

ORIGINAL ARTICLE

Gall Bladder Calculus in reproductive age group females attending the ultrasound clinic at a tertiary care hospital: A comparative Cross-sectional study

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Citation

Pandey M, Rani A, Jaiswal K, Bajpai PK, Kumar S. Gall Bladder Calculus in reproductive age group females attending the ultrasound clinic at a tertiary care hospital: A comparative Cross-sectional study. Indian J Comm Health. 2021;33(3):486-490. <https://doi.org/10.47203/IJCH.2021.v33i03.014>

Source of Funding: Nil Conflict of Interest: None declared

Article Cycle

Received: 09/04/2021; Revision: 13/07/2021; Accepted: 19/08/2021; Published: 30/09/2021

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Abstract

Background: Pregnant females are at risk for cholelithiasis' progress, and the obstruction in the bile duct produced by gallstones is responsible for jaundice and abdominal pain. **Objective:** The objectives of the present study were to see the burden of gall stones, relation with parity, and trimester among reproductive age group females. **Methodology:** A cross-sectional study was conducted on 467 females of age between 15 to 45 years. The gall bladder was thoroughly examined by an ultrasound probe of frequency 2-5 MHz in all planes. **Results:** In most females who had gallstones, single (68.8 percent) gall stone was common as compared to multiple (31.2 percent). More nonpregnant women had gall bladder stones than pregnant women (p -value < 0.005). Among the current nonpregnant group, the percentage of presence of gallbladder stones was greater in the female having parity of two or more (27.4 percent) than the females having parity of less than two (8.2 percent) with p -value < 0.05 . **Conclusion:** Since Gallstones can further complicate the situation in the form of gallbladder carcinoma, and females with higher parity have more chances of developing gallstones. Therefore, it becomes necessary to know the trimester of gallstone formation and its role in the progression of symptoms.

Keywords

Females; Gallstones; Pregnant; Nonpregnant; Ultrasound

Introduction

Cholelithiasis is among the most widespread digestive disorders in India.(1) The gallstones are not always symptomatic; however, when these calculi get entrapped in the cystic duct, it may lead to obstruction in the bile flow, which increases the tension in the gallbladder and presents with colicky pain.(2) Cholesterol, bile pigment, and various calcium salts constitute a significant portion of gallstones. Depending upon these elements, the gallbladder stones are categorized in cholesterol, pigment gallstones, and mixed pigmented stones. (1,3) The formation of gallstones is influenced by the Dietary habits and the lifestyle of the patient. Besides Obesity, Genetic structure, medications, Female gender, Metabolic

syndrome, Bariatric surgery, etc., pregnancy is a cardinal risk-issue for the event of cholelithiasis. (1,2) The elevated estrogen and progesterone levels during the gestational period induce supersaturation of bile by cholesterol.(4) There is a need for a study on gall bladder stones among reproductive age group females to know the effects of pregnancy status on the presence of gall stones, and the trimester most susceptible for the presence of the gall stones, because of complications regarding gall bladder stones. The present study compared the presence of gall stones, mean age and parity between pregnant and nonpregnant females.

Aim & Objective

To estimate the burden of gall stones, relation with parity, and trimester among reproductive age group females.

Material & Methods

An analytical cross-sectional study was carried out over six months in a tertiary care hospital in collaboration with the Radiology Department. Study Population: Female patients attending the obstetrics and gynaecology outpatient department (OPD) of age between 15 to 45 years, who came for any gynaecologic problem were included. Antenatal women coming for a routine check-up only were included in the study. We intend to generalize the results over the female population of reproductive age group. Inclusion criteria: Female patients attending the obstetrics and gynaecology outpatient department (OPD) of age between 15 to 45 years, who came for any gynaecologic problem were included. Antenatal women coming for a routine check-up only were included in the study. Exclusion criteria: Subjects who did not give consent and clinically unstable females were excluded from the present study. Females who took any hormonal therapy, hormonal contraceptive methods in the last five years were excluded from the study. Any ante natal problem was also an exclusion criterion. Females who have known positive family history were excluded from the study. Oral contraceptive pills and any form of hormonal therapy may be the potential confounders. So, we have already excluded these from the study in exclusion criteria.

