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EPIDEMIOLOGICAL SURVEY OF BILIARY DISEASES IN SOUTHERN TAIWAN —AN ULTRASONIC STUDY OF 3004 ASYMPTOMATIC SUBJECTS FROM A GENERAL POPULATION—

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Abstract

An epidemiologic survey of the prevalence of biliary diseases was performed by ultrasonic screening of 3004 apparently healthy volunteers who were randomly selected from various areas of Southern Taiwan. Biliary diseases were detected in 120 (3.99%) of 3004 subjects: 74 (2.46%) with gallbladder stones, 9 (0.30%) with gallbladder polyps, 4 (0.13%) with stones of common bile duct, 3 (0.10%) with dilated common bile duct, 2 (0.07%) with pneumobilia, and 28 (0.93%) with intrahepatic stones. The prevalence of gallbladder stones in males (2.26%) and females (2.69%) were similar and the rates increased in parallel with the age. The prevalence of intrahepatic stones in male (0.82%) and female (1.06%) were similar but the disease occurred more frequently in younger patients. There was no relationship between the prevalence of extrahepatic stones (χ^2=3.61, p>0.1) and degree of urbanization (city, town or village). The difference of the prevalences of intrahepatic stones among different subdivisions of the areas was also not significant. (χ^2=0.953, p>0.5). The existence of parasite ova in stool did not affect the prevalence of biliary stones. (χ^2=3.37, p>0.05)

It was concluded that the prevalence of gallbladder stones in Southern Taiwan is smilar to other reports of screening by ultrasound. the prevalence of intrahepatic stones was not as high as the previous studies from surgically resected biliary stones. The occurrence of biliary stones and their relationship with parasite infestation needs further investigation.

Introduction

Gallstone disease is one of the most common diseases of gastrointestinal field. The prevalence of gallstones, however, is usually difficult to identify. Most studies are based on autopsy series[1)2)] or calculated by symptomatic patients[3)]. The prevalence of gallstones in healthy subjects may vary from 9% to 65% in different countries and by different screening methods[1)~4)]. In Taiwan, the studies of gallstone disease are limited to few autopsied statistics[5)6)], surgical investigations[6)~8)], and routine health examinations[9)]. With the introduction of ultrasonography (US), this powerful, noninvasive imaging modality provides better understanding of biliary diseases and is now considered as the best screening tool in the detection of biliary disease[10)]. Epidemiological study of biliary tract disease by US in Taiwan, however, is limited to small focus areas in Taiwan (such as at Kaohsiung[11)] and Taichung[9)], and the sampling methods are usually not well planned and not-randomized[9)11)]. Therefore, we tried to investigate the prevalence of biliary diseases

among inhabitants in Southern Taiwan by ultrasonic examinations with a large-scale and randomized sampling methods. Stool examinations of parasite ova were simultaneously checked in order to investigate their infestation rates and their relationship with biliary tract disease.

Materials and Methods

Designs of Screening Program

From November 1981 to July 1982, 3004 apparently healthy inhabitants in Southern Taiwan were examined in this study. The ages ranged from 10 to 89 years. There were 1592 males and 1412 females. Their age and sex distributions are listed in Table 1. This study was conducted with the collaboration of Yuan's General Hospital in Kaoshiung, Taiwan, and the Institute of Gastroenterology Tokyo Women's Medical College in Japan. Letters explaining the purpose of this study were sent to various health centers, factories, towns, villages and schools etc. A schedule of the survey was planned according to the arrival of reply letters of consent. All the examinees were informed of the results. The subjects were sampled so that the number of subjects in each age group were similar, and the number of males and females would also be as similar as possible. As

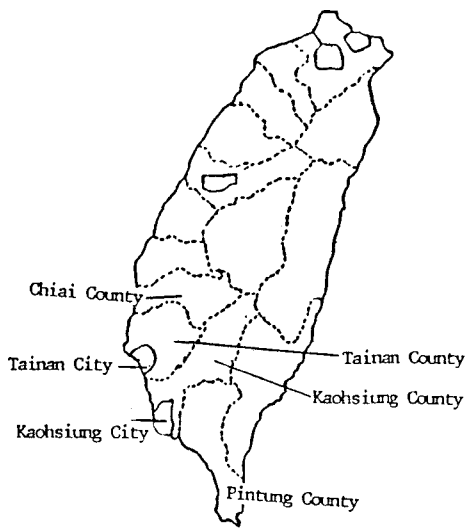

Fig. 1 The material of the survey from these areas according to the official administration divesion in Southern Taiwan was conducted.

