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Liver, biliary and pancreas

Prevalence of biliary tract disease in India: a sonographic study in adult population in Kashmir

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SUMMARY **Sonography was used to investigate the prevalence of symptomatic and silent biliary tract disease, in free living urban population in Kashmir. A randomly drawn sample of 1695 subjects aged 15 years or above was interviewed by a questionnaire. Twenty six had previous cholecystectomies, all for gall stones. Ultrasonography was carried out on 1104 (65·1%). The responder rates for ultrasonography in men (64·3%) and in women (66·0%) were similar ($p>0·2$). Gall stones were detected in 49 adults. Three of these had previous biliary symptoms. The prevalence of gall stones in adult population was 6·12% (men 3·07% and women 9·6%). The prevalence of gall stones rose with age in both sexes to a peak in the sixth decade prevalence of gall stones was significantly higher in age adjusted parous women than in nullipara. There was no correlation with obesity, diet, or socioeconomic status. Five subjects had sonographic appearances of the worm *Ascaris lumbricodis* in the bile ducts: and had previous biliary symptoms.**

Biliary tract disease is common in developed countries and a frequent indication for abdominal surgery and cholelithiasis is the most important cause of biliary tract disease.[1 2] There is limited information on the prevalence of biliary tract disease in developing countries and it is not known whether biliary tract disease is less frequent or more likely to be asymptomatic. Moreover, ascariasis is as common as gall stone in causation of symptomatic biliary and or pancreatic disease in endemic areas.[3] Pigment stones can form in the biliary tract on dead worms as the nidus. The impact of hepatobiliary helminths on the prevalence of biliary tract disease in the general population is also not known. In this paper, we report on the prevalence of biliary tract disease in urban Kashmir, India. Sonography was used to detect gall stones in the adult population and worms in the biliary tract.

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Methods

SUBJECTS

The city of Srinagar, the summer capital of State of Jammu and Kashmir, India, has seven divisions with a population of 561 050 (Master Plan, Srinagar Development Authority). The study was carried out in division B (north) with a population of 109 667 consisting of 22 zones (51 areas). A randomly drawn sample of nine areas with a population of 1695 adult aged 15 years and over formed material for the present study (Figure).

Each house in these areas was visited by a team consisting of two postgraduate doctors and two health visitors trained in epidemiology and nutrition. All subjects were personally interviewed by the team on a predefined questionnaire. The questionnaire defined personal particulars, habits, parity (women) and medical history including previous surgery. All available previous medical records were assessed. A search for inpatient records was made in those with previous hospitalisation.

All those interviewed, were invited to attend the

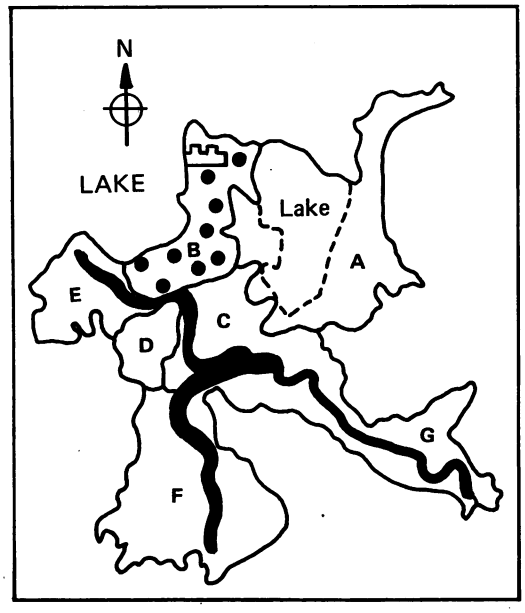

Figure *Sketch map of Srinagar city showing seven divisions. The black dots depict the nine areas surveyed in division B.* |– *Sher-i-Kashmir Institute of Medical Sciences, Soura, Srinagar.* – *Jehlum River.*

Department of Gastroenterology, Sher-i-Kashmir Institute of Medical Sciences, Srinagar, Kashmir, India, to undergo ultrasonographic examination of the upper abdomen. Those who attended the department for ultrasound examination were defined as 'responders' against 'non-responders' who did not accept even after a second invitation.

All ultrasonographic examinations were done by the equipment and the method described earlier.[4] The procedure was carried out by one of the two examiners (MSK, RM). The sonographist was not aware of the clinical status of the persons examined. The diagnosis of gall stones, dilated common bile duct, and biliary ascariasis was established on the basis of the ultrasonographic criteria previously described.[4,5]

Prevalence of gall stones was calculated using the following formula (1):

$$(F) = (D/C^* \times A - B) + B$$

Prevalence (per 100 persons) $= F/A \times 100$

*excluding those with previous cholecystectomy

A = All subjects aged 15 yr or over
B = Number of previous cholecystectomies
C = Number of responders
D = Actual number of cases positive for gall stones on sonography
F = Estimated number of cases with gall stones.

