Prevalence and Risk Factors of Asymptomatic Gallstones in a Sample of Population in Basrah, Iraq

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Abstract

Background: Asymptomatic gallstones can be identified as incidental finding during routine ultrasound examination for other abdominal condition.

Methods: This study was a cross-sectional, which was conducted at the ultrasound departments of Al-Basrah General Hospital and Al-Fayhaa Hospital in Basrah city, over a period of six months from June to December 2015.

A total sample of 1001 participants were included in the study, interviewing them was done using a questionnaire covering information about socio-demographic characteristics and medical history related to the risk of gallstone formation in general population (history of DM, family history of gallstones, history of smoking and history of oral contraceptives use in females).

Results: The prevalence of gallstone was 13.6%. It increased with advanced age. Female gender, people with low level of education, and women who had more than 4 children were more liable to have gallstones.

Those with medical history of diabetes mellitus, persons with family history of gallstones, high serum cholesterol, and overweight or obesity also showed significant association with gallstones.

No association was found between gallstones and history of smoking, history of hemolytic anemia, and history of oral contraceptive use.

Conclusion: The prevalence of asymptomatic gallstone was relatively high in this region. Female gender, age, high cholesterol level, family history of gallstones, and increased BMI were independent risk factors for gallstones formation.

Keywords: Asymptomatic gallstones; Basrah; Prevalence' risk factors

Introduction

Gallstones are aggregation of hard substance that forms inside gallbladder [1] when there is disequilibrium in the constitution of bile such as more cholesterol, accumulated amount of pigment material and/or decreased amount of bile acid [2]. Gallstones may also result from dysfunction of gallbladder contraction [3].

Asymptomatic gallstone can be identified as an incidental finding of gallstone (an echo move with gravity and an acoustic shadow in a visible gallbladder) during routine ultrasound examination for other abdominal condition [4].

Among the well-recognized risk factors for gallstones are the advanced age, female gender, and overweight (which is considered as an avoidable risk factor related to inactive lifestyle and food formula) [5].

There is a pronounced fluctuation in gross gallstone prevalence between divergent ethnic populations [6]. Broadly, there appears to be higher rates of cholelithiasis in Western Caucasian, Hispanic, and Native American populations and decreased rates in Eastern European, African American, and Asian populations [7-9].

In Europe, 10% of adults have gallstones; the prevalence in women is twice that in men [10]. In some studies that followed up the patients with asymptomatic gallstones for many years, the annual complication rates; in form of (pancreatitis, cholicystitis) were about 0.2-0.8%. The risk of cancer over 30 years was between 0.12-0.3% [11].

No much information can be found about the prevalence of asymptomatic gallstones among general population in Basrah.

This study was conducted to ascertain the prevalence of asymptomatic gallstone disease and its associated risk factors among general population in Basrah.

Methodology

Study design and setting

This study was a cross-sectional one conducted at the ultrasound and radiology departments in two major multispecialty hospitals in Basrah (Al-Fayhaa and Basrah General Hospitals) for the period from June 2015 to December 2015.

Subjects

The study population included; patients attending the radiology and ultrasound department during the study period who were presented for abdominal ultrasound examination for other complaints not related to gallstone disease. Patients with symptoms related to gallstone disease, or with history of cholecystectomy, and pregnant women were excluded.

Sampling and sample size

A convenient sample of one thousand and one consecutive patients who fulfilled the inclusion criteria and accepted to take part in the study were included.

Data collection

Interviewing the patients was done using a structured questionnaire to collect data about socio-demographic characteristics (such as age, gender occupation, education), family history of gallstone disease, history of diabetes and hypertension, history of the use of oral contraception, and number of children for females, history of hemolytic diseases, and history of smoking (current or past).

Blood pressure was measured at least twice five minutes apart in a quite environment. WHO definitions were used as the cut-off values for hypertension: systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure 90 mmHg [12].

Height and weight were checked at the examination room. The body mass index (BMI) was calculated. Overweight and obesity were defined as BMI 25-29.9 kg/m2, BMI ≥ 30 kg/m^2 respectively [13].

After fasting for a minimum of 6 hours, ultrasound examination of the gallbladder was performed with the subject in supine and left lateral position. Two experienced radiologists performed all the ultrasound examinations in these hospitals.

