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Knowledge, attitude, and behaviors toward liver health and viral hepatitis-related liver diseases in Thailand

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Abstract

This study aimed to quantify and evaluate the knowledge and awareness toward liver health and diseases as well as explore the attitudes and knowledge toward screening, diagnosis, and treatment of liver disease among the Thai population.

This is a cross-sectional, self-reported and web-based questionnaire study. Awareness, perceptions and attitudes toward liver-related health and diseases as well as screening, diagnosis and treatment of liver diseases were assessed among 500 Thai adults.

Respondents were mostly ≥35 years (62.0%) and females (52.0%). While there was an overall awareness regarding viral hepatitis as the main etiology of liver failure/cancer, respondents expressed misperceptions that hint at social stigmatization or discrimination toward infected individuals. A significant proportion lacked knowledge of liver screening tests and relevant diagnostic tests for viral hepatitis-related liver diseases. Screening or treatment costs and perception of being healthy were among reasons for not seeking medical consultation when exposed to risk factors or diagnosed. Treatment practices of hepatitis included prescription medication (59.1%), functional foods (51.8%) and traditional treatment (28.2%). Multivariate analysis identified income, recent health screening status and being diagnosed with liver disease(s) as significant predictors of the knowledge, attitude, and behaviors of the Thai population toward liver diseases.

This study highlighted a degree of misperception and lack of in-depth understanding toward hepatitis-related liver diseases including poor attitudes and knowledge toward screening, diagnosis, and treatment of liver diseases. Factors identified suggest an unmet need to encourage proactive health-seeking behaviors to reduce transmission risks of hepatitis-related liver diseases within the community.

Abbreviations: CHB = chronic hepatitis B, CHC = chronic hepatitis C, EPI = expanded program of immunization, HBsAg = hepatitis B surface antigen, HBV = hepatitis B virus, HCV = hepatitis C virus, HIV = human immunodeficiency virus, SSS = social security scheme.

Keywords: attitudes, behaviors, hepatitis, knowledge, liver diseases

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This study is part of a broader regional liver index study conducted in Hong Kong, India, Indonesia, Malaysia, Pakistan, Philippines, Singapore, South Korea, Taiwan, Thailand, Vietnam, and administered centrally. As such, the protocol and questionnaire (#20-KANT-214) were submitted to Pearl Institutional Review Board (Indianapolis, Indiana, USA) for exemption determination in accordance with FDA 21 CFR 56.104 and DHHS 45 CFR 46.104 regulations. It was determined to be "Exempt for the life of the study" before the study was implemented. This online survey is deemed noninterventional and online informed consent was obtained from all participants included in the study.

This study has not been published, in part or in full, in any form.

Competing interests: BLN is an employee of Gilead Sciences. SS is an employee of Cerner Enviza. PP and TT declare no competing interests.

The authors have no conflicts of interest to disclose.

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The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

All data generated or analyzed during this study are included in this published article [and its supplementary information files].

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1. Introduction

Viral hepatitis is a predominant etiology of liver cirrhosis and/or liver cancer and is considered a major global public health threat. Approximately 325 million individuals globally have been infected with viral hepatitis B (HBV) and/or C (HCV).[1] In Thailand, the prevalence of HBV and HCV infections among the general public between 2014–2015 was estimated at 5.1% and 0.94%, respectively.[2,3] Among liver cancer patients cases in Thailand, 49.8% were attributed to chronic hepatitis B (CHB) infection while a lesser proportion was due to chronic hepatitis C (CHC) infection.[4]

The Department of Disease Control of the Ministry of Public Health, Thailand implemented HBV vaccination into the Expanded Program of Immunization (EPI) in 1988, with a nationwide roll-out in 1992.[5] Timely administration of HBV vaccine within the first year of life had markedly reduced the prevalence among children aged 5 years and younger to 0.1% in Thailand.[5] A population-based screening program to detect HBV in pregnant women was introduced to identify and treat hepatitis B surface antigen (HBsAg) seropositive mothers, successfully reducing mother-to-child transmission of HBV.[5] A 2016 study revealed that seroprevalence of HBsAg was significantly lower among individuals who were born after the inclusion of HBV vaccine into the EPI than those who were born before (HBsAg: 0.6% vs 4.5%).[6] Mandatory screening was also undertaken by the National Blood Center, Thailand, to screen all new blood donors for HCV. The national survey found an approximate 50% decline in HCV viremia in 2014 compared to 2004, whereby the HCV prevalence rate in 2014 was 0.96% vs 2.15% in 2004.[2,7] The advent of HCV treatment regimens such as direct acting antivirals (DAAs) also reportedly resulted in a significant reduction in HCV global incidence and associated complications.[8,9] The introduction of these regimens, especially interferon-free DAAs regimen, as part of Thailand's Universal Health Care's benefit package[10] together with an increased awareness and precautionary measures against blood-borne pathogens such as human immunodeficiency virus (HIV) and changes in intravenous drug use-oral illicit methamphetamine usage[2,11] could potentially contribute to the nation's decreasing HCV prevalence.

Despite successful reduction in age-standardized incidence rates of hepatitis-related liver cancer in Thailand, studies showed there is an age-dependent association of viral hepatitis seropositivity.[2,6,12] The seroprevalence of HBV and HCV in Thailand was higher among older adults (aged 31–60 years) than younger adults (≤30 years).[12] Moreover, incidences of liver cirrhosis and/or liver cancer due to CHB and CHC were more common among middle-aged to older adults and these individuals were typically diagnosed at advanced stages of the disease.[13–15] As individuals afflicted with viral hepatitis-related liver diseases are generally asymptomatic, a large proportion of these individuals are unaware and tend to go undiagnosed until presented at advanced disease stages.[16] This potentially suggests that access to treatment and effective prevention is strongly influenced by public awareness and knowledge toward diagnosis and treatment as well as the nation's priority on the health policy agenda.

