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Knowledge, Attitude, and Practice Toward Calorie Labeling in Eastern Region, Saudi Arabia

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Abstract

Background: In 2017, the Saudi Food and Drug Authority (SFDA) introduced a calorie labeling policy to empower consumers to make healthier food choices at restaurants and coffee shops. Thus, this study aims to evaluate consumers' knowledge of this calorie labeling policy and assess their attitudes and practices concerning it in the Eastern Region of Saudi Arabia.

Methods: The research design is quantitative and cross-sectional, and the data are collected within one month. The variables studied are consumers' knowledge of the SFDA's calorie labeling policy, their attitudes toward calorie labeling, and their practices related to calorie labeling.

Results: Out of 384 consumers, 67.2% were females, and 58.3% were aged between 18 and 29. The overall mean knowledge score was 3.90 (SD 1.71) out of six points. Accordingly, 40.9% had good knowledge levels, and 22.7% had good practices, while positive attitudes were found in nearly all consumers (81.8%).

Conclusion: Consumers in the Eastern Region had positive attitudes, but their calorie labeling knowledge and practices were limited.

Keywords

Attitude, Calorie, knowledge, Labeling, Obesity, Policy, Practice

Background

Calorie labeling is essential to helping consumers understand the energy content of a particular food product or drink. Customers can determine which foods have more calories by viewing package labels or menu displays. This transparency gives customers complete, detailed information about the nutritional content of the products they purchase, which allows them to make healthy choices. Calorie labeling is a vital strategy that enables individuals to determine the equivalent value of their consumption. Alassaf et al. (2020) explained how consumers can use calorie information to judge the energy content of different food options, thus enabling them to make the necessary adjustments in food choices in line with their nutritional requirements.

The number of calories per serving allows food manufacturers and restaurant owners to take responsibility for the products they sell. Through the explicit, detailed, and highly informative disclosure of respective calorie counts to consumers, commercial enterprises provide healthier options and more nutritionally valuable recipes that are lower in calories (Alkhathami et al., 2021). Additionally, it may bring about the emergence of more nutritionally-oriented foods in the market that might help in the fight against diet-related illnesses. Nutrition labeling promotes a nutrition-based society and encourages people to check the benefits of food products before purchasing them (Alassaf et al., 2020). Getting this food data will lead to eating meals that coincide with food choices and plans.

To help consumers make healthier choices, in 2017, the Saudi Food and Drug Authority (SFDA) launched a policy that compelled all restaurants, eateries, food vendors, and cafes to put a calorie label on each food and beverage item placed in a visible area within the establishment. Adopting the Saudi government's mandate was an influential measure in dealing with the high risk of various non-communicable diseases due to nutrition, such as diabetes and heart disease (Al-Otaibi et al., 2021). The main aim of the Saudi Calorie Labeling Policy was transparency by giving consumers the nutritional facts of the food and drinks they consume. The SFDA intended to ensure that nutrition facts and calorie information are visible to customers so they can make more knowledgeable diet choices (Al-Otaibi et al., 2021).

Aims and objectives

The study aims to evaluate consumers' knowledge of the calorie labeling policy and assess their attitudes and practices in the Eastern Region of Saudi Arabia.

Methods

Research design

The research used a quantitative cross-sectional design.

Study sampling and setting

A convenience sample of 384 participants was used to help identify those who are easier to access. The study was conducted in the Eastern region, which was selected based on convenience. In addition, it has a high number of restaurants and coffee shops. Thus, people living in the area will likely encounter calorie labels on the menu. The appropriate sample size for this study was calculated through a sample size calculator (http://openepi.com). The result was 384 participants based on a 5% error margin and 95% confidence interval. The inclusion criteria included adults 18 to 50 years old living in the Eastern Region. Exclusion criteria included individuals younger than 18 years and older than 50 not living in the Eastern Region, as well as those diagnosed with a chronic disease requiring diet restrictions.

