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Calorie Labeling on Restaurants Menu: Notice and Use among King Abdul-Aziz University Students in Jeddah City, Saudi Arabia

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ABSTRACT

Background: Calorie labeling on restaurants menus (CLRM) is an important public health step to halt the rapid increase in obesity. Research on CLRM conducted on Saudi college students are limited and those investigating its association with weight control behaviors and concerns are absent. Therefore, we aimed to assess CLRM notice and use to limit calories and to investigate its relationships with restaurant visit frequency, weight-related concerns, and weight control behaviors among Saudi college students.

Methods: Participants self-reported demographic, medical information, lifestyle, dietary habits, and weight status and completed a validated Eating and Activity in Teens and Young Adults IV survey (EAT IV) about notice and use of CLRM, restaurants eating frequency, binge eating, weight control behaviors and concern.

Results: A total of 379 responded to the questionnaire, their age ranged from18-28 years. Noticing of CLRM was reported in 74 %, of the participants and 57.5% of them used it to limit calories intake. Logistic regression revealed that, more weight concern score, studying at practical faculties and moderate PA were predictors for noticing menu labels, while using more healthy behaviors for weight control and healthier dietary habits were positively associated with using menu labels to limit calories.

Conclusions: Not everyone who notices CLRM uses it to limit calories and healthy behaviors for weight control and healthier dietary habits are associated with increased labels use to limit calories intake. Raising awareness of CLRM for promoting appropriate caloric consumption and effective health promotion strategies directed at adopting and maintaining positive health-related behaviors are crucial.

Key words: Restaurants, Awareness of menu labeling, Saudi Arabia, Behaviors, Dieting, Weight concern, Weight control

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INTRODUCTION

Obesity is a well-documented problem in Saudi Arabia. Thirty eight percent of Saudi adults are overweight, and 20% are obese [1]. Over the past 50 years, obesity has nearly tripled worldwide. It affects 40% of adults globally, making obesity a public health priority. Overweight and obese individuals are at a major risk factor for heart disease, stroke, hypertension, type 2 diabetes and certain types of cancers, contributing to a decline in both quality of life and life expectancy, and is associated with unemployment, social disadvantages and reduced socio-economic productivity, thus increasingly creating an economic burden [2].

A rapid cultural transferal to westernized dietary and lifestyle habits is considered one of the main causal factors for obesity rates rise among Saudis [3]. In Saudi Arabia, majority of people eat out of their homes several times a week, evident from the increasing number of restaurants opening across the country. There were an estimated 57,072 restaurants in the country in 2017, with a high density of 106 restaurants per households [4]. A previous systematic review has shown that fast food consumption was more commonly reported among Saudi young adults, with prevalence rates ranged from

25% to 80% [5]. A recently published study among Saudi college students concluded that 97% of the students consumed fast food daily [6]. Several studies in the past have explained the relation between eating out of home and obesity, as most of food choices out of home contains very high energy compared to food prepared at home. Moreover, fast food geographical distribution has a positive association with obesity status [7].

The Institute of Medicine 2005 recommended posting calorie content on menus and menu boards in restaurants (hereafter "menu calorie labeling") as a strategy to address the US obesity epidemic. By 2009, a number of counties had passed menu calorie labeling legislation. In 2010, the Patient Protection and Affordable Care Act required menu calorie labeling by chain restaurants. To implement the menu calorie labeling law, in December 2014, the US Food and Drug Administration released final regulations requiring calorie labels on all menus for restaurants and similar establishments with 20 or more locations. The Saudi government aimed to limit the uncontrolled increment in weight among their population by bringing in a mandatory calorie labels on menus starting from 1st Jan 2019 through Saudi Food and Drug Authority (SFDA) initiative to reduce non-communicable diseases. The calorie labels should be clear and visible in five locations: at the cash counter, in the menu board, food menu handouts drive thru and via websites and mobile applications of restaurants [8].

A recent meta-analysis showed calorie labeling could help people to choose lower calorie food items [9]. It is considered a cost-effective strategy for preventing obesity and the resulted diseases. Furthermore, there are some studies showed that calorie labeling may boost restaurants to work on reducing the calorie content in their meals [10]. The impact of menu labeling on food choices in cafeterias and restaurants was evaluated in four previous systematic reviews. Overall, because of a lack of well-powered studies with strong designs, the conclusion is still not enough to approve that menu labeling encourages lower calorie purchases. Although the limited existing research finds little evidence of menu labeling shifting fast-food purchases, there are more promising findings that it may influence consumers at certain types of restaurants and in other types of establishments such as cafeterias.

Studies in western countries reported that 50- 60% of participants noticed calorie menu labels [11,12] and 36.5 % of college students and young adults reported using labels [13]. Recent studies among Saudi adults have found that 30.5- 60 % and 38-58.2% of participants reported they had noticed and positively used energy labeling in the restaurant at their recent visit [14,15].

There are many reasons that people usually use the calorie menu labels when eating out. The most common causes behind using the information in the calorie labels on restaurant menu are mostly to avoid high calorie meals or to order a smaller portion size [16]. Using CLRM to limit calories appear to be stronger in certain settings like full-service restaurants, coffee chains, and certain fast-food restaurants (e.g., sandwich shops) [17]. and both noticing and using menu labels to limit calorie intake were related to eating more often at sandwich/ sub and sit-down restaurants [18]. Previous studies among adults found that, high-income people are more likely to notice and use menu labeling [19], others failed to show this association [20]. Likewise, younger, female, more educated, overweight, or obese, physically active, higher income, former or never-smokers, and those trying to lose weight, consume fruit or vegetable more or reduce soda consumption were more likely to use calorie labels [14,15,21-23]. CLRM use and notice among college students and young adults increase with increasing nutrition education and healthy eating attitude, obesity and overweight [13]. Few studies with mixed findings examined the association of CLRM noticing and use with unhealthy eating behaviors and weight concern. Some research suggests that unhealthy weight-control behaviors (18) and weight concerns [24-26] were predictors for using menu labels others did not found this association [22,27]. There is a gap in the literature on whether labels are beneficial to those who use unhealthy weight control behaviors or negatively impact them.

The new legislation launched by the Saudi Arabian government is considered as an important public health step. To date, research on restaurants calorie labeling conducted upon Saudi population could be counted on one hand; none was targeting Saudi college male and female students. In addition, studies investigating, the association between calorie labeling with eating behaviors and weight concerns among Saudis are absent. To study this gap in the literature, we aimed to assess the CLRM use and notice among Saudi among college students, and to investigate demographic patterns in the notice of calorie information on restaurant menus and its use to limit calories intake and its relationships with restaurant visit frequency and weight-related concerns and weight control behaviors.

