



Dietary Patterns of Females with Cholecystolithiasis: A Comprehensive Study from Central Region of Saudi Arabia

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Abstract

BACKGROUND: Cholecystolithiasis is a worldwide gastrointestinal disorder and dietary pattern is one of the major risk factors involved in formation of cholelithiasis.

AIM: This study was undertaken to determine the dietary patterns of female patients with cholecystolithiasis in the central region of Saudi Arabia.

METHODS: A total of 332 females respondents were included, among them 157 were cholecystolithiasis cases, whereas 175 were healthy female subjects. All respondents were from central region of Saudi Arabia. Data were collected from a self-administered questionnaire and dietary patterns of studied population samples were compared by Chi-square test using SPSS software.

RESULTS: The data showed that the consumption of meat from beef, lamb or goat, butter, ghee, pizza, cereals, legumes, coffee, tea, kabsa rice, tomatoes, and eggs was found to be positively associated with the risk of cholelithiasis. Interestingly, the data also demonstrated that consumption of cakes, chocolates, cookies, ice cream, doughnuts, chicken, fish or other sea foods, French fries, and hot dogs showed no relation with the risk of cholelithiasis.

CONCLUSIONS: This study provides a comprehensive description of the dietary patterns of females from central region of Saudi Arabia and their association with the risk of onset of cholelithiasis. Specifically, the majority of non-vegetarian food stuffs showed positive association with the risk of development of cholelithiasis. These findings strongly recommended that the Health Ministry of Saudi Arabia should initiate the specific intervention public health programs on the dietary pattern in relation with the risk of cholelithiasis.

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Introduction

Formation of gallstones is very common in ever population in all over the world; this disorder is known as cholecystolithiasis [1]. Patients with gallstone diseases are asymptomatic; some become symptomatic after 10 years of follow-up. Risk factors of gallstone diseases are age, gender, obesity, dyslipidemia, and use of contraceptive pills. It is now well-established that the dietary pattern is major modifiable risk factor for formation of gallstones [2]. As we know, intake of sugars in excessive amount has associations with several disorders and studies have also shown it has positive correlation with the generation of gallstones, as excess sugar intake disturbs the lipoprotein metabolism, which increased the low-density lipoprotein and decreased the levels of high-density lipoproteins [3], [4]. Therefore, investigators from all over the globe reported that sugar intake in extra amount is associated with the formation of

gallstones [2], [5]. In addition, investigators also reported that intake of sugar in extra amount has increased the risk of bile deposition which further disturb the lipid metabolism and increase the chances of the formation of gallstones [6]. Gallstones risk is increased by increasing consumption of cholesterol since cholesterol gallstones are more than other types [7]. It is also important to point that intake of trans fats in excess amount has also linked with the formation of gallstone [8]. As dietary trans fats markedly elevate the levels of plasma triglyceride, which may become one of the causes for the formation of gallstones [8], [9]. Furthermore, published reports also mentioned that intake of red meat in excess amount has also associated with the formation of gallstones [10]. Moreover, reports also showed that not only sugar but also altered insulin levels in the blood has association with the formation of gallstones particularly cholesterol gallstone [11], [12]. It is also important to mention that intake of healthy diet including vegetables and fruits is reported to decrease

