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Original Research Article

Prevalence of Asymptomatic Gallstone during Routine Ultrasonography and its Associated Factors: Cross-Sectional Study from a Tertiary Care Teaching Hospital

Prabha Thangaraj[1], Vijayashree Jayagopalan[2], Saraswathi Selvaraju[2]*

Department of Community Medicine[1], Department of Radiology[2], Trichy SRM Medical College Hospital & Research Centre, Irungalur, Trichy, Tamil Nadu

***Correspondence:** Dr. Saraswathi Selvaraju (drsaraswathi2k@gmail.com)

ABSTRACT

Background: Gallstones are the most important risk factor for gall bladder carcinoma. Understanding the burden of asymptomatic gallstone and its associated factors is essential to identify risk group likely to develop complication.

Objectives: To estimate the burden of asymptomatic gallstone (AGS) and assess the factors contributing towards the same.

Material and methods: A cross-sectional study was done during February to August 2023 in a tertiary care teaching hospital among adults aged above 18 years undergoing ultrasound of the abdomen as a part of routine master health check-up. A questionnaire was used collect the socio-demographic details, medical history and laboratory investigation. A total 1300 individuals were screened for AGS and included for analysis

Results: The mean age of study participants was 55.99 ± 15.83 years. The study found 36 individuals with AGS i.e 2.8% (95% CI: 1.9-3.8%). The mean size of gallstone was 8.19 ± 4.6 mm with a range of 2 to 25 mm. Medical condition such as diabetes, hypertension and body mass index was found to be associated with AGS ($p<0.000$). Among the lipid parameters it was found that, low density lipoprotein (LDL) , triglyceride (TG) and cholesterol (CH) mean values were more while high density lipoprotein was lesser among individual with asymptomatic gallstones when compared to their counterparts which was found to be statistically significant ($p<0.000$).

Conclusion: Though the burden of asymptomatic gallstone was low in our setting, our study found diabetes, hypertension, body mass index and lipid profile to be associated with greater risk of gallstone formation. We suggest further studies on follow up of individual with AGS to assess their risk of developing complication due to gallstone

Keywords: Asymptomatic Gallstones, Prevalence, Risk factor, Ultrasonography, Serum lipid levels

INTRODUCTION

Gallstone is a common gastrointestinal condition, which is characterized by the presence of crystalline deposits in the gallbladder along with impaired excretion of bile into the intestine.[1] Though gallstone disease is not associated with high mortality, it causes significant morbidity affecting the economy and public health.[2] Asymptomatic gallstone (AGS) detection has increased in the recent years due to use

of ultrasound for routine screening and other abdominal conditions. Though pain is the most common presenting symptom, it has been reported that 41.67% with gallstone have no symptoms at diagnosis.[3] A study among the American population found 10.5% of individuals with AGS developed symptoms at 5 years and 32.6% at 15 years of follow-up.[4] The natural history of gallstone detected without any symptoms is not known in India.[5]

Gallstones are the most important risk factor for gall bladder carcinoma.[6] Hence, understanding the burden of AGS is essential.

The prevalence of AGS in previous Indian studies done in the north varies between 3 to 4% [7-9] while that of south was 7.5%.[10] Other countries have documented a higher prevalence ranging between 6 to 14%. [11-14] Several risk factors such as age, sex, family history, pregnancy, diabetes and obesity etc. have been identified to contribute to gall stone formation.

The present study aims to assess the burden of AGS and identify risk factors contributing towards the same

MATERIAL AND METHODS

The present cross-sectional study was during February 2023 to August 2023 (six months) in the Radiology Department of a tertiary care teaching hospital among adults aged above 18 years undergoing ultrasound of the abdomen as a part of routine master health check-up. Individual with known history of gall bladder disease or history of any symptoms of gall stone disease (occasional pain in the right upper abdomen) and those not giving consent were excluded.

Variable such as age, sex, residence, body mass index (BMI), diet (vegetarian or non-vegetarian), presence of co-morbidity (diabetes and hypertension) and serum lipid profile i.e Low Density Lipoprotein (LDL), High Density Lipoprotein (HDL), Cholesterol (CH) and Triglyceride (TG) were obtained from master health check-up report. Presence of gall stone and the number of stones were detected using ultrasound (model: GE Logiq P9 Ultrasound system-C1-5-RS) by a senior and two junior radiologists. All scan done by the junior radiologist was re-checked by the senior radiologist to confirm the presence of gallstones.

A total of 1300 participants were included in the analysis.

Institutional Ethics committee approval was obtained prior to the conduct of the study. (Ref. No. 636/TSRMMCH&RC/ME-1/2019-IEC No. 002, dated: 17.07.2019)

Statistics

Data was entered in Microsoft excel sheet and analysis was done in SPSS software version 21. (IBM Corp., Armonk, NY, USA).