SUBJECTS AND METHODS

Design and study population

This cross-sectional study was conducted between November 1st and 30th 2021, on male and female students at faculties of King Abdul-Aziz University (KAU) in Jeddah city, Saudi Arabia. Students who had eaten out at least once in the last month were enrolled and students in one-gender faculties were excluded. Using EPI-INFO 2002 software, a minimum required sample of 369 samples was determined, according to a previous study that demonstrated the prevalence of people who noticed the CLRM to be 60% [18]. With a precision of 5%, confidence level of 95% and an error of 0.05. A multistage stratified random sampling technique was used; stratification was based on the type of faculty (health and science vs. humanities) and the grade levels. The predetermined sample was proportionally allocated

on the selected faculties: the Faculties of Communication and Media (114 students), Low (181 students)), Medicine (64 students) and faculty of Pharmacy (20 students). In the second stages, the assigned sample for each faculty was equally on all grades and then equally allocated on both sexes. It is noteworthy to mention that the response rate was almost 100%. All necessary official approvals were fulfilled. Research Ethics Committee of Taif Health Affairs, Ministry of Health, Saudi Arabia approved this study (IRB. HAP-02-T-067, Number310), all participants signed a written consent form before they answered questions and confidentiality was assured. Research was conducted in accordance with the Declaration of Helsinki.

Data collection and study instruments

Participants self-reported demographic and medical information as well as completed validated questionnaires Eating and Activity in Teens and Young Adults IV (EAT IV survey) [28] and the International Physical Activity Questionnaire Short Form (IPAQ-SF) [29]. Lifestyle History of smoking cigarettes dietary habits were also assessed.

The EAT survey

The EAT survey IV assessed participants notice and use of calorie information on restaurant menus, restaurants eating frequency, weight status, weight control concern and behaviors. Project EAT is a large, population-based study on eating and weight-related outcomes that followed young people from adolescence to young adulthood. Follow up surveys were completed at five-year intervals (Projects EAT-II, III, and IV). EAT Survey was approved by the University of Minnesota's Institutional Review Board Human Subjects Committee.

Calorie information notice on restaurant menus

CLRM notice was assessed by a yes/no question: "In the past month, have you noticed any calorie information while purchasing a meal or snack in any type of restaurant (such as fast-food restaurant, fast casual restaurant, or sit-down restaurant)?". If participants responded yes for noticing CLRM, Participants were asked whether they had used calorie information on menus to decide what to eat on one or more occasions. Those who used the information to avoid high calorie items, decide on a smaller portion size or limit calories to that match daily needs were coded as using CLRM to limit calorie intake other option coded non-users (avoid ordering something that would leave them hungry or decide on a larger portion size).

Restaurant eating frequency

Full-service restaurants, burger-and-fries, fried chicken, Mexican, Asian, pizza, sandwich food eating frequency was categorized (never," "one to three times per month," "one to two times per week," "three to four times per week," "five to six times per week," and "one or more times per day). The response options were correspondingly assigned scores of 0, 2, 6, 14, 22, and 28 times per month to allow for comparison of mean/ median frequencies. This measure was adapted from a previously developed brief screener to estimate fast-food consumption among adolescents. The sum of scores of eating at all types of restaurants was calculated to represent the overall frequency of restaurant eating among studied participants.

Weight-control behaviors

Student's frequency of dieting (never, one to four times, five to ten times, more than ten times, and always dieting) and use of any healthy or unhealthy weight control methods in the last year was assessed. healthy weight control behaviors during the past year were assessed by six specific practices (exercise, ate more fruits and vegetables, ate less high-fat foods, ate less sweets, drank less soda pop (not including diet pop), and watched my portion sizes). Responses included never/ rarely/ sometimes and on regular basis. Six healthy weight control behaviors questions were dichotomized into users (sometimes or on a regular basis) and nonusers (never or rarely) and scored 1 and 0, respectively.

Unhealthy weight control behaviors

Unhealthy weight control behaviors among participants were assessed by respond to yes/no nine specific practices (e.g., fasted, ate very little food, skipped meals, took diet pills, made myself vomit, and used laxatives and diuretics). Scores were dichotomized to nonusers or users (≥1 method). The rate of users and nonusers dichotomies was calculated for each weight control behavior and the rate of the sample engaging in zero to six healthy weight control behaviors and zero to nine unhealthy weight control behaviors were also calculated.

Weight-related concern

Weight-related concern assessment included how strongly students agreed with four statements ("I am worried about gaining weight", "I weigh myself often", and "I sometimes skip meals since I am concerned about my weight".). the responses were scored one to four and summed such that higher values indicated greater weight related concern [30]. Binge eating was defined by responding positively to two questions ("In the past year, have you ever eaten so much food in a short period of time that you would be embarrassed if others saw you? "and "During the times when you ate this way, did you feel you couldn't stop eating or control what or how much you were eating?").

Forward translation of the EAT survey IV was accomplished first by two native Arabic language bilingual translators who are conversant in English, according to Beaton et al. (2000) guidelines. Two native English speakers who were fluent in Arabic but unfamiliar with the concepts of the scales then did a backward translation. The back-translated English questionnaire was then compared to the original English questionnaire, and any discrepancies between the two versions were resolved in order to ensure that the translation had no effect on the questionnaire's validity.

Lifestyle characteristics

The IPAQ-SF is a reliable and valid tool for assessing

Physical activity and Sitting Time from 18-70 years. Using the November 2005 scoring protocol, its results were reported as low, moderate- or high-PA levels and total metabolic equivalents (METs) minutes per week. IPAQ-SF assessed sitting times as minutes per day [29]. Body mass index (BMI) was calculated from self-reported height and weight. Self-report of height (test-retest r=0.98) and weight (test-retest r=0.97) were previously validated in a subsample of 62 female and 63 male participants as part of a 10-year follow-up assessment. Results showed very high correlations between self-reported BMI and measured BMI in females (r=0.98) and males (r=0.95) [31]. Dietary habits were assessed by Arabic version of a questionnaire that was used in previous research among Saudi young adults [32] and the responses (using a 4-point scoring system ranging from 1 to 4) were summed to for dietary habits score. A greater total score represents a dietary pattern reflective of healthier dietary habits.

Statistical analysis

Statistical analyses were performed using IBM (SPSS) Statistics Version 25.0 software. The descriptive statistics, including frequencies and percentages, were used for categorical variables; Median and range were used for continuous variables after determining the normality using Shapiro test. Chi- square test was used to stratify the CLRM notice and use according to participant characteristics, lifestyle habits, weight control behaviors and concern. and Mann-Whitney U test was used to compare the continuous variables between subgroups e.g., dietary habits score, median restaurants eating frequency, Total MET-Min/week, and weight concern score. Two binary Logistic regression models for menu labels noticing and use of to limit calorie intake presented as yes /no (dummy variable) were conducted to determine the significant contributors associated with them. Significant variables in the bivariate analysis were tested to fit logistic regression. For all statistical tests, a significance level was determined below 5% and quoted as two-tailed hypothesis tests.