Table 1 The age and sex distributions of 3004 subjects screened

Sex / Age(yr)	Male		Female		Total	
	NO.	%	NO.	%	NO.	%
10—19	318	20.0	309	21.9	626	20.8
20—29	200	12.6	342	24.2	542	18.0
30—39	303	19.0	265	18.8	568	18.9
40—49	421	26.4	237	16.8	658	21.9
50—59	237	14.9	161	11.4	398	13.2
>60	113	7.1	99	7.0	212	7.1
Total	1592	100.0	1412	100.0	3004	100.0

Table 2 The geographic distribution of 3004 subjects screened

	Male	Female	Total
Kaohsiung City	427	246	673
Tainan City	222	210	432
Pintung County	348	314	662
Kaohsiung County	236	232	468
Tainan County	174	167	341
Chiai County	185	243	428
Total	1592	1412	3004

Table 3 The distributions of residences of 3004 subjects screened

	Male	Female	Total
City	767	614	1381
Town	564	519	1083
Village	261	279	540
Total	1592	1412	3004

can be seen in Figure 1, the 3004 examinees were evenly distributed in the 6 major areas of Southern Taiwan (Table 2: Kaohsiung City, Tainan City, Pintung County, Kaohsiung County, Tainan County and Chiai County) and the residences of all inhabitants were subgrouped into city, town, and village (Table 3) according to the official administration division in Southern Taiwan (Fig. 1).

Ultrasonic Survey

Ultrasonic examinations were conducted by 8 well-trained ultrasonographists. The picutres of abnormal US findings were taken by polaroid camera and interpreted by two different ultra-

sonographists. All subjects were asked to fast overnight before US examination and informed to visit Yuan's General Hospital of further confirmation if there were any abnormalities. A commercially available real-time US scanner (Toshiba, 22A type) with a 3.5 MHz transducer was used for US examination. The diagnostic criteria of gallbladder stones by US were one or several high-echo spots with acoustic shadow in the gallbladder or a contracted gallbladder filled with high-echo spots. Gallbladder polyps were diagnosed when one or several high-echo spots without acoustic shadow were found in the gallbladder and the lesions were not moving after position changes. Dilatation of the common bile duct was diagnosed when the diameter of bile duct just ventral to the bifurcation of the right portal branch exceeded 4 mm by right intercostal scanning. Stones of the common bile duct were diagnosed when there are high-echo spots with or without acoustic shadow in the common bile duct. Intrahepatic stones were diagnosed by US demonstration of high-echo spots with acoustic shadows in the intrahepatic ducts, which may or may not be dilated. Pneumobilia was diagnosed by the linear high-echo lesions with acoustic shadow which accumulated in the caphalic side when examinee was asked to sit upright.

Parasite Examination

All examinees were informed to collect fresh stool specimen before examination. Parasite ova were checked in detail on the slides by light microscopy.

Statistical Methods

The Chi-square test was used in statistics analysis. A p value less than 0.05 was considered as statisticuly significant.

Result

Biliary Diseases Screened by US

Of 3004 examinees, 120 (3.99%) had biliary diseases. They consisted of 74 (2.46%) with gallbladder stones, 9 (0.3%) with gallbladder polyps, 4 (0.13%) with stones of common bile duct, 3 (0.1%) with dilatation of common bile duct, 2 (0.07%) with pneumobilia, and 28 (0.93%) with intrahepatic stones. Among 28 intrahepatic stones, there were 24 (85.7%) on the right side and 4 (14.3%) on the left side. As shown in Fig. 2 the overall prevalence of gallbladder stones in males