Before the ultrasound examination, blood samples were taken for analysis of total cholesterol, fasting plasma glucose. Ultrasound technique for the diagnosis of gallstone disease is considered as very good method as it has good diagnostic accuracy, 14 and holds many advantages: it is non-invasive, there is no ionizing radiation, it is not expensive, and nearly all organs of the abdomen can also be examined. It also has a high sensitivity (97%) and specificity (93.6%) [14,15].

The Ethics and Research Committees of College of Medicine, Basrah University, and the General Directorate of Health approved the study. An informed consent was obtained from each participant before inclusion in the study.

Statistical analysis

Statistical software SPSS V. 20 was used for data input and analysis. Continuous numeric data were summarized as means with SD, these variables showed normal distribution as tested by Semirnov-Knolmogorov test for normality. In the evaluation of differences between groups, the Students t-test was used. Data on qualitative characteristics are expressed as percent values or absolute numbers as indicated. These data were compared using Fisher's exact test or Chi-square test when appropriate. Multivariate logistic regression analysis was carried out to identify independent risk factors for gallstones. Weighted ORs are given with 95% confidence limits. A two-tailed P-value<0.05 was considered significant.

Results

The prevalence of gallstones was 13.6% (95% CI 11.6-15.8). The mean age of the participants was 38.1 ± 15.7 years (the range was 18-80 years). The number of women included in this study was 599, which constituted 59.8% of the total participants. More than three quarters of the patients involved (81.5%) were with educational level less than 12 years, the housewives formed 56.8% of the jobs, the remaining have other occupations like civil employed, retired, private job. The frequency distribution of the socio-demographic features of the participants is presented in Table 1.

Table 1 Socio-demographic characteristics of the studied population.

Character	No. (%)
Age (Mean ± SD) years	38.11 ± 15.66
Range (18-80) years	
Gender	
Male	402 (40.2)
Female	599 (59.8)

Education	
<12 years	816 (81.5)
≥12 years	185 (18.5)
Occupation	
Governmental employed	156 (15.6)
Private job	194 (19.4)
Retired	65 (6.5)
Non employed	17 (1.7)
Housewife	569 (56.8)
No. of children	
0-3	349 (34.9)
4+	250 (25)

Those with positive asymptomatic gallstones on abdominal examination by ultrasound showed older age (43.5 ± 18.4 years) than those without gallstones (37.2 ± 15.0 years) with significant p-value <0.001. Females showed significantly higher rate of asymptomatic gallstones than males (17.7% *vs* 7.7%) with p-value <0.001.

Table 2 Association of socio-demographic features and gallstones.

Socio-demographic features	Gallstone positive	Gallstone negative	P-value
	No. (%)	No. (%)	
Age (Mean ± SD) years	43.5 ± 18.4	37.2 ± 15.0	0.001
Gender			
Male	31 (7.7)	371 (92.3)	0.001
Female	105 (17.5)	494 (82.5)	
Education			
<12 years	120 (14.7)	696 (85.3)	0.04
≥12 years	16 (8.6)	169 (91.4)	
Occupation			
Governmental employed	9 (5.8)	147 (94.2)	
Private job	10 (5.2)	184 (94.8)	<0.001
Retired	16 (24.6)	49 (75.4)	
Non employed	2 (11.8)	15 (88.2)	
Housewife	99 (17.4)	470 (82.6)	
No. of children			
0-3	52 (14.9)	297 (85.1)	0.046
4+	53 (21.2)	197 (87.8)	

People with less than 12 years education showed higher rate of asymptomatic gallstones than those with education level more than 12 years (14.7% vs 8.6%, p=0.040).

Retired people had a significantly higher rate of gallstones (24.6%) than others with significant difference, p-value (<0.0001) as shown in Table 2.

As shown in Table 3, the prevalence of gallstones was significantly more in diabetics (21.5%) as compared with non diabetics (12.6%). Similarly, the presence of family history of gallstone was significantly associated with gallstones. Contraception use in women, history of hypertension, and history of hemolytic diseases showed no significant association with gallstones.

Table 3 Association of medical condition and gallstones.

