



## ORIGINAL ARTICLE

### Prevalence of gallstones and biliary sludge formation during pregnancy detected by ultrasonography

E Saha<sup>1✉</sup>, M Saha<sup>2</sup>, AL Kumar<sup>3</sup>, BK Bain<sup>4</sup>, J Das<sup>5</sup>, AJ Peea<sup>6</sup>, D Saha<sup>7</sup>

#### Abstract

The risk of gallstones is thought to increase with number of pregnancies. Cholesterol gallstones are more prevalent in women than men and primarily related to sex steroids, particularly progesterone. During pregnancy there are changes in bile composition and gallbladder motility that promote gallstone formation. This study was conducted to determine incidence and outcome of pregnancy related biliary sludge and gallstone formation. Two hundred and nine consecutive expectant women were evaluated by ultrasonography at 1st trimester, 3rd trimester and at 4-6 weeks after delivery. Socio-demographic, medical and obstetrical history were taken and recorded. Incidence of gallstone and sludge formation were found 5.7% and 2.9%, respectively. The results suggest that pregnancy may be a risk factor for gallstone and biliary sludge formation.

**Key words:** Prevalence, gallstones, biliary sludge formation, pregnancy, ultrasonography.

#### Introduction

Gallbladder disease is highly prevalent in western countries. The prevalence of gallstones is upto 50.0% among adult women in some population of Latin American countries.<sup>1</sup> The United States of America have demonstrated gallstones in 5.0-12.0% of pregnant women.<sup>2,3</sup> The risk of gallstones is also thought to increase with number of pregnancies.<sup>4,5</sup> Cholesterol gallstones, more prevalent in women than men and are primarily related to sex steroids, particularly progesterone.<sup>6,7</sup> During pregnancy there are changes in bile composition and gallbladder motility that promote gall stone formation.<sup>8</sup> Pregnancy may be a risk factor for gallbladder stone and sludge formation.

was reported upto 36.0% and gallstones upto 11.0%.<sup>9</sup> A prospective study also reported the development of new biliary sludge in 31.0% and new gallstones in 2.0% of the studied women during one year postpartum.<sup>10</sup> The risk remained high during five years after pregnancy.<sup>11</sup>

Most women with biliary sludge remain asymptomatic. However, those with stones may experience pain or serious complications such as cholecystitis, choledocolithiasis or pancreatitis which may have a high morbidity or mortality for both mothers and fetuses.<sup>2,12</sup>

In the literature, prevalence of biliary sludge

There is no study showing incidence of biliary sludge or gallstone development

1. E Saha, Associate Professor, Department of Obstetrics & Gynaecology, Khulna Medical College, Khulna.

Email: dr.etisaha@gmail.com

2. M Saha, Professor of Gastroenterology, North East Medical College, Sylhet

3. AL Kumar, Consultant, Radiology, City Imaging Centre, Khulna

4. BK Bain, Senior Consultant, Radiology, Shaheed Shaikh Abu-Naser Specialized Hospital, Khulna

5. J Das, Assistant Professor, Institute of Nuclear Medicine & Allied Sciences, Khulna Medical College, Khulna

6. AJ Peea, Assistant Professor, Department of Obstetrics & Gynaecology, Gazi Medical College Hospital, Khulna

7. D Saha, Junior Consultant, Paediatrics, Khulna Medical College, Khulna

during pregnancy in Bangladesh. Therefore, this prospective study was designed to determine the incidence and natural outcome of pregnancy related biliary sludge and gallstone and to define potential risk factors in developing such diseases.

### Materials and Method

This study was carried out in a private clinic in Khulna from June 2014 to December 2016 enrolling 233 consecutive pregnant women in 1<sup>st</sup> trimester. The exclusion criteria was the presence of gallstone at entry. Written informed consents were taken from every participants. Particulars of participants with baseline epidemiological and biometric data were recorded in data sheet. Blood glucose and lipid profile were examined.

All the participants underwent ultrasound scanning- 1) at 1<sup>st</sup> trimester (9-12 weeks), 2) early 3<sup>rd</sup> trimester (26-32 weeks) and 3) 6-8 weeks after child birth. If biliary sludge was found at 1<sup>st</sup> scan, the participant were followed up for probable progression to gallstone. Others were followed up for probable development of new biliary sludge or gallstone. A total of 209 mothers completed all 3 scans and were considered as final study population of this study. Data were collected, compiled and entered in spreadsheet and analyzed using appropriate statistical tools. Results were reported as percentage (%).

### Results

Age of the participants of this study varied from 16 to 36 years (mean  $\pm$  SD, 25.3  $\pm$  4.6 years). Among the women, 175 (83.7%) were from middle class family while 28 (13.4%) and 6 (2.9%) from poor family and rich family background, respectively. Of them, 112 (53.6%) were from  $\leq$ 25 years of age, 97 (46.4%) from above 25 years of age (Table 1). Out of 209 women, 22 (10.5%) had history of using of injectable contraceptives and 4 (1.9%) oral contraceptives in the past. Only six (2.9%) of the women had diabetes and hypertension (Table 1).