Instruments

Data were collected using questionnaires available in both English and Arabic. A pilot test was conducted to ensure reliability. The questions of this questionnaire were based on validated questionnaires previously used in a study conducted by Alshehri & Almarzooqi (2022). The questionnaire contained four sections. The first section included the demographic variables, including gender, age, weight (kg), height (cm), educational level, marital status, and income. The second section included six statements to assess customers' knowledge of the calorie labeling policy. All participants who responded with a "yes" were coded with 1, and those who answered "no" were coded with 0. The total knowledge score was calculated by adding all six items. A score ranging from 0 to 6 points was generated. The higher the score, the higher the knowledge of calorie labeling. The cutoff points to determine the knowledge levels were 50% and 75% (Alnemare, 2019). The third section included five statements to analyze customers' attitudes toward calorie labeling using a 5-point Likert scale, with responses ranging from 1 = strongly disagree to 5 = strongly agree. The total attitude was calculated by summing up the five items, resulting in scores ranging from 5 to 25 points. The higher the score, The higher the attitude toward calorie labeling. Criteria similar to those in the Knowledge section were applied to determine the attitude as follows: negative attitude score <50% (0-12 points), neutral attitude score 50–75% (13-18 points), and positive attitude score >75% (19-25 points).

The last section contained seven statements designed to assess the customer's practices of calorie labeling using a 5-point Likert scale, with responses ranging from "never," coded with 1, to "always," coded with 5. The total practice score was calculated by adding all seven items. Scores ranging from 7 to 35 points were generated. The greater the score, the greater the practice concerning calorie labeling. Criteria similar to those in the Knowledge section were applied to determine the level of practice, with a poor practice score of <50% (0-17 points), moderate score of 50–75% (18-26 points), and good practice score >75% (27-35 points).

Data Collection Procedure and Timeline

The questionnaires were distributed online via a secure social media application (WhatsApp and Telegram) link. The study was conducted over one year. Three months were dedicated to finalizing the research proposal and obtaining IRB approval. One month was dedicated to recruiting participants, sending the questionnaires, following up, and tracking responses. The rest of the allocated time was spent compiling the data and conducting statistical analysis and tests. Finally, the remaining time was spent writing and proofreading the paper.

Statistical Analysis

Data were analyzed using SPSS software (version 29). Descriptive analysis, frequencies, and percentages were calculated for the demographic variables. The differences in the knowledge, attitude, and practice scores with participants' socio-demographic characteristics were evaluated using the Mann-Whitney test. The knowledge, attitude, and practice scores followed a non-normal distribution, so the non-parametric test was applied. Furthermore, the Spearman correlation coefficient was used to determine the correlation between the knowledge, attitude, and practice scores.

Ethics and limitations

The ethical committee at Imam Abdulrahman bin Faisal University (IRB-PGS-2023-03-29) approved the study, and participants were required to read and sign a consent form. The study likely had limitations, such as bias due to convenience sampling and the use of closed-ended questionnaires, which restricted participants' responses.

Results

Overall, 384 participants responded to the survey. Descriptive analysis, frequencies, and percentages were calculated for the demographic characteristics. In addition, the assessments of knowledge, attitude, and practices concerning calorie labeling were studied. Also, the knowledge, attitude, and practice scores in correlation with the participants' socio-demographic characteristics were evaluated using the Mann-Whitney test. The Shapiro-Wilk test was used to test normality. The knowledge, attitude, and practice scores followed a non-normal distribution, so the non-parametric test was applied. Furthermore, the Spearman correlation coefficient was used to determine the correlation between the knowledge, attitude, and practice scores.

Table 1: Socio-demographic characteristics of participants (n=384)

Study variables	N (%)
Age group	
• 18 – 29 years	224 (58.3%)
• 30 – 39 years	105 (27.3%)
• 40 – 50 years	55 (14.3%)
Gender	
• Male	126 (32.8%)
• Female	258 (67.2%)

Marital status	
• Single	210 (54.7%)
• Married	160 (41.7%)
• Divorced	14 (03.6%)
Educational level	
• Less than High School	06 (01.6%)
• High School	92 (24.0%)
• Diploma	45 (11.7%)
• Bachelor's Degree	212 (55.2%)
• Master or postgraduate degree	29 (07.6%)
Monthly income (SAR)	
• <10,000	253 (65.9%)
• 10,000 – 19,999	99 (25.8%)
• 20,000 – 29,999	20 (05.2%)
• >30,000	12 (03.1%)
BMI level	
• Underweight (<18.5 kg/m2)	30 (07.8%)
• Normal (18.5 – 24.9 kg/m2)	183 (47.7%)
• Overweight (25 – 29.9 kg/m2)	83 (21.6%)
• Obese (≥30 kg/m2)	88 (22.9%)

Table 1 shows the socio-demographic characteristics of the participants. Nearly 60% were between 18 and 29 years old, with females being dominant (67.2%). More than half were single (54.7%) and held bachelor's degrees (55.2%). Concerning monthly income, nearly two-thirds (65.9%) earned less than 10,000 SAR per month. In addition, 22.9% were considered obese.