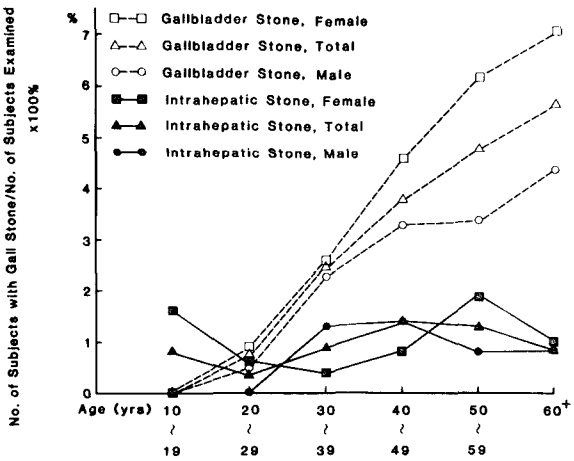

Fig. 2

Table 4 The prevalences of in trahepatic and extrahepatic stones in different geographic areas

	NO. screened	Extrahepatic stones*		Intrahepatic stones	
		NO.	%	NO.	%
Kaohsiung City	673	10	1.49	4	0.59
Tainan City	432	10	2.31	5	1.16
Pintung County	662	10	1.51	7	1.06
Kaohsiung County	468	19	4.06	4	0.85
Tainan County	341	3	0.88	0	0
Chiai County	428	26	6.07	7	1.64
Total	3004	78	2.60	28	0.93

*Including gallstones and common bile duct stones

Table 5 The distribution of extrahepatic stones

	Extrahepatic stones		Total
	+	−	
City	35	1346	1381
Town	23	1060	1083
Village	20	520	540
Total	78	2926	3004

*Including gallbladder stones and common bile duct stones ($\chi^2_2=3.61$, $p>0.1$)

Table 6 The distribution of intrahepatic stones

	Intrahepatic stones		Total
	+	−	
City	12	1369	1381
Town	9	1074	1083
Village	7	533	540
Total	28	2976	3004

$X^2_2=0.95$, $p>0.5$

(2.26%) was similar to that of females (2.69%). Nevertheless, the sexual difference of the prevalences of gallbladder stones became significant as the age became older. The old females had higher prevalence of gallbladder stones than old males. The overall prevalence of intrahepatic stones in males (0.82%) was also similar with that of females (1.06%) while the disease tended to be reduced in the older group. According to the geographic distribution, the prevalence of extrahepatic stones, including gallbladder stones and stones of common bile duct, was 2.6% (78/3004). The prevalence was highest at Chiai County (6.07%) and lowest at Tainan County (0.88%) (Table 4). The prevalence of intrahepatic stones was highest at Chiai County (1.64%) with an overall average prevalence of 0.93% (28/3004) (Table 4).

As shown in Table 5, there was no statistically significant different of the prevalences of extrahepatic stones among city, town, and village ($\chi^2_2=3.61$, $p>0.1$). The some result was obtaind in the prevalences of the intrahepatic stones ($\chi^2_2=0.95$, $p>0.5$) (Table 6).

Parasite Infestation and Biliary Diseases

In Table 7, parasite ova were found in 45 (1.76%)

Table 7 Parasital infestations in 2554 subjected screened

Parasites	Male (N=1381)		Female (N=1173)		Total (N=2554)	
	NO.	%	NO.	%	NO.	%
Ascaris	4	0.29	5	0.43	9	0.35
Ancylostoma	1	0.07	0	0	1	0.04
Trichura	1	0.07	2	0.17	3	0.12
Ehterobius	11	0.80	9	0.77	20	0.78
Clonorchis	8	0.58	4	0.34	12	0.47
Total	25	1.81	20	1.71	45	1.76

Table 8 The relationship between cholelithiasis and parasital infestation (2554 cases)

Parasital infestation	Cholelithiasis*		Total
	+	−	
yes	4	41	45
no	102	2407	2509
Total	106	2448	2554

*Including gallstones, common bile stones, and intrahepatic stones ($X^2_2=3.37$, $p>0.05$)

out of 2554 examinee. Enterobius (0.78%) and clonorchis (0.47%) were the two leading causes of parasite infestation. There was no sexual difference. The relationship between parasital infestation and biliary disease were shown in Table 8. There is no statististically significant relationship ($\chi^2_2=3.37$, $p>0.05$) between the parasital infestation and occurrence of biliary diseases.