Among the women, 90 (43.1%) were primi

**Table 1. Socioeconomic status of the women, presence of hypertension, diabetes and history of contraceptive use, n = 209**

Characteristics	n (%)
Poor family	28 (13.4)
Middle class family	175 (83.7)
Rich family	6 (2.9)
Diabetes mellitus	6 (2.9)
Hypertension	6 (2.9)
History of injectable contraceptive use	22 (10.5)
History of oral contraceptive use	4 (1.9)

gravida, 63 (30.1%) 2<sup>nd</sup>, 42 (20.1%) 3<sup>rd</sup> and 14 (6.7%) 4<sup>th</sup> and more gravida. During 1<sup>st</sup> scanning none of the pregnant women had gallstones but 1 had sludge (Table 2). During 2<sup>nd</sup> scanning at early 3<sup>rd</sup> trimester, 12 (5.7%) of the women including 1 who had sludge in 1<sup>st</sup> scan had gallstones and were found to have gallstones persisted during 3<sup>rd</sup> scanning at about 6-8 weeks after delivery (Table 2). Six women (2.9%) were found to have newly developed biliary sludge during 2<sup>nd</sup> scanning at 3<sup>rd</sup> trimester and of them 5 (2.4%) persisted during 3<sup>rd</sup> scanning at 6-8 weeks after delivery, 1 (0.5%) sludge regressed (Table 2).

Table 3 shows the age, parity and gallstone and sludge formation among the women. Gallstone formation was similar among age groups  $\leq$ 25 and  $>$ 25 years. Sludge formation tended to be more among the age group  $\leq$ 25 years. Gallstone formation was similar in relation to gravida/ parity while sludge formation tended to be more with higher gravida/ parity.

### Discussion

During pregnancy changes in bile composition and gallbladder can lead to nucleation of bile acids, sludge formation and the development of gallstones.<sup>13</sup> In the 3<sup>rd</sup> trimester, the changes in bile composition are mainly due to effects of estrogen.<sup>14</sup> After delivery, bile composition and gallbladder movements return to normal and therefore, sludge or gallstones may resolve.<sup>15,16</sup> In this study, incidence of gallstone and sludge formation during pregnancy was 5.7% and 2.9%, respectively. The observation seems to be consistent with that in a study where

**Table 2. Gallstones and biliary sludge formation among pregnant women, n = 209**

	1 <sup>st</sup> scan	2 <sup>nd</sup> scan	3 <sup>rd</sup> scan
Sludge	1 (0.5%)	6 (new) (2.9%)	5 (2.4%)**
Gallstone	0	12 (5.7%)*	12 (5.7%)

\*: One sludge found by 1<sup>st</sup> scan progressed to gallstone during 2<sup>nd</sup> scan.

\*\* : One sludge found by 2<sup>nd</sup> scan regressed during 3<sup>rd</sup> scan.

**Table 3. Age, parity and gallstone and sludge formation, n = 209**

		Total n (%)	Sludge n (%)	Stone n (%)
Age	≤25 years	112 (53.6)	5 (4.5)	5 (4.5)
	>25 years	97 (46.4)	1 (1.0)	7 (7.2)
		209 (100.0)	6 (2.9)	12 (5.7)
Gravida/ parity	Primi	90 (43.1)	0	6 (6.7)
	2 <sup>nd</sup>	63 (30.1)	2 (3.2)	2 (3.2)
	3 <sup>rd</sup>	42 (20.1)	3 (7.1)	3 (7.1)
	≥4 <sup>th</sup>	14 (6.7)	1 (7.1)	1 (7.1)
		209 (100.0)	6 (2.9)	12 (5.7)

incidence of gallstone in pregnant women was 6.3%.<sup>17</sup> Other series showed lower incidence of gallstone formation during pregnancy of developed countries.<sup>4,18</sup> On other hand in this series sludge formation was low, but higher than report by an author which was 0.68%.<sup>19</sup> Most of the studies show regression of stone and sludge after delivery as gallbladder function and biliary compositions returns to normal after delivery. In this study, 1 (0.5%) sludge regressed. Gallstone formation was similar among age groups ≤25 and >25 years. Sludge formation tended to be more among the age group ≤25 years.

In this study, gallstone formation was similar in relation to gravida/ parity while sludge formation tended to be more with higher gravida/ parity. Gallstone formation was higher among primi gravida which was contradictory to that reported by others.<sup>20,21</sup> Long period of breast feeding and less awareness of mothers regarding body weight may influence the higher incidence.