Quantitative data were expressed in mean and standard deviation while qualitative in frequency and proportion.

The prevalence of AGS was expressed in 95% confidence interval. Independent students-t test was used assesses association of age and lipid profile with presence of AGS while chi-square test was done for diet, BMI and co-morbidity with a p value <0.05 considered to be statistically significant.

RESULTS

The mean age of study participants was 55.99 ± 15. 83 years, with 58.8% being female and the remaining male. The other socio-demographic and medical condition of the study participants are given in table 1. A total 36 individuals were diagnosed with AGS i.e 2.8% (95% CI:1.9-3.8%). The mean size of AGS was 8.19 ± 4.6 mm with a range of 2 to 25 mm. Majority (52.8%) had less than 3 stones and 75% had normal gall bladder followed by well distended (13.8%). (Table 2). There was no statistically significant association between age, sex, residence and diet among those with gallstones present versus absent.

Medical condition such as diabetes, hypertension and BMI was found to be associated with AGS ($p<0.000$). Among the lipid profile, LDL, TG and CH mean values were more and HDL was lesser among AGS individual when compared to their counterparts and this mean difference was found to the statistically significant ($p<0.000$). (Table 3 and 4).

Table-1: Socio-demographic and medical details of study participants (N=1300)

Variable	n (%)
Age (years)	
18 -30	42 (3.2)
31-40	235 (18.1)
41-50	242 (18.6)
51-60	253 (19.5)
61-70	198 (15.2)
71-80	276 (21.2)
≥80	54 (4.2)
Sex	
Female	765 (58.8)
Male	535 (41.2)
Residence	
Urban	989 (76.1)
Rural	311 (23.9)
Diet	
Vegetarian	401 (30.8)
Mixed diet	899 (69.2)
Body Mass Index (BMI)	
Underweight	102 (7.8)
Normal	765 (58.8)
Overweight	377 (29.0)
Obese	56 (4.3)
Co-morbidity	
Diabetes	78 (6.0)
Hypertension	69 (5.3)

Table-2: Gallbladder description of study participants with asymptomatic gallstone (n=36)

Details of AGS	n (%)
Number of stones	
≤3	19 (52.8)
>3	17 (47.2)
Size of stone* (mm)	
≤4.0	7 (19.4)
4.1-6.0	9 (25.0)
6.1-8.0	5 (13.8)
8.1-10.0	5 (13.8)
10.1-12.0	4 (11.1)
>12.0	6 (16.6)
Gall bladder shape	
Normal	27 (75.0)
Mildly distended	1 (2.7)
Moderately distended	2 (5.5)
Well distended	5 (13.8)
Contracted	1 (2.7)

*The largest size of gallstone was document in case with more than one stone

Table-3: Association of socio-demographic details and asymptomatic gallstone (N=1300)

Variable	AGS present (n=36), n (%)	GS absent (n=1264), n (%)	P value
Age (mean ± SD) (in years)	51.64 ±16.28	56.12 ± 15.81	0.112
Sex			
Female	22 (2.8)	743 (97.2)	0.864
Male	14 (2.6)	521 (97.4)	
Residence			
Urban	28 (2.9)	959 (97.1)	0.06
Rural	8 (2.6)	305 (97.4)	
Diet			
Vegetarian	11 (2.7)	390 (97.3)	1.000
Mixed diet	25 (2.8)	874 (97.2)	

AGS-asymptomatic gallstone, GS- gallstone

Table-4: Association of medical condition and serum lipid profile with asymptomatic gallstone (N=1300)

Variable	AGS present (n=36), n (%)	GS absent (n=1264), n (%)	P value
Diabetes			
Yes	16 (20.5)	62 (79.5)	0.000*
No	20 (1.6)	1202 (98.4)	
Hypertension			
Yes	8 (11.6)	61 (88.4)	0.000*
No	25 (2.0)	1206 (98.0)	
BMI			
Underweight	2 (2.0)	100 (98)	0.000*
Normal	11 (1.4)	754 (98.6)	
Overweight	18 (4.8)	359 (95.2)	
Obese	5 (8.9)	51 (91.1)	
Lipid profile (mean ± SD) (mg/l)			
LDL	264.5 ± 41.7	145.1 ± 8.9	0.000*
HDL	13.4 ± 3.9	35.4 ± 5.9	0.000*
TG	473.6 ± 29.7	200.3 ± 28.5	0.000*
CH	286.1 ± 25.1	231.1 ± 17.5	0.000*

LDL- Low density lipoprotein, HDL-High density lipoprotein, TG-Triglyceride, CH-Cholesterol
*statistically significant

DISCUSSION

The present study was done in a tertiary care teaching hospital among apparently healthy individuals attending their routine master health check-up during the period February 2022 to August 2023. A total of 1300 individual undergoing their general health screening were included for analysis. Ultrasound was used to screen the patients for the presence of gall stone, which has a high sensitivity and specificity.[7] We documented 2.8% with ASG and the mean age of study participants was 55.9 years. A similar proportion was reported in previous studies done in Mumbai[7] and Chandigarh[8] while 6 to 7% was documented in studies done in Kashmir[9] and Chennai.[10] In comparison to international studies, Japan[15] and Thailand [16] reported similar findings while Mexico[17] and Iraq[11] found a much higher percentage of 13 to 14%.

