RESEARCH PAPER

The prevalence of gallstones among patients with obesity and its link to hypocalcemia; in Sulaimani governorate, Kurdistan region / Iraq: *a prospective case-control study*

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Abstract

Background: There is a never-ending stream of publications in the literature stating that obesity may be a risk factor for gallstones, associating gallstones with rising body mass index and obesity. The primary gastrointestinal disease associated with increased body mass and obesity was caused by changes in the liver and gall bladder.

Objectives: The current work's objective is to find the prevalence of gallstones in patients with obesity in this agricultural area, which is at the beginning of development and industrialization.

Methods: A prospective case-control study was undertaken over seven years, from May 1, 2012, to April 30, 2019, comparing a matched group (n = 1310) of patients with average weight to 1219 of the 1564 obese patients who visited Hatwan Private Hospital in Sulaimani Governorate, Kurdistan Region, Iraq.

Results: Gallstones were discovered in 140 obese patients or 11.48 percent of the total. The majority of gallstones (n=87, 07.14%) were symptomatic, while fifty-three (4.43%) people had gallstones unintentionally when their abdomens were imaged.

Conclusion: The findings indicated that, compared to patients of average weight, patients with obesity had a lower prevalence of gallstones, whereas patients with obesity had a higher prevalence of symptomatic gallstones.

Additionally demonstrated that patients with obesity had lower serum levels of calcium and vitamin D compared to patients with average weight.

Key words: Calcium, gallstones, Kurdistan, patients with obesity, Vitamin D.

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Introduction

The incidence of gallstones is high among industrial countries. It became a "major public pathological state in Europe and alternative developed countries, rating up to twenty percent of the population".[1,2] It's therefore acquainted to be labelled as the "most common disease in European countries".[2] On the opposite h and, since the eighties of the twentieth century, another public pathological state raised: "Obesity has become the leading metabolic sickness within the World in the twenty-first century became a "global epidemic".[3] There is an eternal flow of articles within the literature linking gallstones to augmented body mass index (BMI)

and obesity.[1,4,5] Some state that "obesity could be a risk factor for gallstones,"[6] and "gallbladder sickness is one amongst the foremost frequent obesity-related comorbid conditions, and is directly correlative to the body mass index (BMI).[1,7,8] It is well known that the "risk of gallstones will increase with increased body mass and obesity".[3] These articles explain this association in several ways: "Obesity results in the assembly of the many cytokines leading to the pathology of the gallbladder," showing that it's going to disturb lipid and endogenous hormones metabolism, and increase the chance of gallstones".[9] Particularly for women, "Insulin resistance could also be related to gallbladder stone formation," who have more "increased body size, central adiposeness (abdominal obesity)".[10] Conjointly, "elevated blood serum lipids, diabetes, and obesity, individual parts of metabolic syndrome, are related to "calcium stone formation" in the gall bladder and bile ducts.[11] Changes within the liver and gall bladder entrenched the principal pathology of the alimentary tract related to excessive body mass and obesity.[8] While in "males, hyperinsulinemia and dyslipidemia might have some role within the etiology of gallbladder sickness on the far side of their association with obesity.[12] The current work's objective is to seek out the prevalence of gallstones in patients with obesity within this agricultural area that is at the start of development and industrialization.

Materials & methods

In accordance with the STROCSS guideline,[13] a prospective case-control study conducted over seven years from May 1, 2012, to April 30, 2019, involving 1219 of 1564 obese patients consulted a bariatric surgeon at Hatwan Private Hospital - Sulaimani Province, Kurdistan Region of Iraq. Simultaneously, a sample of 19,478 average-weight patients was examined to determine the prevalence of gallstones, and then 1,310 average-weight patients were placed into a matched, comparable group for sex, age and general health to be compared to the compared group of patients with obesity. To collect the requested information, each patient was interviewed face-to-face by 2 trainees (from the Kurdish Medical Specialties/Surgery Authority and 2 from the Arab and Iraqi Medical Specialties/Surgery Authority) who worked part-time at the center. Informed consent was obtained from each patient in an interview to complete an originally designed questionnaire in English translated into Kurdish and composed of demographic (age, gender, location, hours of sun exposure), medical, past medical (comorbidity) composite, chronic diseases, medications, family history of gallstones) and biological data (weight, height, BMI), imaging (ultrasound, selective magnetic resonance cholangiopancreatography (MRCP), laboratory data: liver function test (LFT), serum calcium, vitamin D.

Inclusion criteria:

Patients with obesity who were not on a diet, people who had not lost or recycled weight antecedently, inhabit the area, and people under 45 years of age.