#### Conclusion

Pregnancy predisposes gallbladder disease including gallstone and sludge formation. Frequency of sludge formation may rise with parity. There were some limitations in the present study- high dropout rate, small

sample size, and body mass index and cholesterol level of mothers were not evaluated. The study period was short and a single centered study may not proclaim the whole scenario of the country. A multi-centered study in tertiary hospitals of the country including multi disciplinary approach may reveal the real picture.

#### References

1. Diehl AK. Epidemiology and natural history of gallstone disease. *Gastroenterol Clin North Am* 1991;20:1-19.
2. Valdivieso V, Covarrubias C, Siegel F, Cruz F. Pregnancy and cholelithiasis: pathogenesis and natural course of gallstones diagnosed in early puerperium. *Hepatology* 1993;17(1):1-4.
3. Basso L, McCollum PT, Darling MR, Tocchi A, Tanner WA. A descriptive study of pregnant women with gallstones. Relation to dietary and social habits, education, physical activity, height, and weight. *Eur J Epidemiol* 1992;8(5):629-33.
4. Tsimoyiannis EC, Antoniou NC, Tsioulas C, Papanikolaou N. Cholelithiasis during pregnancy and lactation. Prospective study. *Eur J Surg* 1994;160(11):627-31.
5. Scott LD. Gallstone disease and pancre-

- atitis in pregnancy. *Gastroenterol Clin North Am* 1992;21(4):803-15.
6. Everson GT. Gastrointestinal motility in pregnancy. *Gastroenterol Clin North Am*. 1992; 21(4):751-76.
  7. Friedman GD, Kannel WB, Dawber TR. The epidemiology of gallbladder disease: observations in the Framingham Study. *J Chronic Dis* 1966;19(3):273-92.
  8. Kern FJr, Everson GT. Contraceptive steroids increase cholesterol in bile: mechanisms of action. *J lipid Res* 1987;28(7):828-39.
  9. Mendez-Sanchez N, Chavez-Tapia NC, Uribe M. Pregnancy and gallbladder disease. *Ann Hepatol* 2006;5(3):227-30.
  10. Maringhini A, Ciambra M, Baccelliere P, et al. Biliary sludge and gallstones in pregnancy: incidence, risk factor, and natural history. *Ann Intern Med* 1993;119(2):116-20.
  11. Thijs C, Knipschild P, Leffers P. Pregnancy and gallstone disease: an empiric demonstration of the importance of specification of risk periods. *Am J Epidemiol* 1991;134(2):186-95.
  12. Ramin KD, Ramsey PS. Disease of the gallbladder and pancreas in pregnancy. *Obstet Gynecol Clin North Am* 2001; 28(3):571-80.
  13. Braverman DZ, Johnson ML, Kern FJr. Effects of pregnancy and contraceptive steroids on gallbladder function. *N Eng J Med* 1980;302(7):362-4.
  14. Lynn J, Williams L, O'Brien J, Wittenberg J, Egdahl RH. Effects of estrogen upon bile: implications with respect to gallstone formation. *Ann Surg* 1973;178(4):514-24.
  15. Everson GT, McKinley C, Lawson M, Johnson M, Kern FJr. Gallbladder function in the human female: effect of the ovulatory cycle, pregnancy and contraceptive steroids. *Gastroenterology* 1982;82(4):711-9.
  16. Braverman DZ, Herbet D, Goldstein R, Persitz E, Eylath U, Jacobsohn WZ. Postpartum restoration of pregnancy-induced cholestasis and prolonged intestinal transit time. *J Clin Gastroenterol* 1988;10(6):642-6.
  17. Bolukbas FF, Bolukbas C, Haroz M, et al. Risk factors associated with gallstone and biliary sludge formation during pregnancy. *J Gastroenterol Hepatol* 2006;21(7):1150-3.
  18. Ko CW, Beresford SA, Schulte SJ, Matsumoto AM, Lee SP. Incidence, natural history, and risk factors for biliary sludge and stones during pregnancy. *Hepatology* 2005;41(2):359-65.
  19. de Alba-Quintanilla F, Posadas-Robledo FJ. [Ultrasonic evaluation of the gallbladder during pregnancy][Spanish]. *Ginecol Obstet Mex* 1977;65:39-42.
  20. Chesson RR, Gallup DG, Gibbs RL, Jones BE, Thomas B. Ultrasonographic diagnosis of asymptomatic cholelithiasis in pregnancy. *J Reprod Med* 1985;30(12):920-2.
  21. The epidemiology of gall stone disease in Rome, Italy Part II. Factors associated with the disease. The Rome Group for Epidemiology and Prevention of Cholelithiasis (GREPCO). *Hepatology* 1988;8(4):907-13.

**Suggestion for citation of the above:**

*Saha E, Saha M, Kumar AL, Bain BK, Das J, Peea AJ, Saha D. Prevalence of gallstones and biliary sludge formation during pregnancy detected by ultrasonography. Mediscope 2017;4(2):21-4.*