Table 1 *Comparison of age, sex, parity in women, clinical status of responders and non-responders*

	Responders n=1104	*Non-responders n=591*	*Test of significance*	*p Value*
Age				
Mean (1SD)	35·6 (5·8) (yr)	34·9 (7·2)	t	>0·5
Sex				
Men	564 (64·3%)	313	χ^2	>0·2
Women	540 (66·0%)	278		
Parity				
Nulliparous	209 (66·5%)	105	χ^2	>0·5
Parous	331 (65·6%)	173		
Clinical status				
Biliary colic	8	3	χ^2	>0·5
Without biliary symptoms	1096	588		
Previous cholecystectomies	19	7		
Social class				
Upper (rich)	57	29		
Middle (average)	909	454	χ^2	>0·5
Lower (poor)	138	108		

It was presumed that the frequency of gall stone disease would be similar in non-responders and the responders in a defined population, as the age and sex structure, clinical and socio-economic status were comparable in both groups (Table 1).

Body mass index was calculated as weight (kg)/height (M^2).[6] The socio-economic status of an individual was assessed on the basis of modified Kuppuswamy's classification, most widely used method in India and is based on three variables – occupation, education, and monthly income. The population was divided into upper, middle, and lower socio-economic classes.[7,8]

The different parameters were analysed by Students *t* test and individual variables were examined with χ^2 test.

Table 2 *Decadewise distribution of men, women, and total responders*

	Both sexes		*Men*		*Women*	
Age group	*Total*	*Responder (%)*	*Total*	*Responder (%)*	*Total*	*Responder (%)*
15–20	421	241 (57·2)	198	107 (54)	223	124 (55·6)
21–30	570	364 (63·8)	292	193 (66)	278	171 (61·5)
31–40	317	229 (68·4)	164	110 (67)	153	114 (74·5)
41–50	228	156 (68·4)	122	79 (64·7)	106	87 (82·0)
51–60	108	80 (74·0)	69	51 (73·9)	39	29 (74·3)
61 above	51	34 (66·6)	32	24 (75)	19	15 (78·9)
Total	1695	1104 (65·1)	877	564 (64·3)	818	540 (66·0)

Table 3 *Decadewise prevalence of gall stone disease*

Age group	*Men (%)*	*Women (%)*	*Total (%)*
15–20	0	1·97	1·07
21–30	0·75	4·94	2·81
31–40	3·75	15·04	9·45
41–50	5·82	16·48	11·54
51–60	8·10	29·14	15·74
61 above	0	18·66	7·61

This study was approved by the ethical committee of Sher-i-Kashmir Institute of Medical Sciences, Srinagar and the subjects who underwent further investigations gave written consent.

Results

A randomly selected sample of 1695 subjects aged 15 years and over was surveyed. These included 877 men and 818 women with a mean age of 35·2 (6·5). The study population was divided into those with biliary symptoms including biliary colics and acute cholecystitis (11) and those without (1684) as shown in Table 1. Twenty six had previous cholecystectomies, all for gall bladder calculi. Of the defined population, 1104 (65·1%) responded to our invitation for abdominal ultrasonography (Table 2). The responder rates in men (64·3%) and in women (66·0%) were similar ($p>0·2$). Gall stones were detected in 49. Three of these had previous recurrent biliary colic.

PREVALENCE OF GALL STONES

The prevalence of gall stones in the adult population in urban Kashmir was 6·12% (men 3·07%, women 9·6%), and this rose with age in both sexes until a maximum peak was observed in sixth decade of life as shown in Table 3.

The prevalence of gall stones was significantly more ($p<0·05$) in age adjusted parous women (26·7%) compared with nullipara (0·65%). The body mass index was similar ($p>0·05$) in gall stone group (22·4 (3·18) in men, 25·13 (9·3) in women) and no gall stone population (20·54 (3·06) in men, 21·31 (3·92) in women) suggesting that obesity did not appear to be an important risk factor. The total daily calories intake was 2063 (64) in the gall stone group as compared with 2049 (99) in the no gall stone group ($p>0·1$) and similarly, the visible fast content of the diet was 10·5 (1·5) (per cent of total calories per day) in the gall stone group as compared with 10·2 (0·7) in the no gall stone group ($p>0·1$). The prevalence of gall stones was distributed evenly in the different socio-economic strata of population; 7·6% in upper (rich); 6·0% in middle (average); and 5·9% in lower (poor) class ($p>0·5$).