The mean age of individuals with AGS was 51.64 years, similar to previous Indian studies.[3,10] But studies from Iraq[11] and Bangladesh [18] reported AGS to be more common between the age group 30 to 40 years. The occurrence of AGS in our study was slightly more in females than males, but this difference was not statistically significant, similar to a study by Saha et al.[18] In most of the previous studies,[7,10,11] the proportion of ASG was more among female than male. A study by China [13] reported men to be at greater risk than female. Role of gender in contributing to ASG is controversial. Liu et al.[19] in their study found men to be at great risk than women under 50 years but women aged more than 50 years at greater risk than men. Further studies are needed to ascertain these findings in our setting. Dietary practice was not associated with AGS in our study. Singh et al.[8] also reported similar findings. A study by Unisa et al.[7] from northern India found chickpea consumption to increase the risk of gall stone formation. Khuroo et al.[6] in their study compared the mean value of total calorie intake and visible fat content among those with gall stone and those without gallstone. The mean values were found to be similar with no statistical significant difference among the two groups. Chun-Ming et al.[20] in their prospective study found vegetarian diet to lower the risk of gall stone disease among Taiwanese women but not men. Qamar et al.[21] conducted a case-control study among Pakistani women with symptomatic gall stone versus their counterpart and found increased intake of

non-vegetarian food, fried foods and dry fruits to be significantly associated with greater risk. Whether dietary factors play an important role only among the symptomatic gall stones when compared to asymptomatic needs to be reviewed. Moreover, data regarding dietary intake across the studies varies, thus making comparison and interpretation difficult.

Our study found individuals with greater BMI at a greater risk of gall stone formation, similar to studies by Khuroo et al.,[9] Khalaf et al.[11] and Saha et al.[18] A study by Hooper et al.[14] in their study found obesity to be a significant risk factor for gall stones formation only among the female but not males. The type of stone and environment factors can also contribute to gall stone formation. Obesity could result in formation of cholesterol stone over the other types, which is seen less frequent among the Asians than the Europeans.[22]

Froutan et al.[12] found gall stone to be significantly associated with diabetes and recommend the need for screening among them. They also found functional dyspepsia to be an important indicator for presence of gall stones. A systematic review by Chen et al.[1] also concluded the importance of ultrasound screening of gall bladder to decide on the early management to reduce the cost of cholecystectomy. Our study also found the risk of asymptomatic gall stone to be more common among diabetics, but other studies [12,14,18] did not find any association. Similarly, hypertension was also associated with greater risk of gall stone in our study. Zhang et al.[23] conducted a study among 3 lakh sample, which found hypertension to be significantly associated with gall bladder disease. But others studies[7,12,18] found no such associated between the two. Most of the studies have not considered the duration of hypertension among the patients in their studies. Hence, there is a need for meta-analysis study to check for valid association between gall stone formation and hypertension. The mean value of cholesterol, triglyceride and low density lipoprotein was higher, while high density lipoprotein was lower among the individuals with AGS than their counterpart which was statistically significant. A study by Wang et al.[13] and Khalaf et al.[11] also reported similar findings. Narang et al.[6] studied the role of number, size and lipid profile in causing carcinoma gallbladder.

The study concluded that having more than 20 stones and size greater than or equal to 3 cm to be significantly associated with carcinoma gallbladder but no relationship with the lipid profile. Long term follow-up studies for 15 to 20 years from the western countries have documented only a minority with AGS to have developed any symptoms or complication.[24,25] Categorization of individual with AGS into high and low risk for need for initiation of treatment is still far from ideal and needs further research for conclusive risk factors.[5] The limitation of our study was that the samples were taken from hospital-based individuals who reported for their routine health check-up.

Hence, the burden of AGS might differ in the community. Moreover, the dietary history was assessed only on the basis of vegetarian or non-vegetarian diet practiced by the individual.

A detailed dietary history in needed for better understanding about the role of diet in gallstone formation. Lastly, we have not followed-up the study participants to assess the outcome of AGS. Despite these drawbacks, our study has identified certain risk factors to be significantly associated with AGS.

CONCLUSIONS

The burden of AGS in the present was lower than other Indian studies. Majority had less than 3 stones with a mean size of 8.1 ± 4.6 mm. Factors found to be significantly associated with AGS were diabetes, hypertension, obesity and lipid profile. We suggest further studies on follow up of individual with AGS to assess their risk of developing complication due to gallstone.

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