

Arabic coffee consumption and the risk of obesity among Saudi's female population

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Abstract

Arabic coffee is a traditional beverage in the Kingdom of Saudi Arabia (KSA), and it usually has no calories; however, that has changed due to the addition of other ingredients and the consumption of food with coffee. This study assessed the prevalence of Arabic coffee consumption and how it relates to the risk of obesity as indicated by body mass index (BMI). In this cross-sectional study, 384 students and employees between 18 and 45 years of age were recruited from Taibah University. Components of the study included a self-reported questionnaire and anthropometrics assessment. Approximately 71.4% of the participants consumed Arabic coffee daily, of whom 28% were overweight and 33% were obese. Dates and chocolates were the most common foods consumed with coffee (60% and 32%, respectively). The results showed that a high level of coffee consumption was positively associated with obesity among Arabic coffee consumers. The results of the study showed the importance of warning Saudi women against the excessive consumption of Arabic coffee. Accordingly, the study also indicates the need for educational programs related to increasing societal awareness of the harmful effects related to the frequency and quantity of Arabic coffee consumption and the accompanying additives and food.

Keywords: Arabic Coffee, Obesity, Body Mass Index (BMI).

1. Introduction

Obesity is a major risk factor for a variety of non-communicable medical conditions, including diabetes, cardiovascular diseases, and cancer. According to the World Health Organization (WHO), the obesity rate has tripled since 1975 (World Health Organization, 2020). On a national level, approximately 28.7% and 30.7% of Saudi adults were obese and overweight, respectively, in 2013, as indicated by the Saudi Health Information Survey (SHIS). A review of the prevalence of obesity reported that obesity is a public health issue and that the Kingdom of Saudi Arabia (KSA) is predicted to have an obesity crisis in the coming years. In the KSA, the main risk factors associated with obesity included family history, dietary history and habits, the presence of diabetes, physical inactivity, sleep disturbance, and genetic factors (M Alqarni, 2016).

To prepare Arabic coffee traditionally, cardamom is mixed with the dry coffee beans. The two most common additives are cloves and saffron. Usually, Arabic coffee is served in small cups (30 ml each), and people tend to consume 1-2 cups every day (Ali and Felimban, 1993). Arabic coffee is considered the traditional hot beverage of the citizens of the KSA (Khan et al., 2017).

The effect of Arabic coffee consumption on health issues is still controversial, and the evidence of the benefits and/or risk factors is not yet sufficient. For instance, in healthy individuals, the total serum cholesterol levels were higher among Arabic coffee consumers than among non-consumers, and this difference was significantly greater among females than among males (Ali and Felimban, 1993). However, in hypertensive

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patients, a study showed that Arabic coffee consumption led to a reduction in blood pressure (Awaad et al., 2011). In 2013, a study conducted over the course of 4 weeks on the intake of Arabic coffee with cardamom by healthy women resulted in no change in blood pressure or the level of C-reactive protein (CRP), an inflammatory biomarker; furthermore, there was a beneficial effect of a reduction in the level of gamma-glutamyl transferase (GGT), although the levels of low-density lipoprotein cholesterol (LDL-C) and total cholesterol (TC) increased (Badkook, 2013).

Several randomized crossover studies were also performed to assess the relationships between Arabic coffee consumption and glycemic index and glucose metabolism. Alkaabi et al (2013) studied the effect of Arabic coffee on the glycemic index of a common variety of dates among 30 healthy adults and 10 diabetes mellitus type 2 patients. After following these individuals for five days, there were no effects on the capillary glucose levels in the two groups (Alkaabi et al., 2013). Moreover, a study of 10 healthy subjects who ate Khulas dates either with Arabic coffee or water for four months found that there was no effect on their insulin levels, but there were somewhat elevated plasma glucose levels in the Arabic coffee consumers compared to those who consumed water (Al-Mssallem and Brown, 2013). In addition, a systematic review of clinical trials about the effect of coffee consumption on glucose metabolism was conducted among 247 adults. The results indicated that caffeinated coffee consumption for 1-3 hours may increase the glucose level; however, the consumption of caffeinated coffee for 2-16 weeks may improve glycemic metabolism by lowering the glucose level and boosting the insulin response (Reis et al., 2019).