Sample size: It was calculated using the formula(5):

$$n = \frac{[p1(1-p1)+p2(1-p2)]}{(p1-p2)^2} \times Cp.power$$

Where, n= is the minimum number of subjects required in each group

p1= estimated proportion in group1

p2= estimated proportion in group2

Cp,power is as defined below :

p	Power (%)			
	50	80	90	95
0.05	3.8	7.9	10.5	13.0
0.01	6.6	11.7	14.9	17.8

Taking the value of p1=0.076(6), p2=0.001(7), and Cp,power=17.8 (power=95%; p=0.01)(5)

The calculated minimum sample size was 226 for each group. So, we included 230 nonpregnant females and 237 pregnant females (a total of 467 females) in the present study. Study subjects were enrolled on each working day of the week, i.e., from Monday to Saturday, and each day only four participants (two from pregnant and two from nonpregnant) were investigated for 120 days. We call the selected participants the on the day of ultrasonography with empty stomach early in the morning. Data of three and ten participants from the pregnant and nonpregnant groups were not filled completely, so they were excluded from the study at the time of data cleaning. (Figure 1)

Methodology: The patients were informed to come on the day of ultrasonography with an empty stomach early in the morning and also an empty urinary bladder of pregnant females just before the ultrasound procedure. They were examined in a supine position, keeping both arms behind their head. The examination of the gallbladder was done during deep inspiration. The gall bladder was thoroughly examined by a probe of frequency 2-5 MHz in all the planes with the help of USG scanner model number SONOACER7-USS-SAR7E3U/WR (Samsung Medison Co. Ltd. Tehran). Working definition of gallstones: Gall bladder calculus was diagnosed by looking at a hyper-echoic circular focus with posterior acoustic shadow. The gallbladder was examined irrespective of the symptoms of patients.

Statistical Analysis: Differences between the two groups were compared using the Chi-Square test and Fisher’s exact test. The significance level was established at 5% and was considered statistically significant when p < 0.05. Data were analyzed by using IBM Corp. Released 2016. IBM SPSS Statistics for Windows, Version 24.0, IBM Corp., Armonk, NY. (8)

Ethical Consideration: All the study subjects were included after written informed consent. The current study was approved by the University’s Ethics Board. (Letter No. 632/2018-19/EC No. 2018/249, dated 31.05.2019)

Results

The overall mean age of females was 26.3 years, median age was 25 years (IQR=9). (Figure 2), (Table 1) A total of 467 females were included in the study, half (50.7 %; n=237) of which were pregnant. Among pregnant females, most of them (54.4 percent) were in the third trimester. About one-third of females who were included in the study had a parity of one, and one-third have parity of two. Gall bladder stones were present in 13.7 percent of the total females scanned. (Table 2) In most females who had gallstones, single (68.8 percent) gall stone was common as compared to multiple (31.2 percent). (Figure 3) Abdominal ultrasound image of a pregnant female with 31 weeks of gestational age, showing gallstone. (Figure 4) More nonpregnant women had gall bladder stones (21.3 percent) than pregnant women (6.3 percent), and the difference between these two groups was statistically significant (p-value <0.005). (Table 3) Gall bladder stones were found mostly in the second and third trimester of pregnancy (46.6 percent each). The association between the trimester of pregnancy and the presence of gallbladder stone was not found statistically significant. (Table 4) Among the current nonpregnant group, the percentage of presence of gallbladder stones was greater in the female having parity of two or more (27.4 percent) than the females having parity of less than two (8.2 percent). There was a statistically significant difference between these two groups (p-value- 0.001). (Table 5)

Discussion

The gallbladder collects bile as it flows from the liver to the intestine through bile ducts. Bile stasis inside the gall bladder forms gall bladder stones.(9) The gall bladder stones may progress into severe jaundice or gall bladder carcinoma. Gangwar R. et al., in their study regarding gall bladder disease in pregnancy, observed that the mean age of female 'with gall bladder stones' and 'without stones' was 30.24 and 27.56 years, respectively. The current study also showed that the mean age of females with gall bladder stones was 31.25 years and without stones was 25.51 years. The mean parity in the present study among females with gall bladder stones was 2.45 and without stones was 1.74, which was almost similar to the findings of Gangwar R. (10) In the present study, Gall bladder stones were present in 13.7 percent of the total females scanned. In the present study, it was observed that the incidence of gallstones in pregnant females was 6.7%, 46.6%, and 46.6% in the first, second, and third trimester respectively; however, there was no statistically significant association between trimester and gall bladder disease. Similarly, a study was done by Maringhini A. et al. showed that the ultrasonographic report of 17 (6.25%) pregnant women had gallstones / biliary sludge during their first trimester and 49 (18.0%) in the course of their last trimester of pregnancy. (11) Almost similar results were noticed in a study conducted at Baghdad Teaching Hospital (2019), in which 5.2, 11.2, and 16.6 percent of cases reported the presence of gall bladder stones in the first trimester, second and third trimesters, respectively. The association between trimesters of pregnancy and gall bladder disease was statistically significant.(12) The present study showed that the nonpregnant females had more chances of having gallstones than the currently pregnant females. The commonest cause of admission in the hospital in 1st year postpartum is gall bladder disease, and pregnancy is a risk factor for gallstones. (9,10) Gallbladder disease in pregnancy may be due to an increased level of estrogen during pregnancy that causes an indirect increase in cholesterol saturation of bile. It might be possible that women of rural area might have some life style practices/ food habits, which influenced the GB stone prevalence. We have to identify these hidden factors through a large community based epidemiological study. Also, the sample size was not so big, it might cause the reversed results in the present study. But at the same time, it was also evident that the women with higher parity were at more risk of developing the gallstone disease. In the present study, 4.64% of pregnant females with parity of two or more had gall stones. A similar observation was mentioned by Ko C, Beresford et al. where 9.2 % of pregnant females with parity of two or more had gall stones. (13,14,15) Among the currently nonpregnant group, the females having a parity of more than 2, had more chances ($p < 0.001$) of