PREVALENCE OF BILIARY ASCARIASIS

Appearances of the worm, *Ascaris lumbricoides* in the biliary tract were seen in five of the 1104 abdominal ultrasonographies performed. All five subjects (two men and three women) were having recurrent biliary symptoms. Three of these patients had previous cholecystectomies for gall bladder calculi and the other two had intact gall bladder. Endoscopic retrograde cholangiopancreatography (ERCP) performed in three of these five subjects confirmed the presence of worms in the bile duct.

CHRONIC PANCREATITIS

In four subjects, the pancreatic duct was dilated more than 3 mm on sonography. In three of these, the pancreatic duct contained structures with acoustic shadowing suggestive of pancreatic calculi. The diagnosis of chronic pancreatitis was confirmed by ERCP in all the four subjects.

Discussion

Most of the gall stone prevalence studies have dealt with cases of autopsy or surgery.[9–14] General population samples have, however, also been used by previous important studies of gall stone prevalence.[1 2 15–19] In the Framingham study, clinically diagnosed cases of gall stones among a random sample of predominantly Caucasians aged 30–62 years were recorded over a 10 year period. No cases of silent gall stones were included. Such data give an underestimate of the true prevalence of gall bladder disease by failure to identify asymptomatic disease.[15] In a South Wales study in Caucasians, prevalence was based on cholecystographic examination of a random sample of 1442 inhabitants aged 45–69 years, giving no idea of gall stone prevalence in population below 45 years of age.[1] Oral cholecystography has also been used to assess the prevalence of gall stones in a small rural canadian community[18 19] and in Pima Indians, a tribe reported to be a high risk of developing gall stones because of a genetic defect.[16] Real time ultrasonography has been used for the diagnosis of gall stone disease in symptomatic and asymptomatic Italian adult female civil servants. That extensive cross sectional study showed the overall prevalence of gall bladder disease as 9·4%. That study included women aged 20–64 years with higher socio-economic class and lower parity than the general population. Therefore, those data could not be extrapolated to prevalence of gall stones in the general population and did not offer actual comparative frequency of gall stones in men and women.[2] Another ultrasonographic study, was carried out in a random sample of 547 urban middle aged women in Malmo, Sweden. That study included two birth cohorts of women aged

48 years and 53 years. The prevalence of gall stones was 11%.[17]

To our knowledge, the present ultrasonographic study is the first of its kind as it reveals the true prevalence of biliary tract disease, both symptomatic and silent, in the free living population. The sample of our study was community based, drawn randomly from the general population and all individuals aged 15 years or over were included. The overall prevalence of gall stones in the present study was 6·12% (3·07% in men at 9·60% in women). There are no data available on the gall stone prevalence in general population in the Indian subcontinent. The prevalence of gall stones in North India in the present study was similar to that recorded in South Wales Caucasians, American Caucasians and Italian adult women.[1 2 15] These observations led us to believe that the paucity of reported gall stone disease in the developing countries may be the result of lack of medical facilities to recognise gall bladder disease in such areas and/or unawareness of asymptomatic disease in the community.

The prevalence of gall stone disease in our study was three times greater in women than in men and increased with age in both sexes. The increase in prevalence in women was steeper with advancing age than in the men, reaching a peak of 29·14% in the sixth decade. These observations are in conformity with most of the previous studies. In high risk populations for gall stones such as Pima Indians, however, the gall stones prevalence rose rapidly to 73% in the women from 25–34 years and remained high in the older age groups. In men, the prevalence rose significantly after age of 44 and reached over 60% in the group from 55 to 64, a rate similar to that in women of the same age.[16] In the South Wales study, the gall stone prevalence did not increase with age in women between 45 and 69 years.[1] Women below 45 years of age, however, were not included to document the prevalence of gall stones in younger age groups. It is possible that in that study a peak incidence of gall stones had been reached at 45 years of age, or below with no subsequent increase with advancing age.

The prevalence of gall stones showed a marked drop in persons above 60 years in our study. This was a surprising finding and remains unexplained. Although the population sample above 60 was small, it could not explain such a drop in prevalence of gall stones. A similar but less striking drop of gall stone prevalence in women was observed by Bainton *et al* in South Wales.[1]

We observed a positive relation of gall stone disease to parity as most of the previous studies have shown.[2 15] Obesity, however, did not appear to be an important risk factor for gall stone prevalence in our population. This observation was confirmed by the data on prevalence of gall stone disease in Pima Indians[16] and in middle aged women of Sweden[17] but in contrast with many other studies.[2 15] This feature may suggest a difference in the mode of pathogenesis of gall stone in our population compared with that in other populations. Lack of relationship of gall stone prevalence with calorie and fat intake and socio-economic status in our population has been as shown by other workers.[15]

