic factors including gender, age group, nationality, level of education, employment status, and health status were non-significant (P> 0.05) relative to calorie labels use. Participants who had high income and normal BMI were more likely to use calorie labels when purchasing meals from restaurants.

From the results of this study, the higher income level is significantly associated with calorie labels use; this might be attributed to two main factors. First, a lower level of income limits the number of choices consumers have regarding products; and second, consumers actively look for price information, which affects their use of nutritional information (Drichoutis et al., 2005).

The study showed a significant relationship between nutritional knowledge and calorie labels use. Bender and Derby (1992) indicated that nutritional knowledge could improve calorie labels use by improving its perceived benefits and by promoting the evaluation and understanding of calorie labels data. Consumers who were more able to understand calorie labels information were more likely to use it (Drichoutis, 2005). In addition, people with a high level of education (Goodman et al., 2011) and occupation (Drichoutis et al., 2006) were more likely to use calorie labels. Similarly, the results of this study showed that there was a significant correlation between calorie labels use and higher education. According to Nayga(1996), higher-educated individuals care about using calorie labels than uneducated individuals. Marietta et al. (1999) in their study found that nutritional knowledge was positively correlated with the use of calorie labels.

A study done to estimate the relationship between nutritional knowledge and educated people showed that for better food choices and healthy eating, educated people were more conscious (Fitzgerald et al., 2008). However, according to Lin and Lee (2005) who reported that

customers with lower levels of education were found to display more aware buyer attitudes during the decision to buy food. With regard to age, the researchers found that the use of calorie labels was proportional to a rise in age, which could be attributed to older people being more careful about what they are consuming, for medical reasons compared to their younger counterparts, resulting in a higher likelihood of using food labels (Drichoutis et al., 2005).

Regarding the relationship between lifestyle factors and calorie labels use of the study participants, there were significant (P <0.05) associations between calorie labels use and all lifestyle parameters including the frequency of "eating/buying meals outside", reasons for buying a meal, dieting, and exercising. Such findings are consistent with the findings of Doveyet al. (2017) who reported that food marketing messages affected controlled eaters more strongly than unrestrained eaters. Kerr et al. (2014) showed that participants on a weight-loss diet were among the most likely to use nutrition labels, raising the urge to over-eat foods they considered to be healthier.

The study population (59.9%) reported that calorie content to be "very useful and easy to understand". However, only 26.9% of those respondents claimed great influences on their purchasing decision. Thus, when nutrition information is listed on the restaurant menu, it could provide the potential for improving consumer food menu selection. Health promotion should focus on increasing the use of calorie labels at restaurants and educating participants on the positive impact of such usage on their food selection. Evidence on the impact of calorie labeling on consumer purchases is agreed, with some research showing little influence of menu labeling (Harnack et al., 2008; Elbel et al., 2009; Downs et al., 2009) and others finding that labeling facilitated decreases in calories purchased and/or consumed(Roberto et al., 2010; Pulos and Leng, 2010). Calorie labeling is a major step forward in educating the public about calories in restaurants and other food establishments, which might be considered by some people to be very difficult(Block et al., 2013; Roberto et al., 2013).

**In conclusion**, with the current implementation of policy to post calorie information in menus of food establishments in Saudi Arabia, this study recommends developing strategies to stress the importance of educating people on how to understand and utilize these new calorie labeling display through health campaigns and media.

## References

Al-Hazzaa, H.M. (2007). Rising trends in BMI of Saudi adolescents: evidence from three national cross sectional studies. *Asia Pacific Journal of Clinical Nutrition.,16*(3):462–466.

Al-Kandari, Y. Y. (2006). Prevalence of obesity in Kuwait and its relation to sociocultural variables. *Obesity Reviews,* 7(2):147–154.

Al-Nozha, M. M., Al-Mazrou, Y. Y., Al-Maatouq, M. A., Arafah, M. R., Khalil, M. Z., Khan, N. B., & Al-Shahid, M. S. (2005). Obesity in Saudi Arabia. *Saudi Medical Journal, 26*(5): 824–829.

Amin, T. T., Al-Sultan, A. I., & Ali, A. (2008). Overweight and obesity and their relation to dietary habits and socio-demographic characteristics among male primary school

children in Al-Hassa, Kingdom of Saudi Arabia. *European Journal of Nutrition, 47*(6): 310.

Anderson, B., Rafferty, A.P., Lyon-Callo, S., Fussman, C. & Imes, G. (2011). Peer reviewed: Fast-food consumption and obesity among michigan adults. *Preventing Chronic Disease., 8*(4):A71.

Asakura, K., Todoriki, H., & Sasaki, S. (2017). Relationship between nutrition knowledge and dietary intake among primary school children in Japan: Combined effect of children's and their guardians' knowledge. *Journal of epidemiology, 27*(10): 483–491.