RESULTS

The characteristics of the study participants were presented in Table 1. In total, 379 people completed the survey with age between 18 and 28 years and 50.1 % identified as female. Most (n=341, 90%) were not married (n=253, 69.7%). Most of the participants parents were university educated (43.5% of fathers and 44.6% of mothers). Majority of students mothers (60.4%) were housewives, while 39.1% of student's fathers were retired. More than 40% of the sample were overweight and obese and approximately the same percentage reported being low active and used to site more than 6 hours/ day (42.7% and 39.3% respectively). About one tenth of the sample (n =45, 10.9%) were smokers and chronic illness was reported in 15% of the sample.

Dietary habits history revealed that 10.8% and 22.7% of the participants were eating fruits and vegetables daily respectively, and the median dietary habits score was 21(10-30). In relation to patterns of restaurants eating, the overall median frequency of restaurant eating among students was 12 (range: 7-31) times per month. In particular, participants were eating more frequently at sit-down restaurants, burger and fries, fried chicken, Pizza place restaurants (Table 2).

Table 1: Calorie label's notice and use to limit calories among King Abdu-Aziz University student in Jeddah, KSA according to Personal and Sociodemographic characteristics.

	Total	Notice [n.]			Use to limit calories [280]		
	N=379	Yes	No	p value	Yes	No	p value
		n=280 (74%)	n=99 (26%)		n=161 (57.5%)	n=119 (42.5%)	
Faculties							
Faculty of Medicine	64(16.9%)	61(21.8%)	3(3%)		38(23.6%)	23(19.3%)	
Faculty of Pharmacy	20(5.3%)	17(6.1%)	3(3%)		8(5%)	9(7.6%)	
Faculty of Communication and Media	114(30.1%)	65(23.2%)	49(49.5%)	0.000 a*	48(29.8%)	17(14.3%)	0.000 a*
Faculty of Law	181(47.8%)	137(48.9%)	44(44.4%)		67(41.6)	70(58.8%)	
Age (years)							
18-<21	189(49.9%)	129(46.1%)	60(60.6%)	0.034 a*	77(47.8%)	52(43.7%)	
21-<24	136(35.9%)	106(37.9%)	30(30.3%)		54(33.5%)	52(43.7%)	0.16
24-28	54(14.2%)	45(16.1%)	9(9.1%)		30(18.6%)	15(12.6%)	
Median (IQR)	22(18-28)	22 (18-27)	21 (18-28)	0.014 b*	22(18-26)	22(18-27)	0.767
Gender							
Male	189(49.9%)	131(46.8%)	58(58.6%)	0.044 a*	72(44.7%)	59(49.6%)	0.42
Female	190(50.1%)	149(53.2%)	41(41.4%)		89(55.3%)	60(50.4%)	
Marital status of the students							
Married	35 (9.2)	26(9.3)	9(9.1%)		16(9.9%)	10(8.4%)	
Divorced	3(0.8)	3(1.1)	0 (0.0%)	0.584	2(1.2%)	1(0.8%)	0.858
Non-married	341(90)	251(89.6)	90 (90.9%)		143(88.8%)	108(90.8)	
Marital status of the parents							
Married	318(83.9%)	234(83.6%)	84(84.8%)		134(83.2%)	100(84%)	
Divorced	26(6.9%)	21(7.5%)	5(5.1%)	0.683	14(8.7%)	7(5.9%)	0.595
Widowed	35(9.2%)	25(8.9%)	10(10.1%)		13(8.1%)	12(10.1%)	

Occupation status of the father							
Unemployed	19(5%)	14(5%)	5(5.1%)		8(5%)	6(5%)	
Governmental Employee	113(29.8%)	88(31.4%)	25(25.3%)		53(32.9%)	35(29.4%)	
Private Employee	32(8.4%)	25(8.9%)	7(7.1%)		13(8.1%)	12(10.1%)	0.689
Free Lancer	34(9%)	24(8.6%)	10(10.1%)	0.775	17(10.6%)	7(5.9%)	
Retired	148(39.1%)	107(38.2%)	41(41.4%)		59(36.6%)	48(40.3%)	
Died	33(8.7%)	22(7.9%)	11(11.1%)		11(6.8%)	11(9.2%)	
Occupation status of the mother							
Housewife	229(60.4%)	162(57.9%)	67(67.7%)		98(60.9%)	64(53.8%)	
Governmental Employee	75(19.8%)	59(21.1%)	16(16.2%)		30(18.6%)	29(24.4%)	
Private Sector Employee	7(1.8%)	5(1.8%)	2(2%)		2(1.2%)	3(2.5%)	
Free Lancer	14(3.7%)	10(3.6%)	4(4%)		5(3.1%)	5(4.2%)	0.731
Retired	48(12.7%)	38(13.6%)	10(10.1%)	0.423	23(14.3%)	15(12.6%)	
Died	6(1.6%)	6(2.1%)	0(0%)		3(1.9%)	3(2.5%)	
Family income							
Less than 3500 SR	41(10.8%)	30(10.7%)	11(11.1%)		19(11.8%)	11(9.2%)	
3501-7500	69(18.2%)	44(15.7%)	25(25.3%)		20(12.4%)	24(20.2%)	
7501-11000	61(16.1%)	48(17.1%)	13(13.1%)		33(20.5%)	15(12.6%)	
11001-14500	59(15.6%)	47(16.8%)	12(12.1%)		29(18%)	18(15.1%)	0.2
14501-18000	36(9.5%)	24(8.6%)	12(12.1%)	0.224	15(9.3%)	9(7.6%)	
More than 18000 SR	113(29.8%)	87(31.1%)	26(26.3%)		45(28%)	42(35.3%)	
Level of education of the father							
illiterate	17(4.5%)	12(4.3%)	5(5.1%)		8(5%)	4(3.4%)	
Read and write	21(5.5%)	18(6.4%)	3(3%)		9(5.6%)	9(7.6%)	
Primary	16(4.2%)	12(4.3%)	4(4%)		9(5.6%)	3(2.5%)	
Middle	32(8.4%)	22(7.9%)	10(10.1%)		12(7.5%)	10(8.4%)	0.861
Secondary	84(22.2%)	60(21.4%)	24(24.2%)	0.822	33(20.5%)	27(22.7%)	
University	165(43.5%)	125(44.6%)	40(40.4%)		72(44.7%)	53(44.5%)	
Postgraduate	44(11.6%)	31(11.1%)	13(13.1%)		18(11.2%)	13(10.9%)	
Level of education of the mother							
illiterate	19(5%)	14(5%)	5(5.1%)		8(5%)	6(5%)	
Read and write	18(4.7%)	14(5%)	4(4%)		8(5%)	6(5%)	
Primary	27(7.1%)	20(7.1%)	7(7.1%)		13(8.1%)	7(5.9%)	
Middle	36(9.5%)	23(8.2%)	13(13.1%)		15(9.3%)	8(6.7%)	0.855
Secondary	87(23%)	61(21.8%)	26(26.3%)	0.719	33(20.5%)	28(23.5%)	
University	169(44.6%)	130(46.4%)	39(39.4%)		76(47.2%)	54(45.4%)	
Postgraduate	23(6.1%)	18(6.4%)	5(5.1%)		8(5%)	10(8.4%)	
Chronic illness	57(15%)	38(13.6%)	19(19.2%)	0.179	22(13.7%)	16(13.4%)	0.958
Regular medications intake	58(15.3%)	41(14.6%)	17(17.2%)	0.548	23(14.3%)	18(15.1%)	0.844
a* Significant association was assessed using Chi-square test							
b* Significant association was assessed using Mann-Whitney U							