Discussion

Biliary diseases, especially gallstone diseases are common in clinical practice. However, the prevalence of gallstones varies because of different methods of investigations[1)~9)12)]. The prevalence of gallbladder stones was reported to be 16.6% in the necropsy series by Bateson and Bouchier[1)] on 1975. In Japan, the incidence of gallstones in the necropsied cases was reported to be 3.1% in 1913, 4.4% in 1961, and 8.3% in 1967[12)]. In Taiwan, the first epidemiologic study of gallstones was reported by Hsu et al. in 1979[6)]. They reviewed 5154 autopsied cases of National Taiwan University Hospital from 1943 to 1977. There were 85 (1.65%) subjects having gallstones. Among

them, gallstones were found in 80 (6.8%) of 1241 cases older than 20. On 1984, 165 (6.8%) out of 2845 examinee in the Department of Health Examination of Veteran General Hospital in Taichung were reported to have gallstones by oral cholecystography[9]. Ker et al.[11] in 1984 reported that the prevalence of gallstones in the Kaohsiung area was 2.2% by means of US survey of 1166 apparently healthy subjects. In this study, we screened 3004 inhabitants of Southern Taiwan under a randomized sampling schedule which included nearly equal distribution in sex and ages. The sampling method made it possible to reflect the real prevalence of biliary diseases in Southern Taiwan. The prevalence of gallstones including gallbladder stones, stones of common bile duct, and intrahepatic stones, in this study were 3.53% (106/3004). The result was slightly higher than that of Ker et al.[11] but lower than that of Hsu et al.[6] and Yeh et al.[9] The difference may result from different age composition in each series. Subjects receiving routine physical examination were usually the aged and autopsied subjects and may not be compatible with asymptomatic general population. Besides, the study of prevalence of gallstoens from surgical materials can only reflect the incidence in symptomatic patients. However, our result is slightly less than that of Japan (5% by US survey)[12] and Western countries (7.5% to 11% by US survey)[4]. In the meanwhile, the distribution of gallstones in our series was also different from that of Japan and Western countries. Gallbladder was usually the major location of stones in all countries. Nevertheless, intrahepatic stone was quite rare in the Western countries as well as in Japan. The prevalence of intrahepatic stones in the autopsied cases of Sweden was reported as low as 0.23%[2] (5/2218), however in our study the prevalence was 0.93% (28/3004). The reason of high prevalence of intrahepatic stones in Southern Taiwan is still unknown although parasital infestation are proposed. The percentile of intrahepatic stones in all surgical resected gallstones varied from 52.9%[5] to 48.9%[9]. But our study revealed a lower ratio (26.4%, 28 in 106) of intrahepatic stones among all gallstones. This may also result from different study materials. Patients with intrahepatic stones usually had repeated cholangitis and were younger. Therefore, they tended to seek medical or surgical treatment earlier. On the contrary, many patients with gallbladder stones were asymptomatic and older. Thus operation may be not performed due to absence of symptoms and old age. Therefore, analysis of the percentile of intrahepatic stones by surgical materials will mislead us to a much higher prevalence of intrahepatic stones.

The choice of US as the screening tool rahter than oral cholecystography was based on the following advantages[13)~15)]: (1) no risks to iodide hypersensitivity, (2) no irradiation hazards to examinee, (3) more convenient in outdoors survey by portable machine, and (4) higher diagnostic power than oral cholecystography. The sensitivity of US was 91 to 95%[10)13)] while the specificity was 95 to 99%[14)15)]. Nevertheless, some disadvantages, such as interobservor variation and gaseous interference in the lower common bile duct still existed. These may need the supplement of other imaging modalities.

Intrahepatic stones frequently occurred in the inhibitants of rural areas, especially with poor hygiene and high parasital infestation[16]. Our study disclosed that the prevalences of intra- and extra-hepatic stones were not different in the urban and rural areas. This may be due to large-scale immigration of people from the rural village to the town and city, which made the life styles between rural and urban areas became closer. Therefore, no statistical difference can be obtained by this subdivision. There was also no statistically significant difference between the occurrence of gallstones and parasite infestation. The predominant parasite in our study was enterobius rather than ascaris and clonorchis which were thought to be highly associated with the formation of gallstones[16]. With accumulation of more data the interrelationship between the parasital infestation and occurrence of gallstones may be elucidated.

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