There is a lack of data about the association between Arabic coffee consumption and the risk of obesity. To our knowledge, only one study conducted in 2012 on dietary practices among teachers showed that overweight and obesity rates among teachers were 40.5% and 22.4%, respectively. The Arabic coffee consumption rate was 65.7%, which might indicate a relationship between coffee consumption and weight gain (Hedrick et al., 2012). Therefore, the present study was designed to assess the attitude towards Arabic coffee consumption and identify the relationship between Arabic coffee consumption and obesity as indicated by BMI among female college students and employees at Taibah University in Madinah, KSA.

2. Materials and methods

2.1. Study population

A cross-sectional study was conducted at Taibah University during the 2018–2019 school year. The study was approved by the committee of research ethics at the University of Taibah, KSA [TUCDREC/20180420/JALLOUN]. The participants were randomly selected and recruited, and ultimately, 384 female students and employees aged 18–45 years participated. Only those who were willing to participate in the study were included. Women who were underweight, pregnant, lactating, taking medication that affected their weight status and suffering from a chronic disease were excluded from the study.

2.2. Data collection

A self-administered questionnaire was used for data collection. The questionnaire for the study included three parts. The first part consisted of questions about demographic characteristics, including age (years), marital status (single vs. married), smoking (yes vs. no), and physical activity (yes vs. no). Participants were also asked to report three multiple-pass 24-hour recalls for two days during the week and one weekend day to estimate their mean energy intake, which was then compared between Arabic coffee consumers and non-consumers. Elizabeth Stewart Hands and Associates (ESHA) software, version 11.2, was used to determine the total calories consumed by summing the calories of the individual foods in a recipe or food list. The second part of the questionnaire assessed participants' Arabic coffee consumption and asked 5 questions: (1) "What time do you usually drink Arabic coffee?"; (2) "What do you usually eat with Arabic coffee?"; (3) "What are your favorite additives for your coffee?"; (4) "Do you think Arabic coffee decreases your appetite during the day?"; and (5) "Do you think drinking

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coffee helps you skip main meals?”. In the last part of the questionnaire, the Beverage Intake Questionnaire (BEVQ-15) was used to assess Arabic coffee consumption. The BEVQ-15 was created to estimate the average intake of water and other beverages during the day in grams [g] and calories (kcal). It is a quantitative food frequency questionnaire that includes information about the frequency of food items consumed and amounts consumed, which are assessed across 19 beverage categories and one open-ended section for “other” beverages not otherwise listed (Hedrick *et al.*, 2012). The BEVQ-15 was modified for the purpose of the study. The frequency of Arabic coffee consumption focused on the number of times they consumed coffee (1 time, 2 times, 3 times) per day and (1 time, 2-3 times, 4-6 times) per week. The beverage portion sizes were also changed to indicate the approximate amount of beverage the subject drank each time. The cup sizes that were utilized to assess the amounts of Arabic coffee consumed were as follows: 1/2 cup= 125 milliliters, 1 cup= 250 milliliters, 2 cups= 500 milliliters, and 2.5 cups: 625 milliliters. Only Arabic coffee consumers were asked to complete this part of the questionnaire. Before completing the questionnaire, the participants were informed about the study, and each participant filled out the questionnaire alone to ensure that they were comfortable answering truthfully. A pilot questionnaire was used to test the survey with 15 students and 15 employees.

2.3. Anthropometrics

After the completion of the questionnaire and the calculation of the BMI, a bioelectrical impedance analysis (BIA) device (Omron Healthcare Co. Ltd., Kyoto, Japan; BF 501) was used to measure each subject’s weight. Measurements were taken in the morning at least two hours before eating, drinking, or exercising or two hours after breakfast, as, according to the instruction manual, there are changes in body water content that affect body composition (Omran, 2008). Before stepping on the device, participants were asked to take off their shoes and empty their pockets to avoid errors. A standard stadiometer was used to measure height to the nearest 0.1 cm. Before participants stepped onto the stadiometer, the stadiometer was validated. Participants were instructed to remove their shoes, remove hair accessories or adjust hairstyles, and stand straight with their head facing forward. BMI was computed as the ratio between weights in kilogram to height in meter square. According to the values given by the Omron Healthcare catalog based on sex and age, subjects were classified as underweight (BMI \leq 18.0), normal (BMI = 18.5–24.9), overweight (BMI = 25.0–29.9), or obese (BMI \geq 30.0).

2.4. Statistical analysis

The Statistical Package for Social Sciences (SPSS Ins., Chicago, IL, USA) version 25 was used to analyze the data. The chi-square test was used for categorical variables. Multiple logistic regression was performed to assess the association between Arabic coffee consumption and the prevalence of obesity by calculating odds ratios (ORs) and 95% confidence intervals after controlling other variables. All p-values were reported on the basis of two-tailed tests.