Table 2: Assessment of the knowledge, attitude, and practice concerning calorie labeling (n=384)

Knowledge statement	**Yes (%)**
1. I know what is the meaning of calories	360 (93.8%)
2. I can understand the calorie labels on the menu	317 (82.6%)
3. I am familiar with the menu calorie labeling policy	292 (76.0%)
4. I know my daily calorie requirements	233 (60.7%)
5. I can calculate my calorie intake during the day	180 (46.9%)
6. I know how to calculate the calorie content of food items, even those unlabeled	116 (30.2%)
Total knowledge score (mean ± SD)	**3.90 ± 1.71**
Level of knowledge	**N (%)**
• Poor (score <50%)	90 (23.4%)
• Moderate (score 50–75%)	137 (35.7%)
• Good (score >75%)	157 (40.9%)
Attitude statement	**Mean ± SD**
1. I am with the government requiring restaurants to post calorie information on menu boards for each food item.	4.69 ± 0.59
2. I think that posting the calorie information for each food item on the menu is useful.	4.66 ± 0.61

3. I am with posting the calorie information next to the price of the food items on the menus	4.64 ± 0.60
4. Posting calorie information on the menu board would encourage me to select food with less calorie	4.32 ± 0.91
5. I feel guilty for picking a higher-calorie food if calories were posted	3.89 ± 1.18
Total attitude score	**22.2 ± 2.84**
Level of attitude	**N (%)**
• Negative (score <50%)	1 (0.30%)
• Neutral (score 50–75%)	69 (18.0%)
• Positive (score >75%)	314 (81.7%)
Practice Statement	**Mean ± SD**
1. I dine out of home	3.38 ± 0.82
2. I prefer to eat at restaurants that post the calorie information on the menu	3.37 ± 1.27
3. I pay attention to the calorie labels when choosing my order	3.18 ± 1.26
4. I avoid foods posted with higher caloric intake	3.16 ± 1.17
5. I look at the calorie labels when purchasing foods from the markets	3.14 ± 1.30
6. I choose foods with lower caloric intake	3.00 ± 1.13
7. I calculate my total energy intake during the day	2.41 ± 1.29
Total practice score	**21.6 ± 6.19**
Level of practice	**N (%)**
• Poor (score <50%)	107 (27.9%)
• Moderate (score 50–75%)	190 (49.5%)
• Good (score >75%)	87 (22.7%)

The attitude statement has a response ranging from “strongly disagree," coded with 1, to “strongly agree," coded with 5.

The practice statement has a response ranging from "never," coded with 1, to "always," coded with 5.

Regarding the assessment of the knowledge of calorie labeling (Table 2), nearly all participants were aware of the correct meaning of calories (93.8%) .Respondents who were aware of daily calorie requirements were familiar with the menus' calorie labeling policy and understood the calorie labels on menus constituted 60.7%, 76%, and 82.6% of the sample, respectively. In contrast, poor knowledge was seen in calculating the calorie content of food items (30.2%) and calculating calorie intake per day (46.9%). Based on the above statements, the overall mean knowledge score was 3.90 (SD 1.71), with poor, moderate, and good knowledge levels constituting 23.4%, 35.7%, and 40.9%, respectively. Regarding the attitude toward calorie labeling, the highest ratings were seen in the statement, "I am with the government requiring restaurants to post calorie information on menu boards for each food item" (mean score: 4.69) and "I think that posting the calorie information for each food item on the menu is useful" (mean score: 4.66). In contrast, the statement, "I feel guilty for picking a higher-calorie food if calories were posted," showed the lowest rating (mean score: 3.89). The overall mean attitude score was 22.2 (SD 2.84), with negative, neutral, and positive attitude levels constituting 0.3%, 18%, and 81.7%, respectively. Regarding practice concerning calorie labeling, the highest ratings were seen for the statement, "I dine out of home" (mean score: 3.38), followed by "I prefer to eat at restaurants that post the calorie information on the menu" (mean score: 3.37), whereas "I calculate my total energy intake during the day" has the lowest rating (mean score: 2.41). The overall mean practice score was 21.6 (SD

6.19). Percentages of poor, moderate, and good practice levels were 27.9%, 49.5%, and 22.7%, respectively.