having gall stones than the females having parity of less than 2. Although the similar results were seen among the currently pregnant group, but the results were not statistically significant. This might be due to a higher mean age (28.82 ± 8.29 years) among nonpregnant group, than the current pregnant female group (23.84 ± 3.64 years).

Conclusion

In the present study, information about high burden of gallstones in north Indian females was obtained. It was evident that multiple gall stones were less prevalent than the single gall stones. Also, the females with higher parity were found to have increased chances of gall stones. Since Gallstones can further complicate the situation in the form of gallbladder carcinoma, it becomes necessary to elucidate the mechanism of gallstone formation and their role in the progression of symptoms. In the present study, there was no exposure to hormonal contraceptives/therapy, and it allowed the assessment of the effect of pregnancy and related factors independent of exogenous hormonal consequences. Although the women coming to the hospital have one or more health problem. But, as we have limited resources, and the study had no funding, we have to choose the hospital-based study design.

Recommendation

In the present study, the females with higher parity had increased chances of gall stones that can further complicate the situation in gallbladder carcinoma. Therefore, accurate knowledge of the mechanism of gallstone formation and early diagnostics is necessary to decrease the complications associated with the gall stones.

Limitation of the study

As the present study was performed in a hospital whose catchment population was mainly from a rural area, the analysis could not be generalized to the whole population.

Relevance of the study

The present study compared the presence of gall stones, mean age, and parity between pregnant and nonpregnant females. Also, parity and status of gallbladder stones among currently pregnant and nonpregnant females were done because of complications regarding these stones.

Authors Contribution

All authors contributed significantly to the concept, design, acquisition, analysis, interpretation of data, drafting of the manuscript, critical revision of the manuscript for important intellectual content, coordination, statistical analysis, administrative, technical, material support, and supervision.

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Tables

TABLE 1 DISTRIBUTION OF STUDY SUBJECTS ACCORDING TO OBSTETRIC HISTORY AND CURRENT GALL BLADDER STONE STATUS

Variable		Frequency	Percent
Current Pregnancy status	Pregnant	237	50.7
	Nonpregnant	230	49.3
Parity	Zero	38	8.1
	One	152	32.5
	Two	154	33.0
	Three	98	21.0
	Four	20	4.3
	Five	5	1.1
Gall bladder stone	Present	64	13.7
	Absent	403	86.3

TABLE 2 MEAN AGE (IN YEARS) AND MEAN PARITY OF STUDY SUBJECTS

	Overall (Mean±SD)	Gallbladder stone Present (Mean±SD)	Gallbladder stone Absent (Mean±SD)	Prgenant Group (n=237) (Mean±SD)	Non-Prgenant Group (n=230) (Mean±SD)
Age in years	26.30 ± 6.84	31.22 ± 8.36	25.51 ± 6.23	23.84±3.64	28.82±8.29
Parity	1.84 ± 1.05	2.45 ± 0.96	1.74 ± 1.03	1.72±0.84	1.97±1.22

TABLE 3 ASSOCIATION BETWEEN GALL BLADDER STONES WITH PREGNANCY STATUS

		Pregnancy status		p-value
		Pregnant No. (%)	Nonpregnant No. (%)	
Gall bladder stones	Present	15 (6.3)	49 (21.3)	<0.001
	Absent	222 (93.7)	181 (78.7)	

*Yate’s correction applied

TABLE 4 ASSOCIATION BETWEEN GALL BLADDER STONES WITH TRIMESTERS OF PREGNANCY

Variable		Gall bladder stones		p-value
		Present No. (%)	Absent No. (%)	
Pregnancy Trimester	First Trimester	1 (6.7)	11 (4.9)	0.815*
	Second Trimester	7 (46.6)	89 (40.1)	
	Third Trimester	7 (46.6)	122 (55.0)	