3. Results

The baseline characteristics of the participants according to the categories of Arabic coffee consumption are presented in Table 1. A total of 384 female participants, with a mean age of 24.5 years, were included in the present study. Approximately 71.8% of the participants reported consuming Arabic coffee, and more than 50% of them were married, did not smoke and were not physically active. The mean estimated average calorie intake of Arabic coffee consumers was found to be greater than that of non-consumers by approximately 117 calories/day based on the total calorie intake. Furthermore, while 70.3% of participants who did not drink Arabic coffee had normal BMI values, most of the Arabic coffee consumers were classified as overweight or obese (27.8% and 32.6%, respectively).

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Table 1: Characteristics of the participants categorized based on Arabic coffee consumption.

Variables	Arabic Coffee Consumption		p-value ^a
	Yes N (%)	No N (%)	
N	276 (72%)	108 (28%)	
Age^b	25 ± 2	21 ± 1	0.001
Marital status			
Yes	142 (66%)	73 (34%)	0.003
No	134 (79%)	35 (21%)	
Smoking			
Yes	12 (86%)	2 (14%)	0.195
No	264 (71%)	106 (29%)	
Physical activity			
Yes	67 (74%)	23 (26%)	0.250
No	209 (71%)	85 (29%)	
BMI			
Normal	109 (58%)	76 (42%)	0.001
Overweight	77 (78%)	22 (22%)	
Obesity	90 (90%)	10 (10%)	
Estimated average calorie intake^b	1935 ± 654	1818 ± 552	0.022

a Significant at the 5% level of significance.

b Mean and standard deviation.

Table 2 shows that 51% of the participants consumed coffee in the evening, and only 34% of them consumed coffee in the morning. The preferred foods consumed with Arabic coffee were dates and chocolates; these were preferred over other sweets, with 60%, 32% and 8% of the participants consuming dates, chocolates and other sweets, respectively. Sixty-one percent of the participants consumed Arabic coffee with additives; for example, 55% added evaporated milk, and 41% added Coffee-mate or other creamers. Last, 33% of the participants reported that consuming Arabic coffee during the day helped them skip main meals such as breakfast, lunch, and dinner.

Table 2: Participants' Attitude Toward Drinking Arabic Coffee (N=276).

Questions	Answers	N (%)
Q1: What time do you usually drink Arabic coffee?	Morning	100 (34%)
	Afternoon	42 (15%)
	Evening	134 (51%)
Q2: What do you usually eat with Arabic coffee?	Chocolate	97 (32%)
	Dates	167 (60%)
	Others	29 (8%)
Q3: Do you add any additives to your coffee?	Yes	170 (61%)
	No	106 (39%)
Q3: What are your favorite additives for your coffee?	Evaporated milk	93 (55%)
	Coffee Mate or any creamer	70 (41%)
	Any other calorie additives	7 (4%)
Q4: Do you think Arabic coffee decreases your appetite during the day?	Yes	186 (67%)
	No	90 (33%)
Q5: Do you think drinking coffee helps you to skip the main meals?	Yes	90 (33%)
	No	186 (67%)

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Approximately 43% of the participants reported consuming Arabic coffee 4-6 times per week on the BEVQ-15. In comparison, only 7% of the participants reported consuming Arabic coffee 2 to 3 times per week. Although 43% of the participants reported consuming 1/2 cup, 32% reported consuming a cup of coffee each time. The lowest proportions of participants reported daily intake amounts of 2 cups and 2.5 cups each time (16% and 9%, respectively) (Table 3).

Table 3: Arabic Coffee consumption assessment based on the beverage intake questionnaire (BEVQ-15) and Its relation to BMI categories.

BMI N (%)	How often?						P ^a	How much each time?				P ^a
	Per week			Per day				Per cup (250 milliliters)				
	1	2-3	4-6	1	2	3		Cup ^d	1/2	2	2.5	
Normal 109 (40%)	12 (12%)	26 (23%)	50 (46%)	10 (9%)	7 (6%)	4 (4%)	0.001	29 (19%)	77 (69%)	8 (7%)	5 (5%)	0.001
Overweight 77 (27%)	10 (13%)	7 (10%)	25 (32%)	30 (39%)	4 (5%)	1 (1%)		23 (30%)	41 (53%)	5 (6%)	8 (11%)	
Obesity 90 (33%)	2 (2%)	15 (17%)	44 (49%)	4 (5%)	10 (11%)	15 (16%)		39 (43%)	7 (7%)	32 (36%)	12 (14%)	
Total	24 (9%)	48 (18%)	119 (43%)	45 (16%)	21 (7%)	20 (7%)		91 (32%)	115 (43%)	45 (16%)	25 (9%)	

a P-value, significant at the 5% level of significance.