Auchincloss, A. H., Mallya, G. G., Leonberg, B. L., Ricchezza, A., Glanz, K., & Schwarz, D. F. (2013). Customer responses to mandatory menu labeling at full-service restaurants. *American Journal of Preventive Medicine, 45*(6):710–719.

Bassett, M. T., Dumanovsky, T., Huang, C., Silver, L. D., Young, C., Nonas, C., & Frieden, T. R. (2008). Purchasing behavior and calorie information at fast-food chains in New York City, 2007. *American Journal of Public Health, 98*(8): 1457–1459.

Bates, K., Burton, S., Howlett, E., & Huggins, K. (2009). The roles of gender and motivation as moderators of the effects of calorie and nutrient information provision on away-from-home foods. *Journal of Consumer Affairs, 43*(2): 249–273.

Bender, M. M., & Derby, B. M. (1992). Prevalence of reading nutrition and ingredient information on food labels among adult Americans: 1982–1988. *Journal of Nutrition Education, 24*(6): 292–297.

Besler, H. T., Buyuktuncer, Z., & Uyar, M. F. (2012). Consumer understanding and use of food and nutrition labeling in Turkey. *Journal of Nutrition Education and Behavior,44*(6): 584–591.

Block, J. P., Condon, S. K., Kleinman, K., Mullen, J., Linakis, S., Rifas-Shiman, S., & Gillman, M. W. (2013). Consumers' estimation of calorie content at fast food restaurants: cross sectional observational study. *British Medical Journal,* 346: f2907.

Bruemmer B, Krieger J, Saelens BE, &Chan N. (2012). Energy, saturated fat, and sodium were lower in entrées at chain restaurants at 18 months compared with 6 months following the implementation of mandatory menu labeling regulation in King County, Washington. *Journal of the Academy of Nutrition and Dietetics,112*(8):1169–1176.

Burton, S., & Andrews, J. C. (1996). Age, product nutrition, and label format effects on consumer perceptions and product evaluations. *Journal of Consumer Affairs, 30*(1): 68–89.

Cannoosamy, K., Pugo-Gunsam, P., & Jeewon, R. (2014). Consumer knowledge and attitudes toward nutritional labels. *Journal of Nutrition Education and Behavior, 46*(5): 334–340.

Carter, A. O., Saadi, H. F., Reed, R. L., & Dunn, E. V. (2004). Assessment of obesity, lifestyle, and reproductive health needs of female citizens of Al Ain, United Arab Emirates. *Journal of Health, Population and Nutrition*, 75–83.

Cowburn, G., & Stockley, L. (2003). *A systematic review of the research on consumer understanding of nutrition labelling*. European Heart Network.

Dovey, T. M., Torab, T., Yen, D., Boyland, E. J., & Halford, J. C. (2017). Responsiveness to healthy advertisements in adults: An experiment assessing beyond brand snack selection and the impact of restrained eating. *Appetite, 112*: 102–106.

Downs, J. S., Loewenstein, G., & Wisdom, J. (2009). Strategies for promoting healthier food choices. *American Economic Review, 99*(2): 159–164.

Drichoutis, A. C., Lazaridis, P., & Nayga, R. M. (2005). Nutrition knowledge and consumer use of nutritional food labels. *European Review of Agricultural Economics, 32*(1): 93–118.

Drichoutis, A. C., Lazaridis, P., & Nayga, R. M. (2006). Consumers' use of nutritional labels: a review of research studies and issues. *Academy of Marketing Science Review, 9*(9): 1–22.

Driskell, J. A., Schake, M. C., & Detter, H. A. (2008). Using nutrition labeling as a potential tool for changing eating habits of university dining hall patrons. *Journal of the American Dietetic Association, 108*(12): 2071–2076.

Dumanovsky, T., Huang, C. Y., Bassett, M. T., & Silver, L. D. (2010). Consumer awareness of fast-food calorie information in New York City after implementation of a menu labeling regulation. *American Journal of Public Health, 100*(12): 2520–2525.

Elbel, B., Kersh, R., Brescoll, V. L., & Dixon, L. B. (2009). Calorie Labeling And Food Choices: A First Look At The Effects On Low-Income People In New York City: Calorie information on menus appears to increase awareness of calorie content, but not necessarily the number of calories people purchase. *Health affairs, 28*(Suppl1): w1110–w1121.

Ellison, B., Lusk, J. L., & Davis, D. (2013). Looking at the label and beyond: the effects of calorie labels, health consciousness, and demographics on caloric intake in restaurants. *International Journal of Behavioral Nutrition and Physical Activity, 10*(1): 21.