the risk of gallstones [13], [14], [15]. Furthermore, many investigators also reported that intake of nutritional supplements are sometimes also useful that reduce the chances of gallstones formation [16]. Moreover, it is also reported that the fiber-depleted diet can enhance gallstones formation by increase the biliary cholesterol secretion as well as intestinal hypomotility [17]. In contrast, there is a strong relationship between high-fiber diet consumption and the reduction of gallstone development [18]. Studies have also found that obesity, diet habits, sedentary life, and a firmly established as major factors for the formation of gallstones. There is an inverse relationship between physical activity and development of gallstones diseases [19]. Importantly, there is an association between gallstone and several chronic diseases such as cardiovascular disease [20]. Furthermore, the occurrence of these disorders is also associated with number of liver disorders [21]. There are variety of drugs which induce gallstone formation in women by different mechanism for example oral contraceptive – research show relationship between estrogen and gallstone as estrogen increase secretion of cholesterol in bile [1]. There some of lipid reducing drug, which also induce gallstone formation by increase secretion of cholesterol in bile like clofibrate [22]. Octreotide (somatostatin analogue) which use in the treatment of acromegaly is proved to participate in gallstone formation as it causes gallbladder stasis in case of long-term use [22]. Thiazides diuretic which is use in treatment of patient who have hypertension is considered to cause cholelithiasis as it increases biliary cholesterol saturation and induces glucose intolerance which result in gallbladder is hypo-motility-a state is related to formation of both cholesterol and pigment gallstones in addition to acute calculus cholecystitis [22]. Despite of the high prevalence rate of gallstones, but its etiology remains to be completely investigated and the current treatment of gallstones is only based on the surgical removal of gall bladder. This study determined the dietary patterns of female patients with cholelithiasis in Qassim region of Saudi Arabia.

Methods

Study design and studied subjects

A total of 157 female patients underwent cholecystectomy for cholecystolithiasis at various hospitals at Qassim region including King Fahd Specialist Hospital KFSH, Sulaiman Al-Habib Hospital, Albukairyah General Hospital, King Saud Unayzah Hospital, and Central Hospital were included in the study. We have also included 175 normal healthy females aged 20–50 years in the study. This study was conducted from July 2019 to September 2020 using a self-administrated questionnaire and the inclusion

criteria of the patients were age ranged 20–50 years and were females diagnosed with the gallstones. All participants under the age of 20 or over 50 years, patients with infectious disorders such as cancer, hepatitis, and AIDS also pregnant females were excluded in the study. The study was carried out by the Code of Ethics of the World Medical Association (Declaration of Helsinki as revised in Tokyo 2004) for humans and was approved by the Regional Ethical Committee of Ministry of Health, KSA. (Ethical approval # 1440-1922540) and written informed consent from all participants was taken before the data collection.

Collection of data, sampling, and sample size

The data were collected by the distribution of questionnaire among the described participants. The distributed questionnaires were previously validated successfully among different populations [1]. The questionnaire comprised of two main sections, the first section was for the collection of social and demographic details, whereas the other section was for the assessment of dietary pattern. The Simple Random Technique used for the distribution of questionnaire. And the samples size was calculated with the help of online software <https://www.openepi.com/SampleSize/SSMean.htm>. The cholelithiasis patients were selected on the basis of their cholelithiasis diagnosis as described previously [2] and patients with cholelithiasis were interviewed on the basis of set questions in the questionnaire.

Statistical analysis

All statistical analysis was carried out with SPSS program version 23 (IBM, SPSS, USA). The data were presented as mean \pm standard deviation and percentage. Chi-square test was used to compare the distribution of categorical variables among a population sample. $p < 0.05$ was considered statistical significant.

Results

Social and demographic details of studied subjects

Social and demographic details of cholecystolithiasis patients with control healthy humans are summarized in Table 1. This table compared the basic characteristics of 157 cholecystolithiasis female patients with 175 healthy females' controls such as age, marital status, smoking details, living standard in terms of monthly salaries, number of pregnancies, physical activities, family history of gallstones, occupation, and usage of oral contraceptives and duration of

Table 1: Demographic details of cholecystolithiasis female patients and normal healthy females subjects