Figure 1: Correlation between knowledge and attitude scores

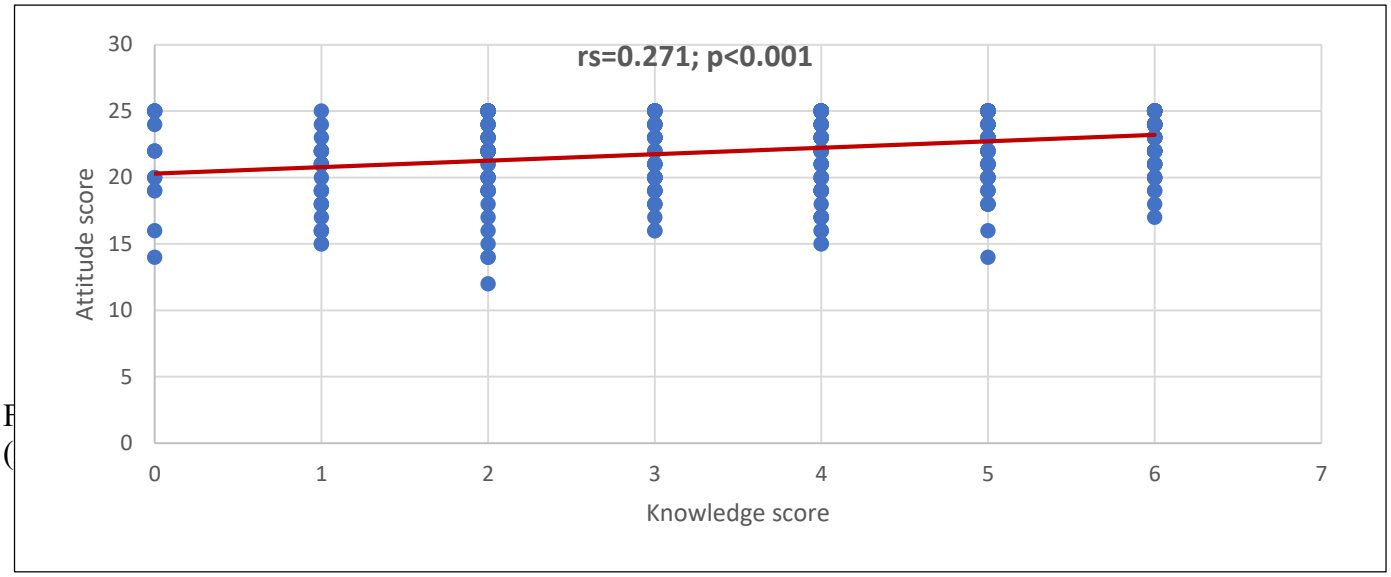

Figure 2: Correlation between knowledge and practice scores

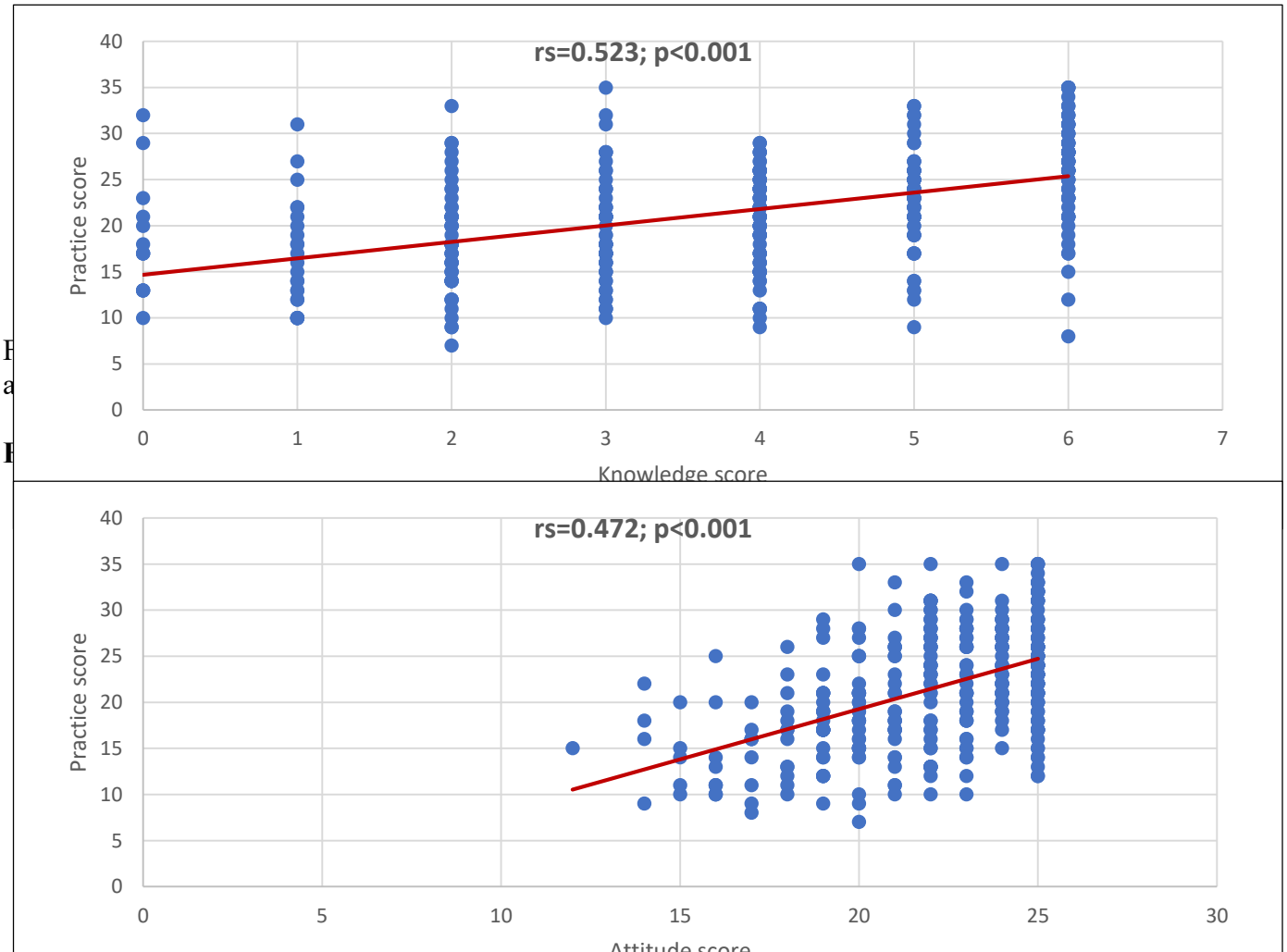

Figure 3 shows a positive, highly statistically significant correlation between attitude and practice scores (rs=0.472; p<0.001).

Table 3: Differences in knowledge, attitude, and practice scores about the socio-demographic characteristics of participants (n=384)

Factor	Knowledge Score (6)			Attitude Score (25)			Practice Score (35)		
	Mean ± SD	**IQR**	**Mean Rank**	**Mean ± SD**	**IQR**	**Mean Rank**	**Mean ± SD**	**IQR**	**Mean Rank**
Age group									
• <30 years	3.94 ±1.71	3	194.81	21.9 ± 2.99	5	184.81	21.1 ± 6.54	10	184.49
• ≥30 years	3.84 ±1.72	2.75	189.27	22.5 ± 2.59	4	203.27	22.3 ± 5.63	8	203.71
Z-test; p-value §	***0.490; 0.624***			***1.637; 0.102***			***1.675; 0.094***		
Gender									
• Male	3.95 ± 1.81	3.25	197.40	22.6 ± 2.81	4	210.05	22.6 ± 6.13	9	210.45
• Female	3.88 ± 1.67	2	190.11	21.1 ± 6.18	5	183.93	21.1 ± 6.18	9.25	183.73
Z-test; p-value §	***0.615; 0.539***			***2.206; 0.027 ** ***			***2.217; 0.027 ** ***		
Marital status									
• Never been married	3.93 ± 1.75	3	194.76	21.9 ± 3.05	5	186.64	21.6 ± 6.53	10	191.63
• Have been married	3.87 ± 1.68	2	189.77	22.4 ± 2.55	5	199.57	21.7 ± 5.79	8	193.55
Z-test; p-value §	***0.446; 0.656***			***1.158; 0.247***			***0.169; 0.866***		
Educational level									
• Diploma or below	3.76 ± 1.76	3	184.20	22.0 ± 2.81	5	184.69	21.7 ± 6.40	10	192.01