The population under study is highly endemic for the intestinal helminth, *Ascaris lumbricoides*. The prevalence of ascariasis in the adult population was 30% according to a recent random survey. Only five subjects had biliary ascariasis, however, and all had clinical symptoms suggestive of biliary disease. None of the asymptomatic subjects had worms documented in the biliary tree. These data suggested that biliary ascariasis was a common cause of symptomatic biliary disease. It did not, however, constitute any proportion of silent biliary disease – a clinical status in which maximal gall stone disease occurred in the community. Similarly, biliary lithiasis secondary to helminth was not seen in any of the subjects. In the hospital based data, biliary lithiasis secondary to helminth constituted 51 of the 402 patients with biliary lithiasis at the Sher-i-Kashmir Institute of Medical Sciences, Srinagar, from December 1982 to March 1987. These stones occurred in the hepatic ducts of patients with acalculous intact gall bladder and histological sections of these soft pigment stones invariably revealed worm segments or fragments as a nidus.[20]

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References

1 Bainton DB, Davies GT, Evans KT, *et al*. Gall bladder disease. Prevalence in South Wales industrial town. *N Engl J Med* 1976; **294:** 1147–9.
2 Rome Group for the Epidemiology and Prevention of Cholelithiasis (GREPCO). Prevalence of gallstone disease in Italian adult female population. *Am J Epidemiol* 1984; **119:** 796–805.
3 Khuroo MS, Zargar SA. Biliary ascariasis: A common cause of biliary and pancreatic disease in an endemic area. *Gastroenterology* 1985; **88:** 418–23.
4 Khuroo MS, Zargar SA, Mahajan R, Bhat RL, Gul Javid. Sonographic appearances in biliary ascariasis. *Gastroenterology* 1987; **93:** 267–72.
5 Bolondi L, Gandolfi L, Labox G. Diagnostic ultrasound in gastroenterology. Padova: Piccin Nuova Libraria, 1984.
6 Khosla T, Lowe CR. Indices of obesity derived from body weight and height. *Br J Prev Soc Med* 1967; **21:** 122–8.

7 Kuppuswamy B. Manual of Socio-economic status scale (urban). Delhi: Manasayan, 1976.
8 Sarin SK, Kapur BML, Tandon RK. Cholesterol and pigment gallstones in Northern India: a prospective analysis. *Dig Dis Sci* 1986; **31:** 1041–5.
9 Malhotra SL. Epidemiological study of cholelithiasis among railroad workers in India with special reference to causation. *Gut* 1968; **9:** 290–5.
10 Ludlow A. Cholelithiasis in the Korean. *Surg Gynecol Obstet* 1930; **50:** 51.
11 Stitnimankarn T. The necropsy incidence of gallstones in Thailand. *Am J Med Sci* 1960; **240:** 349.
12 Kameda H. Gallstone disease in Japan: a report of 812 cases. *Gastroenterology* 1964; **96:** 109.
13 Akute OO, Adekunle OO. Cholelithiasis in Ibadan, Nigeria. *East Afr Med J* 1984; **61:** 45–51.
14 Plant JCD, Percy I, Bates I, *et al*. Incidence of gall bladder disease in Canada, England and France. *Lancet* 1973; ii: 249–51.
15 Friedman GD, Kannel WB, Dawber TR. The epidemiology of gall bladder disease: observations in the Framingham study. *J Chronic Dis* 1966; **19:** 273–92.
16 Sampliner RE, Bennet PH, Comess LJ, *et al*. Gall bladder disease in Pima Indians: Demonstration of high prevalence and early onset by cholecystography. *N Engl J Med* 1970; **283:** 1358–64.
17 Janzon L, Aspelin P, Eriksson S, Hildell J, Trell E, Ostberg H. Ultrasonographic screening for gallstone disease in middle aged women. Detection rate, symptoms and biochemical features. *Scand J Gastroenterol* 1985; **20:** 706–10.
18 Williams CN, Johnson JL, Weldon KLM. Prevalence of gallstones and gall bladder disease in Canadian Micmac Indian women. *Can Med Assoc J* 1977; **117:** 758–60.
19 Willians CN, Johnson JL. Prevalence of gallstones and risk factors in Caucasian women in rural Canadian community. *Can Med Assoc J* 1980; **120:** 664–8.
20 Khuroo MS, Mahajan R, Gul Javid. Bile duct stones secondary to biliary ascariasis. Paper presented in Annual Conference of Indian Society of Gastroenterology held at Bhopal, MP India, Oct 1987.