Parameters	Patients (%) n = 157	Healthy controls (%) n = 175	p-value
Age (years)			0.148
20–25	35.1	54.9	
26–30	15.8	5.7	
31–35	8.8	6.9	
36–40	14.0	8.0	
41–45	10.5	12.6	
46–50	15.8	12.0	
Marital status			0.702
Single	33.3	37.1	
Married	66.7	62.8	
Smoking			0.977
Smokers	3.5	3.4	
Non-smokers	96.5	96.5	
Living standard			0.319
Poor-monthly income <5000 SAR	40.4	56.6	
Average-Monthly Income 5000–15,000 SAR	52.6	32.0	
Good-monthly income >15,000 SAR	7.0	11.4	
Number of pregnancies			0.404
1–2	22.8	20.9	
3–4	17.5	16.0	
>4	26.3	25.4	
Never	22.8	20.3	
Physical activity/Exercise			0.743
Once a day	5.3	8.6	
Weekly	8.8	9.1	
Occasionally	47.4	50.3	
Never	38.6	32.0	
Familial history of gallstones			0.363
Yes	73.7	60.0	
No	26.3	40.0	
Occupation			0.211
Unemployed	61.4	70.3	
Employed	38.6	29.7	
Oral contraceptive usage			0.130
Yes	28.0	16.0	
No	64.9	76.0	
Duration of contraceptive usage			0.341
6 months	14	10.9	
1 year	7.0	4.6	
2 years	2.3	2.9	
Over 2 years	14	14.6	

contraceptive usage. These details between them were found to be statistically insignificant ($p > 0.05$) indicated that the controls group was excellent for the study.

Pattern of dietary intake by cholecystolithiasis patients and healthy controls

Pattern of dietary intake of 157 cholecystolithiasis female patients was compared with the dietary pattern of 175 healthy female controls. The data on intake of traditional foods by the patients and controls are summarized in Figure 1. Among all tested common traditional foods such as jareesh, kabsa rice, beef meat, lamb or goat meat, chicken fish, and other sea foods,

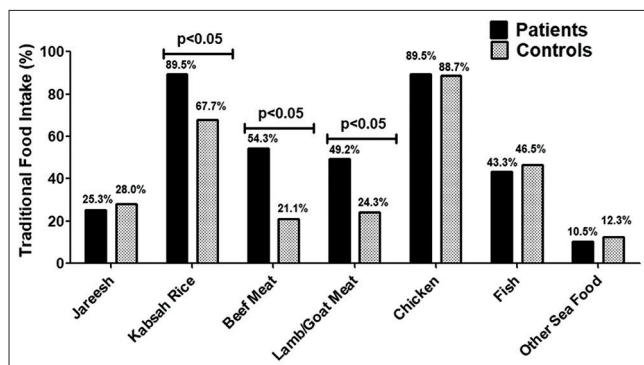


Figure 1: Traditional food intake of cholecystolithiasis patients (n=157) and normal healthy controls (n = 175)

the pattern of intake of kabsa rice, beef meat, and lamb or goat meat were significantly more by the patients as compared with their respective controls ($p < 0.05$). More specifically out of 157 tested cholecystolithiasis patients, 89.5%, 54.3%, and 49.2% patients were taken kabsa rice, beef meat, and lamb or goat meat, respectively. Whereas among 175 healthy controls, 67.7%, 21.1%, and 24.3% healthy females were preferred to take kabsa rice, beef meat, and lamp/goat meat, respectively (Figure 1). Among snacks such as cake, chocolate, cookies, pastries, ma’amoul, ice cream, and doughnuts, only intake of pastries was found to be significantly more by the patients as compared with the controls (Figure 2; $p < 0.05$). Among beverages such as coffee, tea, fruit juices, and soft drinks, only intake of coffee and tea was significantly more by the patients as compared to controls ($p < 0.05$), whereas intake of fruits juices was significantly more by the healthy controls as compared to the tested patients ($p < 0.05$). Out of 157 cholecystolithiasis patients, 78.8%, 47.4%, and 15.9% patients were taken coffee, tea, and fruit juices, respectively, whereas among 175 healthy controls, 62.6%, 36.0%, and 27.4% healthy controls were taken coffee, tea, and fruit juices, respectively (Figure 3).