Eze, N. M., Maduabum, F. O., Onyeke, N. G., Anyaegunam, N. J., Ayogu, C. A., Ezeanwu, B. A., & Eseadi, C. (2017). Awareness of food nutritive value and eating practices among Nigerian bank workers: Implications for nutritional counseling and education. Medicine, 96(10):e6283. doi: 10.1097/MD.0000000000006283.

Fitch, R. C., Harnack, L. J., Neumark-Sztainer, D. R., Story, M. T., French, S. A., Oakes, J. M., & Rydell, S. A. (2009). Providing calorie information on fast-food restaurant menu boards: consumer views. *American Journal of Health Promotion, 24*(2): 129–132.

Fitzgerald, N., Damio, G., Segura-Pérez, S., & Pérez-Escamilla, R. (2008). Nutrition knowledge, food label use, and food intake patterns among Latinas with and without type 2 diabetes. *Journal of the American Dietetic Association, 108*(6): 960–967.

Freedland, S. J., Wen, J., Wuerstle, M., Shah, A., Lai, D., Moalej, B.,& Aronson, W. J. (2008). Obesity is a significant risk factor for prostate cancer at the time of biopsy. *Urology, 72*(5): 1102–1105.

Garcia, G., Sunil, T.S.,&Hinojosa, P. (2012). The fast food and obesity link: consumption patterns and severity of obesity. *Obesity Surgery., 22*(5): 810–818.

Gasbarrini, A., & Piscaglia, A. C. (2005). A natural diet versus modern western diets? A new approach to prevent "Well-Being Syndromes". *Digestive diseases and sciences, 50*(1): 1-6.

Girois, S. B., Kumanyika, S. K., Morabia, A., & Mauger, E. (2001). A comparison of knowledge and attitudes about diet and health among 35-to 75-year-old adults in the United States and Geneva, Switzerland. *American Journal of Public Health, 91*(3): 418–424.

Goodman, S., Hammond, D., Pillo-Blocka, F., Glanville, T., & Jenkins, R. (2011). Use of nutritional information in Canada: national trends between 2004 and 2008. *Journal of Nutrition Education and Behavior, 43*(5): 356–365.

Goon, S., Bipasha, M.S.,& Islam, S. (2014). Fast food consumption and obesity risk among university students of Bangladesh. *European Journal of Preventive Medicine .,2*(6): 99–104.

Grunert, K. G., Wills, J. M., & Fernández-Celemín, L. (2010). Nutrition knowledge, and use and understanding of nutrition information on food labels among consumers in the UK. *Appetite, 55*(2):177–189.

Harnack, L. J., French, S. A., Oakes, J. M., Story, M. T., Jeffery, R. W., & Rydell, S. A. (2008). Effects of calorie labeling and value size pricing on fast food meal choices: results from an experimental trial. *International Journal of Behavioral Nutrition and Physical Activity,* 5(1): 63. doi: 10.1186/1479-5868-5-63.

Hendrie, G. A., Coveney, J., & Cox, D. (2008). Exploring nutrition knowledge and the demographic variation in knowledge levels in an Australian community sample. *Public Health Nutrition, 11*(12):1365–1371.

Hoefkens, C., Verbeke, W., & Van Camp, J. (2011). European consumers' perceived importance of qualifying and disqualifying nutrients in food choices. *Food Quality and Preference, 22*(6): 550–558.

James, W.P.T., Jackson-Leach, R., Mhurchu, C.N., Kalamara,E., Shayeghi, M., Rigby, N.J., Nishida, C.,& Rodgers, A. (2004). In Comparative quantification of health risks: global and regional burden of disease attributable to selected major risk factors. Ezzati M, Lopez

AD, Rodgers A, Murray CJL, editor. Geneva, World Health Organization; 2004. Overweight and obesity (high body mass index). 497–596.

Kamphuis, C. B., de Bekker-Grob, E. W., & van Lenthe, F. J. (2015). Factors affecting food choices of older adults from high and low socioeconomic groups: a discrete choice experiment. *The American Journal of Clinical Nutrition, 101*(4): 768–774.

Kerr, M. A., McCann, M. T., & Livingstone, M. B. E. (2015). Food and the consumer: could labelling be the answer?. *Proceedings of the Nutrition Society, 74*(2): 158–163.

Lee, S. J., & Cranage, D. A. (2007). The relative importance of menu attributes at point of menu selection through conjoint analysis: Focused on adolescents. *Journal of Foodservice Business Research, 10*(2):3–18.

Lin, W., & Ya-Wen, L. (2005). Nutrition knowledge, attitudes, and dietary restriction behavior of the Taiwanese elderly. *Asia Pacific Journal of Clinical Nutrition, 14*(3): 221–229.