• Bachelor's degree or higher	3.98 ± 1.68	3	197.43	22.3 ± 2.86	4	197.14	21.6 ± 6.08	9	192.79
Z-test; p-value §	***1.149; 0.251***			***1.083; 0.279***			***0.067; 0.947***		
Monthly income (SAR)									
• <10,000	3.92 ± 1.72	2.50	193.65	22.1 ± 2.81	5	189.72	21.5 ± 6.44	9	190.52
• ≥10,000	3.87 ± 1.70	2	190.28	22.3 ± 2.91	5	197.87	21.9 ± 5.70	8	196.32
Z-test; p-value §	***0.287; 0.774***			***0.695; 0.487***			***0.486; 0.627***		
BMI level									
• Normal or underweight	3.69 ± 1.68	3	178.57	21.8 ± 2.90	5	178.44	20.9 ± 6.29	10	179.12
• Overweight or obese	4.15 ± 1.73	3	209.85	22.6 ± 2.71	4	210.01	22.6 ± 5.95	8	209.16
Z-test; p-value §	***2.793; 0.005 ** ***			***2.822; 0.005 ** ***			***2.639; 0.008 ** ***		

§P-value has been calculated using the Mann-Whitney test.

** Significant at $p<0.05$.

The differences in the knowledge, attitude, and practice scores about the socio-demographic characteristics of participants were evaluated using the Mann-Whitney test. (Table 3) show that the attitude and practice scores of males and females were significantly different, $p=0.027(<0.05)$. At the same time, the male gender had a more significant mean rank (197.40) than females with a mean rank (190.11), and thus, the male gender was associated with higher attitudes and practice scores than females. The KAP scores of BMI level were significantly different, $p=0.005(<0.05)$. Being overweight or obese was associated with a higher mean rank (209.85) than being normal or underweight with a mean rank (178.57), and thus, being overweight or obese was associated with higher knowledge, attitude, and practice scores than being normal or underweight. No significant differences were observed between KAP regarding age, marital status, educational level, and monthly income (all $p>0.05$).

Discussion

Study's population's knowledge regarding calorie labeling needs to be more profound. According to the criteria, although 76.6%% were considered to have good or moderate knowledge, 23.4% had limited knowledge. The overall mean knowledge score was 3.90 out of 6 points. This is almost consistent with the study done in India (Nayak et al., 2023). The reports showed that 81.9% of the students had medium to high knowledge about food labeling, and the rest had low knowledge (18.1%). Supporting these reports, a study conducted in Malaysia documented a high level of knowledge detected in 61.5% of students (Zaini et al., 2022). However, in Jeddah (Turkistani & Saati, 2020), better knowledge was seen among the population, as 95.6% of the restaurant consumers had calorie labeling knowledge ranging from good to excellent. There is a need to improve the knowledge among consumers in the Eastern Region. Having adequate knowledge of food labeling could lead to better nutrition, particularly for consumers with chronic diseases. Being overweight or obese was identified as a significant predictor of increased knowledge. These results are different from various reports. Most studies documented an association between the level of knowledge about gender and education (Liao et al., 2023; Nayak et al., 2023; AlShehri & AlMarzooqi, 2022; Turkistani & Saati, 2020). However, a study by Zaini et al. (2022) found no significant association between knowledge, gender, and education, which coincided with our findings.

Finally, examining the specific details of consumers' knowledge of calorie labeling has revealed that the majority were knowledgeable about the true meaning of calories (93.5%), understood the calorie labels on menus well (82.6%), were familiar with the menu calorie labeling policy (76%), and knew the daily requirements of caloric intake (60.7%). However, there were gaps, particularly in calculating calorie content (30.2%) and calorie intake per day (46.9%). Contradicting these reports, Radwan et al. (2017) documented that 60% and 59% were aware of the energy requirements for moderately active men and women, while the energy requirements for inactive adults were lower (34%). However, in Iran (Rabiei et al., 2022; Mahdavi et al., 2012), studies emphasized the importance of food labels to ensure that the food is fresh and to determine whether the food has nutritional value. Although many were skeptical about the nutritional values written on food labels (79.2%), most students (84%) highlighted the importance of expiry dates and the storage conditions of food as the most critical components of food labels (Mahdavi et al., 2012).