Medical history and tests	Gallstones (+ve)	Gallstones (-ve)	P-value
	No. (%)	No. (%)	
Diabetes Mellitus			
Present	23 (21.5)	84 (78.5)	0.017
Absent	113 (12.6)	781 (87.4)	
Family history of gallstones			
Present	89 (42.6)	120 (57.4)	0.0001
Absent	47 (5.9)	745 (94.1)	
Hypertension			
Present	41 (14.3)	246 (85.7)	0.682
Absent	95 (13.3)	619 (86.7)	
History of contraceptive use			
Yes	34 (19.3)	142 (80.7)	
No	71 (16.8)	352 (83.2)	0.532

Hemolytic anemia			
Yes	2 (11.8)	15 (88.2)	0.996
No	134 (13.6)	850 (86.4)	
Smoking			
Current	6 (9.7)	56 (90.3)	
Ex-smoker	0 (0.0)	8 (100.0)	0.322
Non smoker	130 (14.0)	801 (86.0)	
Cholesterol level (mg/100 ml)	232.8 ± 41.7	153.5 ± 33.7	0.001
Mean ± SD			

BMI (kg/m^2) Mean ± SD	30.0 ± 5.6	25.4 ± 4.1	0.001

High serum cholesterol level and increased BMI were significantly higher in those with gallstones compared to those without gallstones.

Multivariate logistic regression analysis showed that gallstone disease is more likely to be associated with the following conditions: increased BMI (OR, 1.12; 95% CI, 1.059-1.186; p=0.001); increased serum cholesterol (OR, 1.05; 95% CI, 1.043-1.06; p=0.001); age (OR, 1.025; 95% CI, 1.008-1.043; p=0.005), female gender; (OR, 2.078; 95% CI, 1.056-4.066; P=0.034), and family history of gallstones (OR, 9.52; 95% CI, 5.18-17.54, p=0.001). Diabetes mellitus was not identified as significant risk for the development of asymptomatic gallstones as shown in Table 4.

Table 4 Logistic regression analyses.

Variable	β-Coefficient	P-value	OR (95% CI)
Age	0.026	0.005	1.03 (1.01-1.04)
Female gender	0.728	0.034	2.08 (1.06-4.07)
Family history of gallstones	2.257	0.001	9.52 (5.18-17.54)
S. Cholesterol mg/100 ml	0.053	0.001	1.05 (1.04-1.06)
BMI (kg/m^2)	0.114	0.001	1.12 (1.06-1.19)

Discussion

In this study, the prevalence rate of asymptomatic gallstones was 13.6%, which is much higher than that previously reported in (Baghdad) which was 3.3% [16]. It is also higher than that reported in other countries; in Japan (3.2%) [17], India (6.12%) [18], and Italy (3.5%) [19]. But it is in agreement with that of many studies in other places of the world, which showed high prevalence rate of gallstones [20-22]. The prevalence of gallstones in this study was comparable to the average prevalence in Middle Eastern countries which ranges from 4-12% [23]. In Saudi Arabia (Hail district), the prevalence of gallstones was 10.9%, 23 while in Asir region it was 11.7% [24]. In Iran (Zahedan district), the prevalence rate of asymptomatic gallstones was 2.4% [25].

This variation in the prevalence of gallstones may be related to the ethnic differences, or may be to other socio-demographic factors.

In the present study, the old age and female gender were found as major risk factors for gallstone disease, which is in agreement with other studies done previously [26-28]. The relation between female gender and gallstone formation can be attributed to the effect of female sex hormone in form of estrogen in childbearing age and hormone replacement therapy in post menopausal age on the biliary cholesterol secretions causing super saturation of bile ending in gallstone formation [23].

The risk factors of gallstones in this study did not differ from that reported in local studies 16, regional countries such as Saudi Arabi [23,24] and Iran [25], or worldwide [17-19].

In consistence with other studies [29,30], an increased BMI, which is considered as an avoidable risk factor, was independently associated with a higher risk of gallstones. In accordance with other studies [31], high serum cholesterol concentrations were independently associated with the risk of gallstones. In contrast, Pagliarulo et al. [32] found no significant association between serum cholesterol and the presence of gallstones.

Our study showed that contraception was not a significant risk factor for gallstone disease. This result agreed with other study done by Caroli-Bosc et al. [33], but was inconsistent to another prior study done by Khan et al. [34] which revealed that contraception use by females is a relevant risk factor for gallstones. The risk of contraception on the gallstone formation related to the content of the estrogen, which could be dose dependent effect [35]. Low dose estrogen in some types of contraception recently used may have no or less risk and this theory may explain our results of negative association of contraception with the presence of gallstones.

In univariate analysis, a positive significant association between diabetes and gallstones was noticed, but this association disappeared on multivariate analysis, a result that had been reported by others [24]. Elmehdawi et al. found that diabetes was an independent risk factor for gallstone in females but not in males [36]. Other investigators did find diabetes as a significant independent risk factor for gallstone

[37]. This controversy may be explained by presence of cofactors in diabetics related to gallstone formation, such as age, obesity and hyperlipidemia.