Exclusion criteria: The following patients who are at an exaggerated risk of developing calcium cholelithiasis were excluded; Patients over the age of 45 years, to avoid age bias in the formation of gallstones, patients with a positive history of gallstones, patients with weight loss, patients with polygenic diseases, patients with regional

ileitis, patients on a diet and patients who lowered their blood cholesterol levels too quickly, and finally patients discovered to have thyroid disease and people using diuretics and proton pump inhibitor use for a long time previously.

The patients were divided into two groups:
Group A: Including 1219 patients with obesity.
Group B: Including 1310 patients of average weight. The work was approved by the Ethics Committee of the University of Sulaimani College of Medicine No. 28, 0n 06/26/2019 and registered in the research registry UIN 5217.

The statistical evaluations were all carried out with SPSS Version 21. Chi-square tests adjusted for clinical features were assessed at the conventional significance level of 0.05, with any P-value of 0.05 being considered statistically significant.

Results

Gallstones were noted in 140 obese patients (11.48%) in group A versus 158 (12.06%) in group B. Most gallstones were symptomatic (n = 87, 07.14%) in Group A, in contrast to 27 (02.06%) patients in Group B, (Tables-1,3). Some of the asymptomatic gallstones in patients in both Groups A and B increased in size by a few millimeters during their 3-year follow-up period. None of them became symptomatic, (Table-1). Although less than a quarter of Group B patients (303, 23.13%) have serum vitamin D deficiency (below thirty 30 ng/mL, while 459 (37.65 %) Patients in Group A have lower than normal serum vitamin D levels, as shown in (Table-3). Regarding gender, the female patients in Group A were vitamin D deficient (n = 290, 40.27 %) and hypocalcemia (n = 346, 48.05%), compared to the male patients with vitamin D deficiency (n = 169, 33.86%) and hypocalcemia (n = 179, 35.87%), as listed in (Table-2). In addition, serum calcium was below the usual level (8.5 mg/dL) among 459 (37.65%) patients in Group A versus (n = 303, 23.13%) patients in Group B (Table-3).

Table 1. Frequency and percentage of patients who have gallstones in the obese patients versus average weight patients, and change in size, number throughout threeyears follow-up.

Variables		Group A (n = 1219) No. (%)	Group B (n = 1310) No. (%)	P-value
Total number of patients with Gallstones	**Total**	**140(11.48)**	**158 (12.06)**	0.653
	Change in size	2 (0.70)	10 (00.76)	
	Change in number	4 (1.40)	20 (01.52)	
Symptomatic gallstones	Cholecystectomy	87 (7.14)	27(2.06)	0.001
Incidental finding of gallstones	**Total**	**53 (4.34)**	**131(10.00)**	
	Change in size	2 (0.70)	10 (0.76)	
	Change in number	4 (1.40)	19 (1.45)	

Table 2. Frequency and percentage of vitamin D and serum calcium in both gendersof the obese patients.

Variables		Male (n=720) No. (%)	Female (n=499) No.(%)	P value
Vitamin D	**< 30 ng/ml**	290 (40.27)	169(33.86)	0.023
	30-50 ng/ml	430(59.73)	330(66.14)	
Serum Calcium	**<8.5 mg/dl**	346(48.05)	179(35.87)	0.001
	8.5-10.5 mg/dl	374(51.95)	320(64.13)	
	>10.5 mg/dl	00	00	

Table 3. Biochemical blood test results and frequency of gallstones in obese patientsversus average weight patients.

Variables		Group A Obese patients (n= 1219) No. (%)	Group B Average weight patients (n= 1310) No. (%)	P value
Vitamin D	**< 30 ng/ml**	459 (37.65)	303(23.13)	0.001
	30-50 ng/ml	760 (63.35)	1007 (76.87)	
Serum Calcium	**< 8.5 mg/dl**	525 (43.06)	437 (33.36)	0.001
	8.5-10.5 mg/dl	694 (L56.8)	873 (66.64)	

Discussion

The prevalence of gallstones:

Gallstones were less common in obese patients (11.48%) than in patients of average weight (12.06%), whereas in the literature, the incidence ranges from (45%-96%) to (11.6%).[14] According to some authors, women who are obese have a seven-fold increased risk of developing gallstones.[7,14] A group of studies recommended that any weight above average could be a "definitive risk factor for stone growth" because obese subjects had a considerably higher prevalence of cholelithiasis, and cholecystitis.[4]

The impact of obesity:

Obesity may interfere with the metabolism of lipids and endogenous hormones, affect visceral motility, and raise the risk of gallstones.[9,10] Additionally, it has been noted that "obesity may be a chronic inflammatory condition, is markedly increasing the amount of pro-inflammatory factors, and may cause fatty infiltration of numerous internal organs, including the viscera and liver".[15] Although it plays a part "in the aetiology of biliary tract stones," metabolic syndrome and insulin resistance are present in some obese patients.[11] Gallstones are primarily made of "cholesterol, bilirubin, and calcium salts, with smaller amounts of super molecule and other materials"[16,] whereas cholesterol stones are "composed primarily of cholesterol crystals (50-99%), but additionally contain different materials forming a central calcium nidus."[17] Important roles for calcium are played during the formation.