Loureiro, M. L., Gracia, A., & Nayga Jr, R. M. (2006). Do consumers value nutritional labels?. *European Review of Agricultural Economics, 33*(2):249–268.

Mahfouz, A. A., Abdelmoneim, I., Khan, M. Y., Daffalla, A. A., Diab, M. M., Al-Gelban, K. S., & Moussa, H. (2008). Obesity and related behaviors among adolescent school boys in Abha City, Southwestern Saudi Arabia. *Journal of Tropical Pediatrics, 54*(2):120–124.

Marietta, A. B., Welshimer, K. J., & Anderson, S. L. (1999). Knowledge, attitudes, and behaviors of college students regarding the 1990 Nutrition Labeling Education Act food labels. *Journal of the American Dietetic Association, 99*(4): 445–449.

Ministry of Health. Health Tool (2011). Available from: www.moh.gov.sa/en/HealthAwareness/MedicalTools/Pages/default.aspx.

Nayga Jr, R. M. (1999). Toward an understanding of consumers' perceptions of food labels. *The International Food and Agribusiness Management Review, 2*(1): 29–45.

Nayga, R. M. (1996). Determinants of consumers' use of nutritional information on food packages. *Journal of Agricultural and Applied Economics, 28*(2): 303–312.

Nielsen, S.J., Siega-Riz, A.M.,& Popkin, B.M. (2002). Trends in food locations and sources among adolescents and young adults. *Prev Med., 35*(2):107–113.

Parmenter, K., & Wardle, J. (1999). Development of a general nutrition knowledge questionnaire for adults. *European journal of clinical nutrition, 53*(4): 298–308.

Parmenter, K., Waller, J., & Wardle, J. (2000). Demographic variation in nutrition knowledge in England. *Health Education Research, 15*(2):163–174.

Pulos, E., & Leng, K. (2010). Evaluation of a voluntary menu-labeling program in full-service restaurants. *American Journal of Public Health, 100*(6): 1035–1039.

Roberto, C. A., Haynos, A. F., Schwartz, M. B., Brownell, K. D., & White, M. A. (2013). Calorie estimation accuracy and menu labeling perceptions among individuals with and without binge eating and/or purging disorders. Eating and Weight Disorders-Studies on Anorexia, *Bulimia and Obesity, 18*(3): 255–261.

Roberto, C. A., Larsen, P. D., Agnew, H., Baik, J., & Brownell, K. D. (2010). Evaluating the impact of menu labeling on food choices and intake. *American Journal of Public Health, 100*(2): 312–318.

Rosenheck, R. (2008). Fast food consumption and increased caloric intake: a systematic review of a trajectory towards weight gain and obesity risk. *Obesity Reviews, 9*(6): 535–547.

Saudi Food and Drug Authority. "Food and Drug" obliges restaurants and cafes to offer calories (2018).Available from: www.sfda.gov.sa/ar/food/news/Pages/f5-8-2018a1.aspx.

Seo, S. (2005). Identifying relative importance of quality attributes of dining service for older adults using conjoint analysis. *Journal of Community Nutrition, 7*(1): 58–63.

Shine, A., O'Reilly, S., & O'Sullivan, K. (1997). Consumer use of nutrition labels. *British Food Journal.99*:290–296.

Shori, A. B., Albaik, M., & Bokhari, F. M. (2017). Fast food consumption and increased body mass index as risk factors for weight gain and obesity in Saudi Arabia. *Obesity Medicine, 8*:1–5.

Singla, M. (2010). Usage and understanding of food and nutritional labels among Indian consumers. *British Food Journal*, 112 (1): 83-92.

Smith, S. C., Taylor, J. G., & Stephen, A. M. (2000). Use of food labels and beliefs about diet–disease relationships among university students. *Public Health Nutrition, 3*(2): 175–182.

Spronk, I., Kullen, C., Burdon, C., & O'Connor, H. (2014). Relationship between nutrition knowledge and dietary intake. *British journal of nutrition, 111*(10), 1713–1726.

Whati, L., Senekal, M., Steyn, N. P., Lombard, C., & Nel, J. (2009). Development of a performance-rating scale for a nutrition knowledge test developed for adolescents. *Public health nutrition, 12*(10), 1839–1845.

World Health Organization. Diabetes Country Profiles (2016). Available from: https://www.who.int/diabetes/country-profiles/sau_en.pdf.

Yang, P., Zhou, Y., Chen, B., Wan, H. W., Jia, G. Q., Bai, H. L., & Wu, X. T. (2009). Overweight, obesity and gastric cancer risk: results from a meta-analysis of cohort studies. *European journal of cancer, 45*(16): 2867–2873.