Approximately three quarters of participants (74%) reported they had noticed CLRM while purchasing a meal or snack in a restaurant within the past month. Female sex (P<0.044), smoking (0.038), higher age (P<0.014), practical college studying (P<0.000), higher levels of physical activities (p<0.003), more vegetables intake (p<0.024), a positive history of dieting during the last year (p<0.005), committing higher healthy weight control behaviors (p<0.000) and reports of higher weight related concern (0.000) were all related with higher likelihood of calorie label noticing. For CLRM noticing, the Composite Unhealthy weight control behavior Score, binge eating, and frequency of different restaurant eating did not significantly associated with the different strata (Tables 1-4).

As shown in Figure 1, the majority of students who had noticed CLRM during last month reported they use it to avoid high calorie menu items (45.7%). One tenth of participants reported using CLRM to help avoid menu items that would leave them hungry (10.7%) or to help decide on a smaller or larger portion size (8.9 and 3.2 % respectively). A little percentage (2.8%) of students reported using CLRM on choosing calories that match their daily needs. About one third of participants who noticed calorie information (28.6%) reported they did not use it when determining what to purchase on one or more occasions.

Higher likelihood of CLRM using to limit calorie intake was linked to higher levels of physical activities (P<0.001), lower sitting time (p<0.015), attending faculties of medicine and communication, healthier dietary habits (p<0.000), lower overall frequency of restaurant eating (P<0.006), frequent dieting during the last year (p<0.000), committing various weight control behaviors (healthy (p<0.000) and unhealthy (p<0.003)), and higher score of weight related concern (0.000). The use

Table 2: Calorie label's notice and use to limit calories among King Abdu-Aziz University student in Jeddah, according to lifestyle habits and restaurant eating frequency.

	Total	Notice [n=379]		p value	Use to limit calories [n=280]		p value
		Yes	No		Yes	No	
	[N=379]	n=280 (74%)	n=99 (26%)		n=161 (57.5%)	n=119 (42.50%)	
Physical activity							
Low	162(42.7%)	106(37.9%)	56(56.6%)		49(30.4%)	57(47.9%)	
Moderate	136(35.9%)	113(40.4%)	23(23.2%)		65(40.4%)	48(40.3%)	0.001 a*
High	81(21.4%)	61(21.8%)	20(20.2%)	0.002 a*	47(29.2%)	14(11.8%)	
Total MET-Min/week	1080(0.00-5508)	1206.5(0.00-5508)	579(0.00-5508)	0.040 b*	1548(0.00-5508)	695(0.00-3897)	0.000 b*
Sitting time							
1-2 hours/ day	54(14.2%)	39(13.9%)	15(15.2%)		22(13.7%)	17(14.3%)	
3-4 hours / day	113(29.8%)	84(30%)	29(29.3%)	0.937	59(36.6%)	25(21%)	0.015 a*
5-6 hours/ day	63(16.6%)	45(16.1%)	18(18.2%)		27(16.8%)	18(15.1%)	
More than 6 hours/ day	149(39.3%)	112(40%)	37(37.4%)		53(32.9%)	59(49.6%)	
BMI							
Underweight	58(15.3%)	38(13.6%)	20(20.2%)		22(13.7%)	16(13.4%)	
Overweight	96(25.3%)	69(24.6%)	27(27.3%)	0.144	43(26.7%)	26(21.8%)	0.815
Obesity	52(13.7%)	36(12.9%)	16(16.2%)		20(12.4%)	16(13.4%)	
BMI Median (IQR)	23.6(15.1-48.8)	23.5(15.1-48.8)	24(15.6-41.2)	0.749	23.8(15.1-42)	23.1(16.2-48.8)	0.563
Non-smoking	334(88.1%)	241(86.1%)	93(93.9%)		138(85.7%)	103(86.6%)	0.841
Smoker	45(11.9%)	39(13.9%)	6(6.1%)	0.038 a*	23(14.3%)	16(13.4%)	
Daily Fruits intake	41(10.8%)	30(10.7%)	11(11.1%)	0.505	25(15.5%)	5(4.2%)	0.000 a*
Daily Vegetables intake	86(22.7%)	70(25%)	16(16.2%)	0.024 a*	50(31.1%)	20(16.8%)	0.000*
Fried food intake (never)	77(20.3%)	54(19.3%)	23(23.2%)	0.329	46 (28.6%)	8 (6.7%)	0.000 a*
Daily Breakfast intake	137(36.1%)	100(35.7%)	37(37.4%)	0.952	70(43.5%)	30(25.2%)	0.000 a*
Eating with family (daily)	169(44.6%)	126(45%)	43(43.3%)	0.29	64(39.8%)	62(52.1%)	0.22
Taking meal regularly	95(25.1%)	71(25.4%)	24(24.2%)	0.826	53(32.9%)	18(15.1%)	0.001 a*
Diet Score Median (IQR)	21(10-30)	21(10-30)	20 (11-30)	0.38	22(12-29)	20(10-30)	0.000 b*
Burger and fries#	2(0.00-28)	2(0.00-28)	2(0.00-28)	0.899	2 (0.00-28)	6 (0.00-28)	0.000 b*
Mexican food	0 (0.00-28)	0 (0.00-28)	0 (0.00-28)	0.32	0 (0.00-22)	0 (0.00-28)	0.297
fried chicken #	2(0.00-28)	2(0.00-28)	2(0.00-28)	0.178	2 (0.00-28)	2 (0.00-28)	0.008 b*
Sandwich or sub #	0 (0.00-28)	0 (0.00-28)	1 (0.00-14)	0.456	2 (0.00-28)	0 (0.00-22)	0.389
Pizza place#	2(0.00-28)	2(0.00-28)	2(0.00-14)	0.156	2 (0.00-22)	2 (0.00-28)	0.543
Asian fast food#	0(0.00-28)	0(0.00-28)	0(0.00-14)	0.977	0 (0.00-22)	0 (0.00-28)	0.137
Sit-down restaurants#	2(0.00-28)	2(0.00-28)	2(0.00-28)	0.928	2(0.00-28)	2(0.00-28)	0.223
Any Restaurants	12(7-31)	12(7-31)	12(7-31)	0.375	11(7-31)	12(7-27)	0.006 b*

Median frequency of eating (IQR), a* Significant association was assessed using Chi-square test

b* Significant association was assessed using Mann-Whitney U

Table 3: Calorie label's notice and use to limit calories among King Abdu-Aziz University student in Jeddah, KSA, according to Dieting and other Weight-control behaviors.