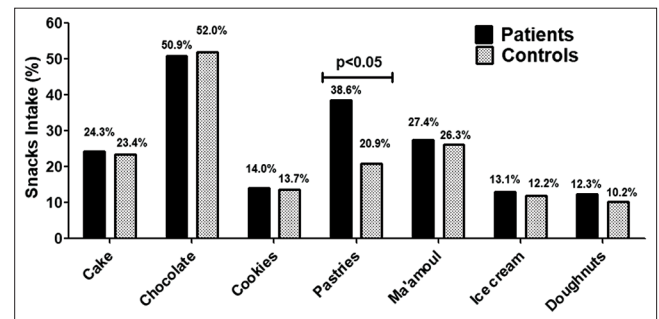


Figure 2: Snakes intake of cholecystolithiasis patients (n = 157) and normal healthy controls (n = 174)

Among fast food, such as shawarma, red meat burger, white meat burger, pizza, chicken nuggets, French fries, and hot dogs, intake of red meat burger and pizza, was significantly more by the patients as compared with their respective controls ($p < 0.05$). Specifically, 48.6% and 47.4% patients were taken red meat burgers and pizza, respectively, whereas among 175 healthy controls, 30.1% and 37.7% healthy controls were taken red meat burger and pizza, respectively (Figure 4). Among cooking oils, such as butter, ghee, canola oil, olives oil, coconut oil, and

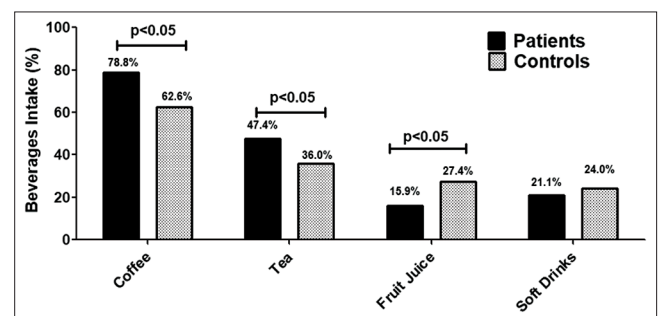


Figure 3: Beverages intake of cholecystolithiasis patients (n = 157) and normal healthy controls (n = 175)

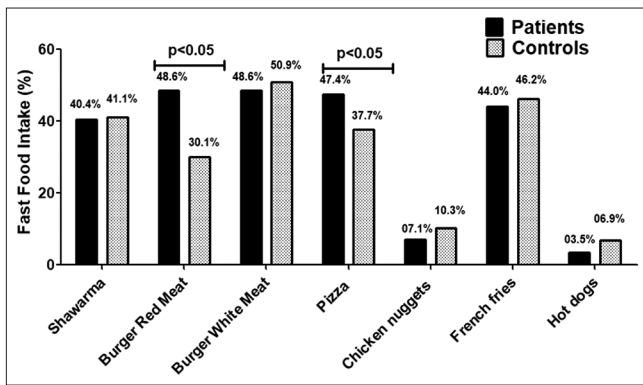


Figure 4: Fast food intake of cholecystolithiasis patients (n = 157) and normal healthy controls (n = 175)

sunflower oil, intake of butter and ghee, were significantly more by the patients as compared with their respective controls ($p < 0.05$). Specifically, 29.8% and 24.1% patients were taken butter and ghee, respectively, whereas among 175 healthy controls, 13.7% and 12.6% healthy controls were taken butter and ghee, respectively (Figure 5). Among common vegetables and fruits, intake of legumes, cereals, and tomatoes were significantly more by the patients as compared with their respective healthy controls ($p < 0.05$). Specifically, 43.3%, 45.6%, and 66.7% patients were taken legumes, cereals, and tomatoes, respectively, whereas, 33.3%, 22.9%, and 31.4% healthy controls were taken legumes, cereals, and tomatoes, respectively (Figure 6). Not only have these, we also asked the questions on milk, eggs, and various other products such as yoghurt, cheese, bread, and pasta. Among them, only intake of eggs was found to be significantly more by the patients as compared with the healthy controls ($p < 0.05$). Specifically, 62.3% patients and 43.7% healthy females were taken eggs (Figure 7; $p < 0.05$).