*Yate’s correction applied

TABLE 5 ASSOCIATION BETWEEN PARITY AND STATUS OF GALLBLADDER STONES AMONG CURRENTLY PREGNANT AND NONPREGNANT FEMALES

	GB Stone status	Parity		p-value
		< Two	≥Two	
Currently Pregnant	GB stone Present	4 (3.4)	11 (9.2)	0.107*
	GB Stone Absent	113 (96.6)	109 (90.8)	
Currently Non-Pregnant	GB stone Present	6 (8.2)	43 (27.4)	0.001
	GB Stone Absent	67 (91.8)	114 (72.6)	

* Fischer’s Exact test applied

Figures

FIGURE 1 FLOW DIAGRAM OF THE STUDY

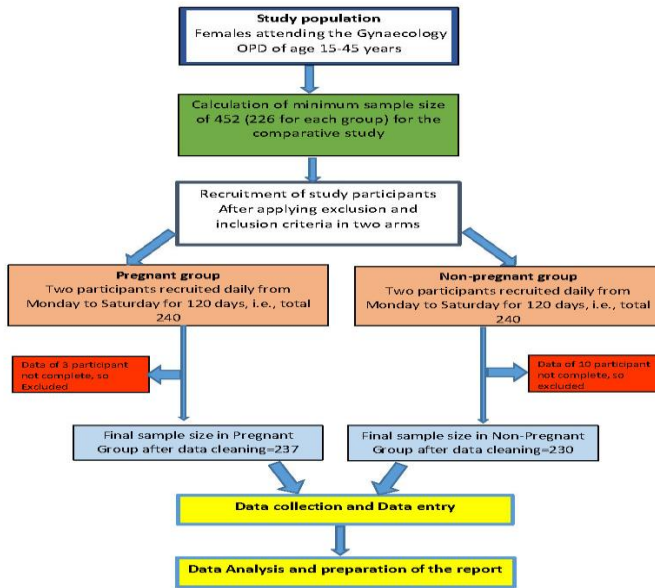


FIGURE 2 BOX-WHISKER PLOT SHOWING AGE DISTRIBUTION OF STUDY PARTICIPANTS

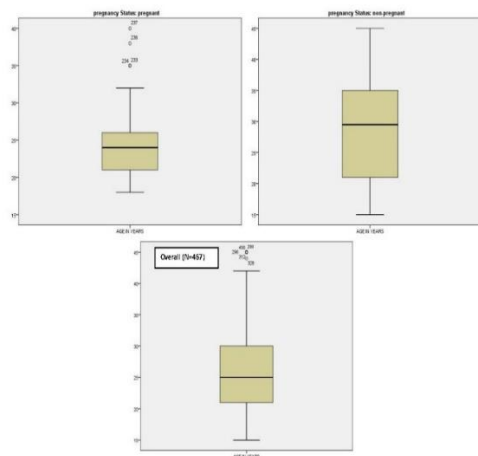


FIGURE 3 DISTRIBUTION OF FEMALES WITH GALL BLADDER STONE ACCORDING TO NUMBER OF STONES

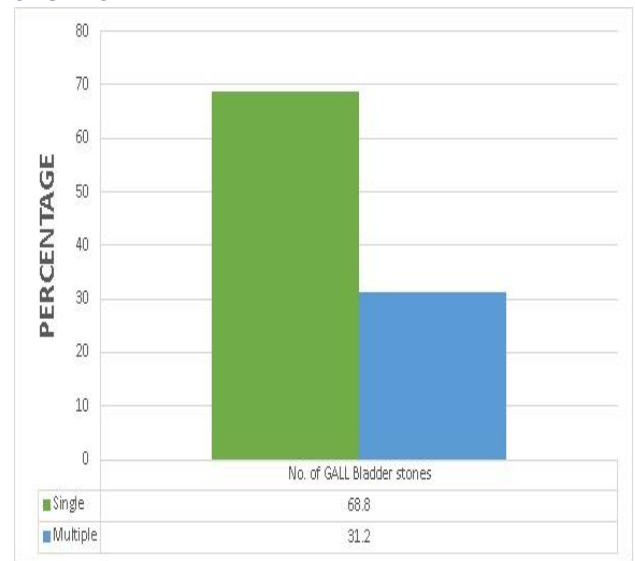


FIGURE 4 ULTRASOUND IMAGE SHOWING GALLSTONE IN A PREGNANT FEMALE WITH 31 WEEK OF GESTATIONAL AGE