	Total	Notice [n=379]		p value	Use to limit calories [n=280]		p value
		Yes	No		Yes	No	
	[N=379]	n=280 (74%)	n=99 (26%)		n=161 (57.5%)	n=119 (42.50)	
Dieting during the last year	240(63.3%)	189(67.5)	51(51.5%)	0.005 a*	123(76.4)	66(55.5%)	0.000 a*
Dieting frequency /year							
Never	139(36.7%)	92(32.9)	47(47.5%)		38(23.6%)	54(45.4%)	
1-4 times	146(38.5%)	116(41.4)	30(30.3%)	0.072	69(42.9%)	47(39.5%)	0.000 a*
5-10 times	27(7.1%)	21(7.5)	6(6.1%)		15(9.3%)	6(5.0%)	
More than 10 times	67(17.7%)	51(18.2)	16(16.2%)		39(24.2%)	12(10.1%)	
Are you currently trying to							
Lose weight	199(52.5%)	156(55.7)	43(43.4%)		99(61.5%)	57(47.9%)	
Gain weight	58(15.3%)	37(13.2%)	21(21.2%)	0.062	14(8.7%)	23(19.3%)	0.016 a*
Nothing	122(32.2%)	87(31.1%)	35(35.4%)		48(29.8%)	39(32.8%)	
Types of Healthy weight control behaviors used							
Exercise Users	301(79.4%)	232(82.9%)	69(69.7%)	0.005 a*	145(90.1%)	87(73.1%)	0.000 a*
Ate more fruits	278(73.4%)	213(76.1%)	65(65.7%)	0.044 a*	139(86.3%)	74(62.2%)	0.000 a*
Ate less fat	279(73.6%)	220(78.6%)	59(59.6%)	0.000 a*	144(89.4%)	76(63.9%)	0.000 a*
Ate less sweets	270(71.2%)	216(77.1%)	54(54.5%)	0.000 a*	137(85.1%)	79(66.4%)	0.000 a*
Drank less soda	253(66.8%)	196(70%)	57(57.6%)	0.024 a*	119(73.9%)	77(64.7%)	0.097

Watch food portions	289(76.3%)	224(80%)	65(65.7%)	0.004 a*	143(88.8%)	81(68.1%)	0.000 a*
Types of Unhealthy weight control behaviors used							
Fasting	145(38.3%)	110(39.3%)	35(35.4%)	0.489	78(48.4%)	32(26.9%)	0.000 a*
Ate very little food	202(53.3%)	162(57.9%)	40(40.4%)	0.003 a*	99(61.5%)	63(52.9%)	0.152
Used powder or special drink	42(11.1%)	29(10.4%)	13(13.1%)	0.45	22(13.7%)	7(5.9%)	0.035 a*
Skipped meals	164(43.3%)	131(46.8%)	33(33.3%)	0.020 a*	80(49.7%)	51(42.9%)	0.257
Took diet pills	25(6.6%)	16(5.7%)	9(9.1%)	0.245	11(6.8%)	5(4.2%)	0.349
Made him/her vomit	20(5.3%)	16(5.7%)	4(4.0%)	0.522	13(8.1%)	3(2.5%)	0.048 a*
Used laxatives	24(6.3%)	14(5.0%)	10(10.1%)	0.073	8(5%)	6(5%)	0.978
Used diuretics	22(5.8%)	14(5.0%)	8(8.1%)	0.26	9(5.6%)	5(4.2%)	0.598
Smoked more cigarettes	11(2.9%)	9(3.2%)	2(2.0%)	0.543	8(5%)	1(0.8%)	0.053
Composite Healthy weight Control Behavior Score:							
0 – 2 Healthy Behavior	69(18.2%)	41(14.6%)	28(28.3%)		11(6.8%)	30(25.2%)	
3 – 4 Healthy Behaviors	75(19.8%)	48(17.2%)	27(27.3%)	0.000 a*	18(11.2%)	30(25.25)	0.000 a*
5 – 6 Healthy Behaviors	235(62.0%)	191(68.2%)	44(44.4%)		132(82.0%)	59(49.6%)	
Composite Unhealthy Weight Control Behavior Score							
0 – 2 Unhealthy Behavior	259(68.3%)	187(66.8%)	72(72.7%)	0.548	95(59%)	92(77.3%)	
3 – 5 Unhealthy Behaviors	103(27.2%)	80(28.6%)	23(23.2%)		55(34.2%)	25(21.0%)	0.003 a*
6 – 9 Unhealthy Behaviors	17(4.5%)	13(4.6%)	4(4.0%)		11(6.8%)	2(1.7%)	
a* Significant association was assessed using Chi-square test							

Table 4: Calorie label's notice and use to limit calories among King Abdu-Aziz University student in Jeddah, KSA, according to Binge eating and weight related concern.

	Total	Notice [n=379]		p value	Use to limit calories [n=280]		p value
	N=379	Yes	No		Yes	No	
		n=280 (74%)	n=99 (26%)		n=161 (57.5%)	n=119 (42.5%)	
Bing eating	92(24.3)	73(26.1)	19(19.2)	0.17	41(25.5)	32(26.9)	0.788
I think a lot about being thinner							
Strongly disagree	97(25.6)	61(21.8%)	36(36.4%)		26(16.1%)	35(29.4%)	
Somewhat disagree	27(7.1)	18(6.4%)	9(9.1%)		9(5.6%)	9(7.6%)	0.036 a*
Somewhat agree	84(22.2)	64(22.9%)	20(20.2%)	0.015 a*	38(23.6%)	26(21.8%)	
Strongly agree	171(45.1)	137(48.9%)	34(34.3%)		88(54.7%)	49(41.2%)	
I am worried about gaining weight							
Strongly disagree	79(20.8)	51(18.2%)	28(28.3%)		24(14.9%)	27(22.7%)	
Somewhat disagree	35(9.2)	24(8.6%)	11(11.1%)		12(7.5%)	12(10.1%)	0.013 a*
Somewhat agree	86(22.7)	51(18.2%)	35(35.4%)	0.000 a*	23(14.3%)	28(23.5%)	
Strongly agree	179(47.2)	154(55%)	25(25.3%)		102(63.4%)	52(43.7%)	
I weigh myself often							
Strongly disagree	86(22.7)	59(21.1%)	27(27.3%)		25(15.5%)	34(28.6%)	
Somewhat disagree	77(20.3)	56(20%)	21(21.2%)		27(16.8%)	29(24.4%)	0.001 a*
Somewhat agree	127(33.5)	95(33.9%)	32(32.3%)	0.494	57(35.4%)	38(31.9%)	
Strongly agree	89(23.5)	70(25%)	19(19.2%)		52(32.3%)	18(15.1%)	
I sometimes skip meals since I am concerned about my weight.							
Strongly disagree	123(32.5)	79(28.2%)	44(44.4%)		31(19.3%)	48(40.3%)	
Somewhat disagree	60(15.8)	48(17.1%)	12(12.1%)		23(14.3%)	25(21%)	0.000 a*
Somewhat agree	94(24.8)	63(22.5%)	31(31.3%)	0.000 a*	42(26.1%)	21(17.6%)	
Strongly agree	102(26.9)	90(32.1%)	12(12.1%)		65(40.4%)	25(21%)	
Weight-related Concern Score							
Mean ± SD. Median (IQR)	12(4-16)	12(4-16)	10(4-16)	0.000 b*	13(4-16)	11(4-16)	0.000 b*
[a]* Significant association was assessed using Chi-square test							
b* Significant association was assessed using Mann-Whitney U							