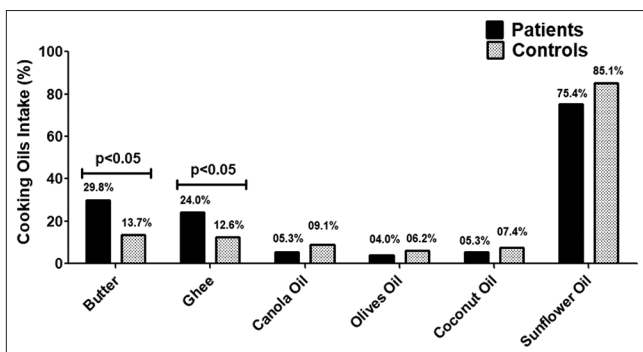


Figure 5: Cooking oils intake of cholecystolithiasis patients (n = 157) and normal healthy controls (n = 175)

Discussion

This is the comprehensive study from central region of Saudi Arabia that showed the dietary patterns of females with cholecystolithiasis. This study demonstrated

the usage of almost all types of common food such as traditional food, snacks, beverages, fast foods, cooking oils, common vegetables, and fruits by the 157 female patients with cholecystolithiasis and their results were compared with 175 healthy female subjects. Among all tested traditional foods, such as jareesh, kabsa rice, beef meat, lamb meat, goat meat, chicken, fish and other sea foods, the pattern of taken of kabsa rice, beef meat, lamb, and goat meat, were found to be significantly more by the studied female patients as compared to their respective normal healthy control females. These findings suggested that kabsa rice and red meat from lamb, goat or beef may have positive association with the generation of cholelithiasis. Moreover, the findings

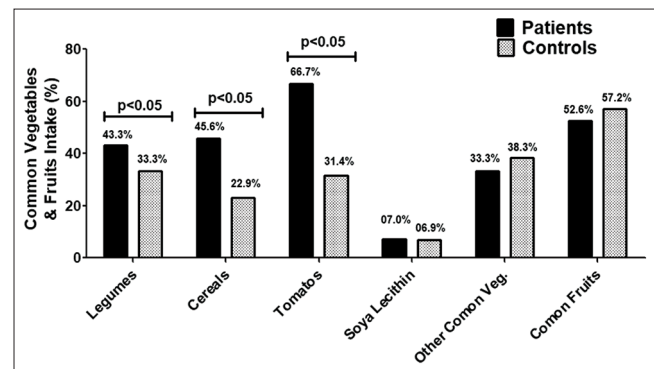


Figure 6: Common vegetables and fruits intake of cholecystolithiasis patients (n = 157) and normal healthy controls (n = 175)

also suggested that other tested traditional foods such as jareesh, chicken, fish, and other common sea foods have no relation with the onset of cholelithiasis. These findings were somewhat supported by the previous studies that showed that the risk of cholelithiasis was positively associated with intake of meat in the Caucasian population [23]. Moreover, these findings were also well supported by the Iranian population that again showed the risk of onset of cholelithiasis with the consumption of red meats [13]. The pattern of intake of snacks such as cake, chocolate, cookies, pastries, ma'amoul, ice cream, and doughnuts was also demonstrated in the present study. Out of them only intake of pastries was found to be positive associated with the patients. These are novel findings, to the best of our knowledge, which has not been investigated before. However, as snacks intake as a total was previously reported

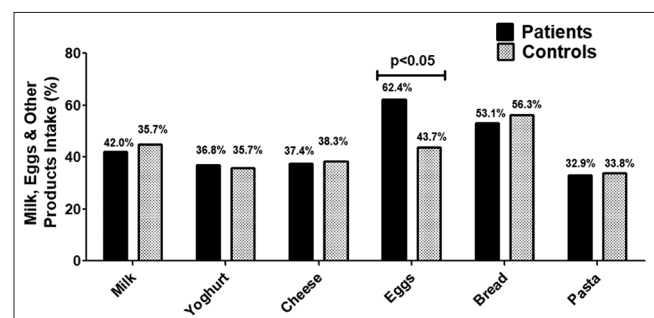


Figure 7: Intake of milk, eggs and other common products by the cholecystolithiasis patients (n = 157) and normal healthy controls (n = 175)