Positive family history is associated with increased risk for asymptomatic gallstones, the same results were found in other studies conducted previously [38,39] which showed that there is a strong familial tendency for gallstone formation in relatives of gallstone disease patients. This result optimizes the idea of genetic as risk factor for gallstone, or shared same environmental factors such as diet.

Conclusion

The prevalence of asymptomatic gallstones was relatively high in this region. Female gender, age, high cholesterol level, family history of gallstones and increased BMI were independent risk factors. Some of these factors such as BMI and the cholesterol level can be prevented by modification of lifestyle to reduce the risk of development of gallstones.

References

1. Liu CM, Su HC, Wang YT, Tung TH, Chou P, et al. (2010) Reduced bile duct contractile function in rats with chronic hyperglycemia. Health 2: 1072-1077.

2. Carey MC, Lamont JT (1992) Cholesterol gallstone formation. 1. Physical-chemistry of bile and biliary lipid secretion. Prog Liver Dis 10: 139-163.

3. Ding X, Lu CY, Mei Y, Liu CA, Shi YJ (2005) Correlation between gene expression of CCK-A receptor and emptying dysfunction of the gallbladder in patients with gallstones and diabetes mellitus. Hepatobiliary Pancreat Dis Int 4: 295-298.

4. Glambek I, Arnesjo B, Soreide O (1989) Correlation between gallstones and abdominal symptoms in a random population. Results from a screening study. Scand J Gastroenterol 24: 277-281.

5. Volzke H, Baumeister SE, Alte D, Hoffmann W, Schwahn C, et al. (2005) Independent risk factors for gallstone formation in a region with high cholelithiasis prevalence. Digestion 71: 97-105.

6. Diehl AK (1991) Epidemiology and natural history of gallstone disease. Gastroenterol Clin North Am 20: 1-19.

7. Borch K, Jonsson KA, Zdolsek JM, Halldestam I, Kullman E (1998) Prevalence of gallstone disease in a Swedish population sample: Relations to occupation, childbirth, health status, life style, medications, and blood lipids. Scand J Gastroenterol 33: 1219-1225.

8. Jørgensen T (1987) Prevalence of gallstones in a Danish population. Am J Epidemiol 126: 912-921.

9. Massarrat S (2001) Prevalence of gallstone disease in Iran. J Gastroenterol Hepatol 16: 564-567.

10. Festi D, Sottili S, Colecchia A, Attili A, Mazzella G, et al. (1999) Clinical manifestations of gallstone disease: evidence from the multicenter Italian study on cholelithiasis (MICOL). Hepatology 30: 839-846.

11. Heaton KW, Braddon FE, Mountford RA, Hughes AO, Emmett PM (1991) Symptomatic and silent gall stones in the community. Gut 32: 316-320.

12. (1996) Hypertension control. Report of WHO Expert committee, Geneva.

13. Anuurad E, Shiwaku K, Nogi A, Kitajima K, Enkhmaa B, et al. (2003) The new BMI criteria for Asians by the regional office for the western pacific region of WHO are suitable for screening of overweight to prevent metabolic syndrome in elder Japanese workers. J Occup Health 45: 335-343.

14. Gandolfi L, Torresan F, Solmi L, Puccetti A (2003) The role of ultrasound in biliary and pancreatic diseases. Eur J Ultrasound 16: 141-159.

15. Scruggs W, Fox JC, Potts B, Zlidenny A, McDonough J, et al. (2008) Accuracy of ED Bedside Ultrasound for Identification of gallstones: retrospective analysis of 575 studies. West J Emerg Med 9: 1-5.

16. Al-Obaidi SMM, Abdulla TS, Al-Alawi MS, Mohammed HMK (2006) The prevalence of silent gallstones and its relation to some risk factors in Iraq. The Iraqi postgraduate medical Journal 5: 146-150.

17. Nomura H, Kashiwagi S, Hayashi J, Kajiyama W, Ikematsu H, et al. (1988) Prevalence of gallstone disease in a general population of Okinawa, Japan. Am J Epidemiol 128: 598-605.

18. Khuroo MS, Mahajan R, Zargar SA, Javid G, Sapru S (1989) Prevalence of biliary tract disease in India: a sonographic study in adult population in Kashmir. Gut 30: 201-205.

19. Loria P, Dilengite MA, Bozzoli M, Carubbi F, Messora R, et al. (1994) Prevalence rates of gallstone disease in Italy. The Chianciano population study. Eur J Epidemiol 10: 143-150.