To examine the relationship between Arabic coffee consumption and the risk of obesity as indicated by BMI categories, a logistic regression model was used with Arabic coffee consumption as the dependent variable ($\geq \frac{1}{2}$ cup vs. none), adjusting for age, marital status, smoking, physical activity, average calorie intake and BMI, as shown in Table 4. Age, marital status, smoking and physical activity were not significantly associated with Arabic coffee consumption. An association between Arabic coffee consumption and BMI was observed, and the risk of both overweight and obesity were higher among those who consumed Arabic coffee. In terms of overweight, the odds ratio was 2.5-fold higher in those who consumed Arabic coffee than in those who did not (OR 2.3, 95% CI 1.9-5.3, $P < 0.005$). Additionally, the risk of obesity was significantly associated with Arabic coffee consumption and was 4.7-fold higher in those who consumed Arabic coffee than in those who did not (OR 4.8, 95% CI 3.5- 9.3, $P < 0.001$). The estimated average calorie intake was significantly 2.56-fold higher in those who consumed Arabic coffee than in those who did not consume Arabic coffee (OR 2.56, 95% CI 1.02- 8.40, $P < 0.022$).

4. Discussion

This study examined whether consuming Arabic coffee had a significant effect on the risk of obesity among females at Taibah University. Interestingly, the results demonstrated that Arabic coffee consumption, depending on how often it was consumed and the amount consumed, significantly increased the risk of obesity compared with non-consumption, possibly due to the consumption of additional calories in the form of coffee additives and sweet and savory foods.

Arabic coffee is considered a welcoming beverage in the KSA that is served all day long. In the present study, one-third of the participants consumed Arabic coffee in the morning, and more than half of them thought their appetites were substantially reduced. Regarding the timing of drinking coffee in the morning and the appetites, to our knowledge, no work has studied the effect of drinking Arabic coffee in the morning on health and other aspects. However, the influence of Arabic coffee or other types of coffee and their constituents – especially caffeine – on appetite remains largely unexplored. Several studies that explored coffee consumption and appetite showed no significant change in appetite during the day, which was in consistent to our results (Gavrieli et al., 2011; Schubert et al., 2014, 2017) because Arabic coffee contains a very low dose of caffeine compared to other kinds of coffee (Naser et al., 2018). The most likely explanation for this result is that Arabic

Table 4: The risk of obesity among coffee consumption by multiple logistic regression.

Variables	p-value ^a	OR	95% CI for adjusted OR	
			Lower	Upper
Model 1^b				
BMI	Reference			
BMI (1)^c	0.001	2.5	1.1	5.7
BMI (2)	0.002	6.2	3.0	10.8
Model 2^d				
BMI	Reference			
BMI (1)	0.005	2.3	1.9	5.3
BMI (2)	0.001	4.8	3.5	9.3
Age	0.896	0.89	0.58	1.84
Marital status	0.110	0.42	0.34	2.99
Smoking	0.252	0.77	0.52	11.93
Physical activity	0.951	1.01	0.67	2.81
Estimated average calorie intake	0.022	2.56	1.02	8.40

a Significant at the 5% level of significance. OR: odds ratio; CI: confidence interval.

b Model 1 was unadjusted.

c BMI categories; BMI; normal body weight, BMI (1); overweight, BMI (2); obese.

d Model 2 was adjusted for age, marital status, smoking, physical activity, and average calorie intake.

coffee is usually consumed with either dates, desserts, or salty foods which could lead to increased satiety during the day. Additionally, this might demonstrate that Arabic coffee consumers are more likely to skip meals.