of menu labels to limit calorie intake was higher (84.6%, 6-9) among participants using unhealthy weight control behaviors than healthy behaviors (69.1). Associations were also observed when frequency of eating at specific types of restaurants (Burger and fries and fried chicken restaurants) was examined. Use of CLRM menu to limit calorie intake was related to eating less often at burger & fries and fried chicken restaurants. Proportion of participants who notice and use CLRM to limit calorie intake was lower among those using unhealthier weight control behaviors (use 3-9 behaviors) (41%) than it was among those using healthier behaviors (3-6 behaviors) (93.2%) (Tables 1-4).

The significant contributing factors of CLRM notice and use to limit caloric intake were illustrated using ORs in Table 5. Logistic regression revealed that, Participants who attended Practical faculties, had a

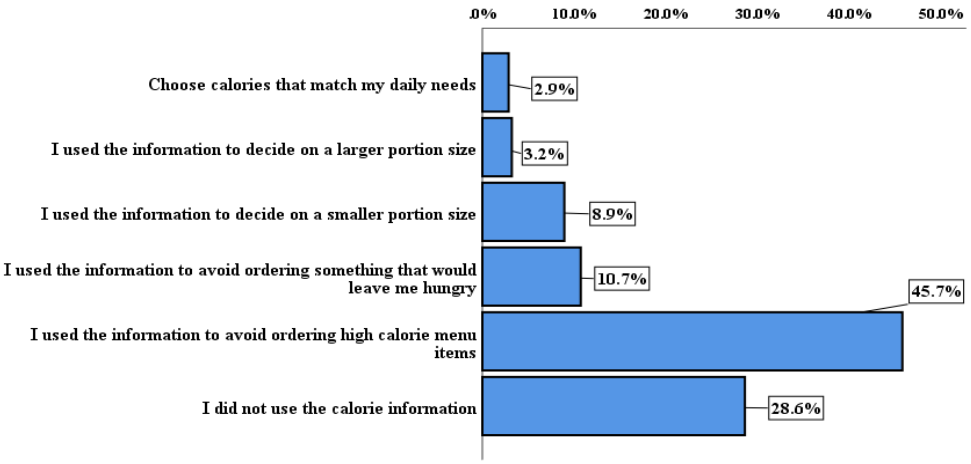

Figure 1: Calorie labels on restaurants menus use in deciding what to order among King Abdul-Aziz University Students in Jeddah City, Saudi Arabia (n=379).

Table 5: Logistic Regression Model to identify the significant contributing factors in CLRM Noticing and use to limit calories intake.

	Variables	B	OR	95% CI for OR		p-value
				LL	UL	
	Sex					
Notice	Female	0.487	1.627	0.964	2.746	0.068
	Faculties					
	Practical	1.659	5.254	2.119	13.028	0.000*
	Age (years)	0.09	1.094	0.958	1.249	0.185
	Smoking	1.128	3.088	1.183	8.062	0.021*
	Physical Activity					
	Moderate	0.658	1.931	1.045	3.568	0.036*
	High	0.289	1.335	0.672	2.651	0.41
	Vegetables intake/week					
	1-2 times/w	0.597	1.816	0.577	2.107	0.113
	3-4 times/week	0.097	1.102	0.67	3.123	0.768
	Daily	0.369	1.447	0.958	1.249	0.347
	Healthy weight control behaviors composite score					
	5-6 Healthy weight control behaviors	0.44	1.553	0.709	3.401	0.271
	3-4 Healthy weight control behaviors	-0.12	0.887	0.404	1.95	0.766
	Weight concern	0.102	1.108	1.015	1.208	0.022*
	Dieting	-0.241	0.786	0.386	1.598	0.0506
Use to limit calories	Faculties					
	Medicine	1.093	2.984	1.32	6.745	0.009*
	Pharmacy	0.376	1.456	0.44	4.821	0.539
	Communication	1.426	4.163	1.88	9.223	0.000*
	Healthy weight control behaviors composite score					
	3-4 Healthy weight control behaviors	0.057	1.059	0.366	3.063	0.916
	5-6 Healthy weight control behaviors	1.066	2.903	1.08	7.805	0.035*
	Unhealthy weight control behaviors composite score					
	3-5 Unhealthy weight control behaviors	0.39	1.477	0.699	3.122	0.307
	6-9 Unhealthy weight control behaviors	0.899	2.458	0.434	13.917	0.309
	Dietary habits score	0.115	1.122	1.023	1.23	0.014*
	Eating Frequency in any Restaurant type	-0.047	0.954	0.84	1.083	0.469
	Eating frequency in Burger & Fries restaurants	-0.029	0.972	0.9	1.049	0.464
	Eating Frequency in Fried Chicken restaurants	-0.028	0.972	0.891	1.061	0.532
	Dieting frequency/year	0.166	1.18	0.507	2.749	0.701
	Currently Trying to					
	Gain weight	0.167	1.182	0.462	3.022	0.727
	Loss Weight	1.081	2.948	0.911	9.538	0.071
	Maintain weight	1.232	3.428	1.064	11.045	0.039*
	Physical activity					
	Moderate	-0.25	0.779	0.396	1.532	0.469

High	0.658	1.931	0.791	4.715	0.148
Weight Concern	0.117	1.124	0.99	1.277	0.071
Sitting time /week					
1-2 hours / day	-0.198	0.821	0.325	2.07	0.675
3-4 hours / day	0.711	2.036	0.978	4.239	0.057
5-6 hours/ day	0.17	1.186	0.484	2.902	0.709