Most of study respondents had a positive attitude toward calorie labeling (81.8%), while others were neutral (18%), and only one respondent (0.3%) had a negative attitude (mean score: 22.2 out of 25 points). This is comparable to the paper of Nayak et al. (2023). Most students (65.6%) showed a positive attitude toward labeling food, while 24.3% were neutral and 10.6% were negative. Studies conducted in China (Liao et al., 2023) and Malaysia (Zaini et al., 2022) showed similar results.

Male gender and being overweight or obese were significant predictors of an increased positive attitude. This is different from the study of Alkhatami et al. (2021), which suggests that using caloric information on menus to select meals was significantly associated with attitude and perceived behavioral control. Supporting these accounts, Rabiei et al. (2022) reported a positive association between "attention to the word 'diet' when purchasing." Suggesting that a more positive attitude could result in more attention to the word "diet" when buying.

Regarding specific attitude details, respondents from our study showed high scores for most of the attitude items. Most notably, agreement was highest in requiring restaurants to post calorie information on menu boards and the government's role in implementing this regulation. This

echoed the results of AlShehri and AlMarzooqi (2022). The findings show that 83.9% believed that calorie labeling information encourages consumers to choose foods with fewer calories. However, Alsaaf et al. (2020) reported that approximately half (50%) of the respondents are affected by calorie labeling to make healthier choices.

Consumers' practices concerning calorie labeling

There were gaps in consumers' practices concerning food labeling. Approximately 27.9% were categorized as having poor practices, and the rest had good (22.7%) and moderate (49.5%) practice levels (mean score: 21.6 out of 35 points). This is almost consistent with the study done in India (Nayak et al., 2023), where 52.5%, 30.6%, and 16.9% were classified as having good, fair, and poor use of food labels.

Significant predictors of increased practice include the male gender and being overweight or obese. This almost agrees with the study of AlShehri and AlMarzooqi (2022). The study identified predictors of practice such as marital status and BMI levels. When evaluating the practices of consumers concerning calorie labeling, we noticed good practices when dining out at restaurants that had calorie information on the menu, paying attention to calorie labels when choosing orders, and avoiding foods high in calories. However, calculating caloric intake per day was a concern since the rating was low (mean score: 2.41 out of 5 points). This may not coincide with the reports of Mahdavi et al. (2012). Among students, 47.6% read nutritional facts labels during shopping, but the use of these information labels to fit the food into their daily diet was low, at 32.3%. Incidentally, the least noteworthy item on nutritional facts labels was fatty acids (1.9%).

Limitations

Finally, the study has some limitations. First, the closed-ended questionnaire may have restricted participants' responses. Second, this cross-sectional survey was prone to bias and did not measure cause and effect. Several suggestions may be made to improve the Eastern Region of Saudi Arabia's understanding, perspective, and implementation of calorie labeling. To begin, it is critical to launch focused educational initiatives to get the word out about how calorie labeling may help people make better food choices.

Implication of the study

The study has several implications for public health, policymaking, and future research. Firstly, it highlights the need for enhanced public education to bridge gaps in knowledge and promote healthier dietary habits. The findings can inform policymakers about the effectiveness of calorie labeling as a tool for addressing obesity and related health issues, supporting the implementation and enforcement of labeling regulations in food establishments. Additionally, the study underscores the importance of fostering positive attitudes toward calorie awareness, which can lead to more informed consumer choices. For future research, the study serves as a baseline for exploring the long-term impact of calorie labeling on public health outcomes and identifying barriers to its acceptance and utilization.

Conclusion and Recommendations

Consumers in the Eastern Region had positive attitudes, but their knowledge and practices concerning calorie labeling were limited. Consumers who were overweight or obese tended to have better perspectives on calorie labeling. In addition, male consumers were more likely to demonstrate better attitudes and practices but needed to be knowledgeable. In particular, the study provides valuable information that will help develop effective interventions and highlight the gaps seen in the participants, especially in calorie counting and calorie intake per day. Therefore, health

agencies need to run campaigns and health promotion programs to teach consumers about calorie labeling so they will consider this information when choosing what to eat at a restaurant. Also, the outcomes of the study advocate for more research on implementing menu labeling in restaurants. Furthermore, literature that discusses awareness of nutrients and calories is essential to warrant the Saudi population's understanding of calorie requirements. Reading and applying nutritional facts on product labels to their consumption practices is beneficial and helps to reduce the obesity rate and related diseases. To educate people on how to efficiently use calorie information, these campaigns may be run through public health programs, community seminars, and social media.

Conflict of Interest

The authors declare that they have no conflict of interest associated with this article.

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