Multiple factors related to Arabic coffee consumption could explain or contribute to the association with an increased risk of obesity. First, we found that half of the participants consumed coffee in the evening, which may lead to weight gain, especially when the coffee is paired with food. This finding is in agreement with previously published studies in different countries showing that consuming food and beverages at night may lead to obesity. In Sweden, a cross-sectional parallel group design among 83 obese women and 94 reference women found that obese women tended to eat more in the evening and at night (Bertéus Forslund et al., 2002). Additionally, a prospective Danish study reported that eating at night led to an average change in weight of 5.2 kg, particularly in women (Andersen et al., 2004). Second, there are some variations in the caloric content of Arabic coffee based on the additives used. The most commonly used additive in Arabic coffee is evaporated milk, which is also a common coffee additive in Malaysia (Chua et al., 2012), followed by Coffee-mate (Bouchard et al., 2010). This finding indicates that when determining how many extra calories are consumed by those who drink Arabic coffee, the additive type and amount should always be considered; Arabic coffee with no additives has no calories (Naser et al., 2018). The more calories consumed, the more extra calories are stored as fat, which may lead to obesity. Similar results were observed in many populations when coffee consumption and the use of additives were assessed (Bellisle et al., 2001; Bouchard et al., 2010).

The data obtained from our study are broadly consistent with the observation that date fruits are the food most commonly paired with Arabic coffee. In agreement with this finding, dates are the food most commonly

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consumed by school teachers (Hedrick et al., 2012; Al-Mssallem and Brown, 2013). One important finding was that the energy intake was higher in the subjects who consumed Arabic coffee than in the non-Arabic coffee consumers. One possible explanation of this finding is that Arabic coffee is likely to be consumed with dates and desserts, as this is the traditional way of serving it. In contrast, in a double-blind randomized crossover interventional study, a significant reduction in calorie intake was found in subjects who consumed coffee compared with the control group. The coffee used was 100% Arabica coffee that was specifically prepared for the study (Lang et al., 2014). Moreover, a review reported that energy intake is not significantly reduced by consuming coffee at a single meal. Nevertheless, the total energy intake seems to be slightly lower, by 55 kcal/day, when coffee is consumed (Schubert et al., 2014).

Although a different type of coffee was consumed, our results agree with those of other studies that have shown that overweight and obesity are prevalent among those who drink >120 mL/day of coffee (Sousa et al., 2016; Kim and Park, 2017). Our results indicated that the estimated average daily coffee intake was 250 mL (1 cup/d) in 39% of the population and 500 mL (2 cups/d) in 32% of the population among obese individuals. This showed a higher volume of coffee intake than in studies performed in the USA (Loftfield et al., 2016), Europe (Panagiotakos et al., 2007; Sartorelli et al., 2010; Rohrmann et al., 2013) and Brazil (Sousa and Da Costa, 2015; Sousa et al., 2016). Our study found that the majority of the subjects consumed ½ cup 4-6 times/week. The results suggested that obese subjects consume Arabic coffee. Women who consume 3 cups per day or more seem more likely to be obese (Lee et al., 2017). In contrast, the risk of obesity was reduced with increased coffee intake up to 4 cups/day in an observational cross-sectional study (Nordestgaard et al., 2015). Interesting results were found after adjusting for coffee additives to explore the lack of a significant association between BMI or WC and coffee consumption, and the use of additives is a probable explanation for the association of obesity and coffee consumption (Bouchard et al., 2010).

5. Strengths and limitations

The present study has several strengths, including the sample size and the inclusion of participants of different ages and body compositions. We also used the BEVQ-15 to assess Arabic coffee intake, which is a reliable way to obtain data on beverage consumption (Hedrick et al., 2012). The present study also has some limitations. This study is a cross-sectional study that cannot determine cause and effect. All participants in the sample were female, which limited our ability to examine whether Arabic coffee consumption was predictive of obesity in males. However, performing similar research with male subjects can extend the current findings in the future.

6. Conclusion

In conclusion, the present study demonstrated that the rate of Arabic coffee consumption was linked to BMI and therefore obesity; the consumption of Arabic coffee may promote unhealthy eating habits among female students and employees, which in turn may affect their nutritional status and quality of life. The results of this study suggest that the risk of obesity associated with Arabic coffee consumption may perhaps depend on two factors, namely, the type and the amount of the additives that are added to the coffee and the food that is consumed with the coffee. Our findings suggest the need for efficient strategies and educational programs to increase awareness regarding the need to limit the intake of Arabic coffee. Future research should continually assess the impact of Arabic coffee consumption on other aspects of obesity and other health issues to combat overconsumption and excessive energy intake among old, middle-aged, and high school in both genders.

Acknowledgments / Funding Source

The authors are grateful to all data participants for their enthusiastic participation in the study. This research received no specific funding from any grant.

Conflict of Interest: The authors declare no conflicts of interest.

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