Notice as dependent variable; X2=64.608; p<0.001*; Nagelkerke R2=0.229; Significant predictors in the model: Sex (Reference: Male), Faculties (Reference: Theoretical faculties), Dieting and Smoking (Reference: No), Physical Activity (Reference: Low), Healthy composite score (Reference:0-2 Healthy Weight Control Behaviors), Vegetables intake/w (Reference: rarely) # CLRM Use to limit calories as dependent variable; X2=92.706; p<0.000*; Nagelkerke R2=0.379; Significant predictors in the model: PA levels (Reference: Low level), Healthy and Unhealthy Weight Control Behaviors (Reference: 0-2 Healthy or Unhealthy Weight Control Behaviors), Eating Frequency in any Restaurant type/ Fried Chicken/ Burger & fries Restaurants/ Dieting Frequency/ Currently Trial to Lose or gain weight (Reference: No), Sitting time /week (Reference: More than 6 hours/ day)

history of smoking, practiced moderate PA, and had a high weight concern score (OR=1.108, 95% CI=1.015, 1.208, p=0.022*) were significantly more likely to Notice CLRM. Using 5-6 healthy behaviors for weight control (OR=2.903, 95% CI=1.080, 7.805, p=0.035*), Healthy dietary habits (OR=1.122, 95% CI=1.023, 1.230, p=0.014*), and studying at faculty of Medicine and Communication were positively associated with those who noticed the labels and use them to limit calories intake. Surprisingly, maintaining weight found as a promoting factor for using CLRM for this purpose (OR=3.428, 95% CI=1.064, 11.045, p=0.039*). CLRM use was unrelated to the weight-related concern, overall frequency of restaurant eating or the frequency of eating at different types of restaurants (Burger and fries and fried chicken restaurants).

DISCUSSION

In this study, we explored the CLRM use and notice among university students in Jeddah city, Saudi Arabia, and studied the demographic patterns in the notice of calorie information on restaurant menus and its use to limit calories intake and its relationships with restaurant visit frequency and weight-related concerns and weight control practices. Results showed that most students reported that they had noticed restaurants labels (74%) while purchasing within the past month. This agreed with Al-Otaibi H et al [24]. Conversely, other studies reported lower rates among adults and young adults [11, 18]. This finding also was in contrast with the published Saudi Arabia studies which reported substantially lower rates of CLRM noticing among adults [14, 15]. More than a quarter (28.6%) of those who noticed reported they did not use it in deciding what to order and the rest reported they use it in different ways. More than half of those who noticed mentioned they used it to choose lower caloric meals (57.5%). This was consistent with Larson et al results among young adults [18] and AlAmer N et al [15] among Saudi adults. Moreover, a study done by Alassaf et al in Saudi Arabia revealed similar results to our study, where half of the participants changed their order according to the labels [33]. In contrast, a higher rate of use to lower energy intake was reported among public in Saudi Arabia (76%) [14], and a lower rate of overall use among college students was found in a previous review [13]. These differences may be accounted for in the timing of data collection, differences in the population studied and geographic areas. The publicity of this topic increases with time which in turn increased the awareness regarding it. One tenth of individuals reported other uses of CLRM were to help avoid menu items that would leave them hungry or to help decide on a larger portion size, this was consistent with another research [18].

Concerning demographic patterns association with CLRM noticing, a significant association was found between female sex, smoking, age 21-28 years, practical colleges studying, and CLRM noticing. This was consistent with Alkhaldy et al [14] where paying attention to CLRM was more frequently reported among females as well as those with a medical/scientific background that may increase students' awareness concerning health. However, unlike the reported study and other studies, there was no significant association found with other individuals' characteristics and CLRM notice [14,20,18]. Students aged 21-28 years have more opportunities to be exposed to menu labeling than younger university students because they frequently eat at fast food restaurants [29]. Even though the reasons for the variations in menu labeling noticing among smokers in our study are unclear; this reported higher levels may be due to higher age among smokers. Previous research has shown minimal effects in likelihood of noticing and using CLRM among never and former smokers [23]. It is noteworthy that in the current study, higher likelihood of CLRM using to limit calorie intake was linked only to one demographic character i.e., attending faculty of medicine. This contradicts previous research, where frequent users were significantly more likely to be younger, female, more educated and had high-income [11,18].

Various subpopulations were identified for whom additional targeted initiatives to promote menu labeling awareness and utilization may be necessary. In terms of lifestyle characteristics, students who were physically active, followed a healthier diet, and ate more vegetables were more likely to notice and use menu labels to limit calories. These findings backed up prior studies [13,21,23,18]. Overweight and obese individuals can use CLRM for weight management, but we could not verify this association [13,14]. Similarly, logistic regression revealed that attending Practical faculties, history of smoking and Physical Activity were common significant increasing factors for CLRM notice.

While, healthy dietary habits, studying at faculty of Medicine and Communication and trying maintaining weight were positively associated with those who noticed the labels and use them to limit calories intake. Moreover, the current study found that use of CLRM menu to limit calorie intake was associated with lower overall frequency of restaurant eating and eating less often at burger & fries and fried chicken restaurants. These results are in line with earlier research that both noticing and using menu labels to limit calorie intake were related to eating more often at sandwich/sub and sit-down restaurants, However, at typical fast-food restaurants, the effects may be limited [17].

It is worth mentioning that weight-related concerns, dieting, and other weight-control behaviors were associated to the most prevalent reported use of CLRM to restrict calorie consumption while purchasing a meal or snack among university students. The use of menu labels to limit calorie intake was higher among participants using unhealthy weight control behaviors than healthy behaviors practices. Use of label among subpopulations with weight concern and disordered eating behaviors may lead to worsening tendencies to restrict eating, putting those people at risk. Further studies are needed to highlight whether labels are useful or negatively influence them. The contradictory evidence might be explained by differences in population, types of restaurants studied, and methods used to CLRM use decisions assessment (e.g., recall or actual use). However, after logistic regression, weight concern was a significant increasing CLRM notice factors, while healthy behaviors for weight control were found as a promoting factor for using CLRM for this purpose. CLRM use was unrelated to the weight-related concern, overall frequency of restaurant eating or the frequency of eating at different types of restaurants (Burger and fries and fried chicken restaurants). Some studies have indicated that unhealthy weight-control practices [18] and weight concerns [24-26] are predictors of menu label use, while others have not [22,27].

There are a number of strengths of this study, including the inclusion of appropriate sample size, our sample was recruited randomly, covering multiple college fields, assessment of eating at different types of restaurants and the timing of data collection relative to CLRM legislation in Saudi Arabia. In addition, research on CLRM among male and female Saudi college students are absent, and those investigating its association with weight control behaviors and concerns are limited. Targeting college age is very crucial as eating at restaurants tends to be greater for populations in this life stage. However, there are also some limitations to consider. Firstly, all data are self-reported which may involve recall bias. Secondly, data are based on a cross-sectional and therefore causality cannot be inferred. Finally, because the study was conducted at a single university in Saudi Arabia, more caution should be used when extrapolating the findings to other communities. Longitudinal studies are recommended to observe changes over time to assess the impact of CLRM on physical well-being.