The impact of calcium:

Gallstone formation is influenced by the majority of harmful mechanisms by calcium.[2,19,20] It is mentioned in the literature that low calcium levels, might be associated with a lower incidence of gallstones, and hypercalcemia, which increases the risk of gallstones may be through "calcium precipitation with biliary anions to create calcium-rich gallstones," [15,16,21] The results showed that most of the obese patients have subnormal serum calcium levels, and they have a lower prevalence of gallstones.

The impact of Vitamin D:

Since vitamin D is essential for calcium metabolism and it can be difficult to distinguish its effects from those of calcium,[22] vitamin D deficiency is the most common cause of hypocalcemia.[23] Vitamin D deficiency is another factor in the lower prevalence of gallstones among obese patients in the current research, as our area has very little annual sun exposure due to the long winter season, and high geographical latitude,[24,25] many people live indoors lives, and diets low in vitamin D. Lack of vitamin D-fortified diets, [16,21,26] unavailability of the seafood.[23,26] Vitamin D deficiency is the most common cause of hypocalcemia,[23] accordingly from a total of 1219 obese patients, 346(48.05%) women and 179(35.87%) men have hypocalcaemia (serum calcium below 8.5 mg/dl), as shown in (Table-2). which may contributed to lower prevalence of the gall stones in the patients with obesity in comparison to the literature. Thus, the results of the current paper (Table-1) are in contradiction to other studies claiming that the prevalence of gallstones is higher in patients with obesity by "13%,"[26] and a study from Asia that "showed no correlation of asymptomatic gallstones with obesity,"[22] This is likely due to the patients' have lower than normal levels of vitamin D and serum calcium. The results also showed that patients with obesity, who have gallstones have a higher number of symptomatic and complicated gallstones as seen in (Table-3).

In conclusions, the findings indicated that, compared to patients of average weight, patients with obesity had a lower prevalence of gallstones, whereas patients with obesity had a higher prevalence of symptomatic gallstones. Additionally demonstrated that patients with obesity had lower serum levels of calcium and vitamin D compared to patients with average weight.

Strengths and weakness:

Strength:

The first survey conducted in Kurdistan-Iraq shows the actual prevalence of gallstones in the population and patients with obesity.

In Kurdistan, it is the first to study the prevalence of vitamin D and serum calcium in average weight and patients with obesity.

Weakness

In the cross-sectional sample·

Research Registry

The work registered in the research registry under the number Research Registry UIN 5217

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مدى انتشار حصوات المرارة بين مرضى السمنة وارتباطها بنقص كلس الدم. في محافظة السليمانية، إقليم كردستان/ العراق: دراسة الحالات والشواهد المحتملة

الخلفية: هناك تيار لا ينتهي من المنشورات في الأدبيات التي تشير إلى أن السمنة قد تكون عامل خطر لحصوات المرارة، وربط حصوات المرارة بارتفاع مؤشر كتلة الجسم والسمنة. كان سبب مرض الجهاز الهضمي الأساسي المرتبط بزيادة كتلة الجسم والسمنة هو التغيرات في الكبد والمرارة.

الأهداف: هدف العمل الحالي هو معرفة مدى انتشار حصوات المرارة لدى مرضى السمنة في هذه المنطقة الزراعية التي هي في بداية التطور والتصنيع.

الطرق: تم إجراء دراسة الحالات والشواهد على مدى سبع سنوات، من ١ مايو ٢٠١٢ إلى ٣٠ أبريل ٢٠١٩، بمقارنة مجموعة متطابقة (العدد = ١٣١٠) من المرضى ذوي الوزن المتوسط إلى ١٢١٩ من ١٥٦٤ مريضًا يعانون من السمنة المفرطة الذين زاروا هاتوان. مستشفى خاص في محافظة السليمانية، إقليم كردستان، العراق.

النتائج: تم اكتشاف حصوات المرارة لدى ١٤٠ مريضاً يعانون من السمنة المفرطة أو ١١,٤٨٪ من المجموع. كانت غالبية حصوات المرارة (العدد = ٨٧، ٠٧,١٤٪) مصحوبة بأعراض، في حين أصيب ثلاثة وخمسون (٤,٤٣٪) من الأشخاص بحصوات في المرارة عن غير قصد عندما تم تصوير بطنهم.

الكلمات المفتاحية: كالسيوم، حصى في المرارة، كردستان، مرضى السمنة، فيتامين د