to be associated with the generation of cholelithiasis in Caucasian and Iranian populations [13], [23]. Furthermore, this study also demonstrated the intake pattern of beverages by the patients. The beverages such as coffee, tea, fruit juices, and soft drinks were demonstrated. Interestingly, intake of coffee and tea was found to be positively associated with the risk of onset of cholelithiasis. Moreover, data also showed that intake of fruits juices was more by the healthy controls, indicating that intake of fruits juices may prevent the generation of cholelithiasis. These results were fully supported by a study conducted on western population that clearly demonstrated that the intake of coffee and tea was positively associated with the risk of generation of cholelithiasis [24]. In contrast, of these, a study performed in Netherlands showed that ingestion of <400 ml regular coffee and <165 ml regular decaffeinated coffee on a daily basis showed no associated with risk of cholelithiasis [25]. In this context, our study was found to be very useful to solve this controversy, as the data clearly showed that both tea and coffee were both associated with risk of onset of cholelithiasis. This study also tested the risk of consumption of common fast foods such as shawarma, red and white meat burger, pizza, chicken nuggets, French fries, and hot dogs on the generation of cholelithiasis. Our data showed that the intake of red meat burger and pizza may have association with the onset of cholelithiasis, whereas other fast foods such as shawarma, white meat burger, chicken nuggets, French fries, and hot dogs were not found to be risky for cholelithiasis. These are important findings which have not been investigated before. Among cooking oils such as butter, ghee, canola oil, olives oil, coconut oil, and sunflower oil, intake of butter and ghee was found to be positively associated with the risk of cholelithiasis. These results were well supported by the previous studies which demonstrated that consumption of saturated fats was associated with the risk of onset of cholelithiasis [26], [27], [28]. Among common vegetables and fruits, this study determined that consumption of legumes, cereals, and tomatoes was risky for the generation of cholelithiasis. Not only have these, our data intake of eggs was also risky for the onset of cholelithiasis. Importantly, our data also determined that the consumption of bread, pasta, milk, and its products such as yoghurt and cheese were not associated with the risk of development of cholelithiasis. Despite of these important findings on the dietary patterns of Saudi females with cholelithiasis, but still the study has few limitations such as it was limited to the central region of Saudi Arabia only and was conducted only on females. In short, the novel data from this study demonstrated that the patients with cholecystolithiasis consumed significantly more kabsa rice, beef meat, lamb or goat meat, pastries, coffee, tea, red meat burger, pizza, butter, ghee, legumes, cereals, tomatoes, and eggs, suggesting that these dietary components may have positive association with the risk of generation of cholelithiasis.

Conclusions

This report shows the dietary pattern of Saudi female patients with cholelithiasis. Our novel data suggest that the intake of meat from beef, lamb or goat, butter or ghee, pizza, cereals, legumes, coffee and tea, kabsa rice, tomatoes, and eggs was found to be positively associated with the risk of development of cholelithiasis. Importantly, the consumption of jareesh, cakes, chocolates, cookies, maamoul, ice cream, doughnuts, chicken, fish or other sea foods, shawarma, white meat burger, French fries, hot dogs, canola oil, olives oil, coconut oil, and sunflower oil showed no relation with the onset of cholelithiasis. These findings strongly recommended that the Health Ministry of Saudi Arabia should initiate the specific intervention public health programs on the dietary pattern in relation with the risk of cholelithiasis.

Authors' contributions

RAA, WSA, EAA, AMA, ASA, AAA, and NKA carried out experimentation, data interpretation, and manuscript drafting. WA, EA, and MIK performed data interpretation and manuscript drafting. NR conceived of the study, its design, coordination, data interpretation, and manuscript drafting. All authors have read and approved the final manuscript.

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