20. Berndt H, Nürnberg D, Pannwitz H (1989) Prevalence of cholelithiasis. Results of an epidemiologic study using sonography in East Germany. Z Gastroenterol 27: 662-666.

21. Everhart JE, Yeh F, Lee ET, Hill MC, Fabsitz R, et al. (2002) Prevalence of gallbladder disease in American Indian populations: findings from the Strong Heart Study. Hepatology 35: 1507-1512.

22. Glambek I, Kvaale G, Arnesjö B, Søreide O (1987) Prevalence of gallstones in a Norwegian population. Scand J Gastroenterol 22: 1089-1094.

23. Alawad MN, Almotlaq AM, Alorf SH, Alshammari NH, Almhanaa AM, et al. (2016) Ultrasound Prevalence of Gallbladder Disease in Hail, Saudi Arabia. International Journal of Science and Research 5: 2019-2020.

24. Abu-Eshy SA, Mahfouz AA, Badr A, El Gamal MN, Al-Shehri MY, et al. (2007) Prevalence and risk factors of gallstone disease in a high altitude Saudi population. East Mediterr Health J 13: 794-802.

25. Ansari-Moghaddam A, Khorram A, Miri-Bonjar M, Mohammadi M, Ansari H (2015) The Prevalence and Risk Factors of Gallstone Among Adults in South-East of Iran: A Population-Based Study. Glob J Health Sci 8: 48440.

26. Novacek G (2006) Gender and gallstone disease. Wien Med Wochenschr 156: 527-533.

27. Festi D, Dormi A, Capodicasa S, Staniscia T, Attili AF, et al. (2008) Incidence of gallstone disease in Italy: results from a multicenter, population-based Italian study (the MICOL project). World J Gastroenterol 14: 5282-5289.

28. Sun H, Tang H, Jiang S, Zeng L, Chen EQ, et al. (2009) Gender and metabolic differences of gallstone diseases. World J Gastroenterol 15: 1886-1891.

29. Stender S, Nordestgaard BG, Tybjaerg-Hansen A (2013) Elevated body mass index as a causal risk factor for symptomatic gallstone disease: a Mendelian randomization study. Hepatology 58: 2133-2141.

30. Bonfrate L, Wang DQ, Garruti G, Portincasa P (2014) Obesity and the risk and prognosis of gallstone disease and pancreatitis. Best Pract Res Clin Gastroenterol 28: 623-635.

31. Chen CH, Huang MH, Yang JC, Nien CK, Etheredge GD, et al. (2006) Prevalence and risk factors of gallstone disease in an adult population of Taiwan: an epidemiological survey. J Gastroenterol Hepatol 21: 1737-1743.

32. Pagliarulo M, Fornari F, Fraquelli M, Zoli M, Giangregorio F, et al. (2004) Gallstone disease and related risk factors in a large cohort of diabetic patients. Dig Liver Dis 36: 130-134.

33. Caroli-Bosc FX, Deveau C, Harris A, Delabre B, Peten EP, et al. (1999) Prevalence of cholelithiasis: results of an epidemiologic investigation in Vidauban, southeast France, General Practitioner's Group of Vidauban. Dig Dis Sci 44: 1322-1329.

34. Khan MK, Jalil MA, Khan MS (2007) Oral contraceptives in gall stone diseases. Mymensingh Med J 16: S40-45.

35. Thijs C, Knipschild P (1993) Oral contraceptives and the risk of gallbladder disease: a meta-analysis. Am J Public Health 83: 1113-1120.

36. Elmehdawi R, Elmajberi S, Behieh A, Elramli A (2009) Prevalence of Gall Bladder Stones among Type 2 Diabetic Patients in Benghazi Libya: A Case-control Study. Libyan J Med 4: 27-30.

37. Toosi FS, Ehsanbakhsh AR, Tavakoli MR (2011) Asymptomatic gallstones and related risk factors in Iran. Hepatogastroenterology 58: 1123-1126.

38. Salinas G, Velásquez C, Saavedra L, Ramírez E, Angulo H, et al. (2004) Prevalence and risk factors for gallstone disease. Surg Laparosc Endosc Percutan Tech 14: 250-253.

39. Sarin SK, Negi VS, Dewan R, Sasan S, Saraya A (1995) High familial prevalence of gallstones in the first-degree relatives of gallstone patients. Hepatology 22: 138-141.