CONCLUSION

In conclusion, not everyone who notices CLRM uses it, and healthy weight control behaviors and healthier dietary habits are associated with increased labels use to limit calories. Raising awareness of CLRM for promoting appropriate caloric consumption and effective health promotion strategies directed at adopting and maintaining positive health behaviors are crucial. After implementation of the new legislation, further research should be directed to address how often CLRM is used by different Saudi subgroups so that public awareness campaigns will be announced. Further studies are also needed to highlight whether labels are useful or negatively influence individuals with weight concern and disordered eating behaviors.

REFERENCES

1. https://www.moh.gov.sa/en/Ministry/Statistics/Population-Health-Indicators/Documents/World-Health-Survey-Saudi-Arabia.pdf
2. https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight
3. DeNicola E, Aburizaiza OS, Siddique A, et al. Obesity and public health in the Kingdom of Saudi Arabia. Rev Environ Health 2015; 30:191-205.
4. https://www.stats.gov.sa/en
5. Afrin S, Mullens AB, Chakrabarty S, et al. Dietary habits, physical activity, and sedentary behaviour of children of employed mothers: A systematic review. Prev Med Rep 2021; 24:101607.
6. Kazi RNA, El-Kashif MML, Ahsan SM. Prevalence of salt rich fast-food consumption: A focus on physical activity and incidence of hypertension among female students of Saudi Arabia. Saudi J Biol Sci 2020; 27:2669-2673.
7. Fraser LK, Edwards KL. The association between the geography of fast-food outlets and childhood obesity rates in Leeds, UK. Health Place 2010; 16:1124-1128.
8. https://www.sfda. gov.sa/en/food/news/Pages/f11–9–2018a1.aspx
9. Agarwal D, Ravi P, Purohit B, et al. The effect of energy and fat content labeling on food consumption pattern: a systematic review and meta-analysis. Nutr Rev 2022; 80:453-466.
10. Bleich SN, Wolfson JA, Jarlenski MP. Calorie changes in large chain restaurants from 2008 to 2015. Prev Med 2017; 100:112-116.
11. Green JE, Brown AG, Ohri-Vachaspati P. Sociodemographic disparities among fast-food restaurant customers who notice and use calorie menu labels. J Acad Nutr Diet 2015; 115:1093-1101.
12. Elbel B, Kersh R, Brescoll VL, et al. Calorie labeling and food choices: a first look at the effects on low-income people in New York City. Health Aff 2009; 28:w1110-21.

13. Christoph MJ, An R, Ellison B. Correlates of nutrition label use among college students and young adults: A review. Public Health Nutr 2016; 19:2135-148.

14. Alkhaldy AA, Taha DS, Alsahafi SE, et al. Response of the public and restaurant owners to the mandatory menu energy-labelling implementation in restaurants in Saudi Arabia. Public Health Nutr 2020; 23:3435-3447.

15. AlAmer NA, AlOmar RS, AlKaltham SM, et al. Perceived effect of calorie count display on customers' eating behaviors in food facilities of eastern province, Saudi Arabia: A mixed method study. J Multidiscip Healthc 2020; 13:1849-1861.

16. Sinclair SE, Cooper M, Mansfield ED. The influence of menu labeling on calories selected or consumed: A systematic review and meta-analysis. J Acad Nutr Diet 2014; 114:1375-88.e15.

17. VanEpps EM, Roberto CA, Park S, et al. Restaurant menu labeling policy: Review of evidence and controversies. Curr Obes Rep 2016; 5:72-80.

18. Larson N, Haynos AF, Roberto CA, et al. Calorie labels on the restaurant menu: Is the use of weight-control behaviors related to ordering decisions? J Acad Nutr Diet 2018; 118:399-408.

19. Sarink D, Peeters A, Freak-Poli R, et al. The impact of menu energy labelling across socioeconomic groups: A systematic review. Appetite 2016; 99:59-75.

20. Ellison B, Lusk JL, Davis D. Looking at the label and beyond: The effects of calorie labels, health consciousness, and demographics on caloric intake in restaurants. Int J Behav Nutr Phys Act 2013; 10:21.

21. Oh A, Nguyen AB, Patrick H. Correlates of reported use and perceived helpfulness of calorie information in restaurants among U.S. adults. Am J Health Promot 2016; 30:242-249.

22. Bleich SN, Wolfson JA. Differences in consumer use of food labels by weight loss strategies and demographic characteristics. BMC Public Health 2015; 15:1275.

23. Lee-Kwan SH, Pan L, Maynard LM, et al. Factors associated with self-reported menu-labeling usage among US adults. J Acad Nutr Diet 2016; 116:1127-1135.

24. Al-Otaibi H, Al-Sandal T, Elkatr HO. Is calorie labeling on menus related to weight disturbances among females in Saudi Arabia? J Nutr Metab 2021; 2021:4041451.

25. Fawkes K, Levy J, Terry K, et al. Female college students' attitudes about body image and food labels and how they affect purchasing behavior. Top Clin Nutr 2010; 25:165–171.

26. Nianogo RA, Kuo T, Smith LV, et al. Associations between self-perception of weight, food choice intentions, and consumer response to calorie information: A retrospective investigation of public health center clients in Los Angeles County before the implementation of menu-labeling regulation. BMC Public Health 2016; 16:60.

27. Lillico HG, Hanning R, Findlay S, et al. The effects of calorie labels on those at high-risk of eating pathologies: a pre-post intervention study in a University cafeteria. Public Health 2015; 129:732-739.

28. Neumark-Sztainer D, Wall M, Chen C, et al. Eating, activity, and weight-related problems from adolescence to adulthood. Am J Prev Med 2018; 55:133-141.

29. http://www.ipaq.ki.se

30. Neumark-Sztainer D, Wall M, Story M, et al. Correlates of unhealthy weight control behaviors among adolescent: Implications for the primary prevention of disordered eating. Health Psychol 2003; 22:88–98.

31. Quick V, Wall M, Larson N, et al. Personal, behavioral and socio-environmental predictors of overweight incidence in young adults: 10-yr longitudinal findings. Int J Behav Nutr Phys Act 2013; 10:37.

32. Al-Rethaiaa AS, Fahmy AE, Al-Shwaiyat NM. Obesity and eating habits among college students in Saudi Arabia: A cross sectional study. Nutr J 2010; 9:39.

33. Alassaf HI, Alaskar YA, Alqulaysh BF, et al. Assessment of knowledge, attitudes and practices of Saudi adults about calorie labeling in central Saudi Arabia. Saudi Med J 2020; 41:296-303.