However, there had been limited research exploring the knowledge, attitude, and behavior among the Thai population toward hepatitis-related liver diseases. Therefore, this study sought to quantify and evaluate the level of knowledge and awareness among the local community toward liver health and liver diseases, not limited to but including viral hepatitis. This study also sought to explore the attitudes and knowledge of the Thai population toward screening, diagnosis and treatment of liver diseases as well as identify factors associated with the knowledge, attitude, and behavior toward liver health and hepatitis-related liver diseases.

2. Methods

2.1. Study population

Eligible respondents, at least 18 years and had provided informed online consent and able to read English or Thai, were invited via email by a web-based consumer panel to participate in a web survey. There were no exclusion criteria. The email invitations were continuously sent out over a 3-week period in February 2020 until a sample quota of 500 was achieved. A sampling frame based on the age and gender distribution in Thailand was applied to the recruitment process of eligible respondents. Responses from 500 adult individuals were deemed sufficient to provide a descriptive estimate of 4.33% margin of error, assuming 95% confidence interval and 50% response distribution.

2.2. Study design

Awareness, perceptions, and attitudes toward overall liver health and liver diseases were explored using a self-reported survey, as part of a regional liver index study of 11 countries/territories (Hong Kong, India, Indonesia, Malaysia, Pakistan, Philippines, Singapore, South Korea, Taiwan, Thailand, Vietnam). A steering committee comprising of gastroenterologists and/or hepatologists from the 11 countries/territories reviewed and finalized the developed questionnaire (*Lee Mei-Hsuan et al, unpublished data*). The 30-minute survey questionnaire was developed in English and translated into local language(s), that is, Thai, for respondents in Thailand. The translation was validated by a linguist who is a native speaker of the language.

Herein, this study reports the responses from eligible Thai respondents, whereby all respondents completed the questionnaire in either English or Thai. Only de-identified data was collected. The protocol and questionnaire for the study (#20-KANT-214) were reviewed for exemption by the Pearl Institutional Review Board (IRB) as part of a regional liver index study (*Lee Mei-Hsuan et al, unpublished data*) and was determined to be exempted from IRB review for the periods of which the data is used in the current study. This online survey is deemed noninterventional and online informed consent was obtained from all participants included in the study.

To understand if being born before or after the implementation of HBV vaccination into the EPI would affect the respondents' knowledge toward hepatitis B, the study population was further categorized into 2 subgroups – individuals born before EPI inclusion (≥25 years), and individuals born after EPI inclusion (<25 years).

2.3. Survey questionnaire and Liver index

The questionnaire in this study (Appendix, Supplemental Digital Content, http://links.lww.com/MD2/A772) comprised of 25 questions from the regional liver index study (*Lee Mei-Hsuan et al, unpublished data*) and 6 additional questions specific to the Thai community. The internal consistency of the 25 questions

from the regional liver index study were assessed by Cronbach alpha (alpha > 0.7) and were used to develop the overall liver index (*Lee Mei-Hsuan et al, unpublished data*).

The overall liver index was developed as a tool to monitor gaps in knowledge and awareness of liver diseases as well as the attitude toward liver disease prevention, screening, diagnosis, and treatment. The liver index consisted of 2 sectional liver indices measuring the knowledge and awareness of liver health and diseases (Section 1 liver index; Q1–Q14), and the attitude of the respondents toward screening, diagnosis and treatment (Section 2 liver index; Q15–Q25) (*Lee Mei-Hsuan et al, unpublished data*).

The additional Thailand-specific questions (Q26-Q31, Appendix, http://links.lww.com/MD2/A772) pertained to the attitudes and awareness of the Thai community toward the treatment of liver diseases and the national HBV vaccination program.

2.4. Statistical analysis

Descriptive analysis of respondents' characteristics and responses of the liver index and survey questions were summarized and presented as texts, tables and charts in frequencies and percentages.

Logistic regression was performed to examine the association of the respondents' characteristics with the overall and sectional liver indices. The respondents' characteristics included age, gender, education, household income, self-reported ever-been diagnosed with liver disease, health-screening status within recent 2 years and medical insurance status. Variables with $P < .25$ in the bivariable logistic regression analysis were considered in the multivariable logistic regression mode. Adjusted odds ratio with 95% confidence intervals (CI) and *P*-values were reported.

Chi-square/Fisher exact tests were conducted to investigate if being born before or after implementation of HBV vaccine into the EPI affected hepatitis B knowledge of respondents. One-way ANOVA tests were performed to examine the association of the overall and sectional liver indices with being diagnosed with hepatitis B or hepatitis C or other liver disease(s). The statistical significance was assessed at $P < .05$. Data analyses were conducted by R version 3.6.1.

Data missing was at random, and all data were reported. Missing data to any question would only be excluded from that respective question instead of the whole study.

3. Results

Thailand had an overall liver index score of 63.1 out of a 0–100-point scale as compared to the regional mean of 62.4 (*Lee Mei-Hsuan et al, unpublished data*). Among the countries/territories, Thailand was ranked 5th in the region with Vietnam, Taiwan, Indonesia, and Pakistan having better liver index scores.

3.1. Participants' characteristics

The respondents' age was evenly distributed with 62.0% aged 35 years and older. The gender distribution of the respondents was 48.0% male and 52.0% female. Majority of the respondents (78.4%) had completed at least university education and 46.4% had a household income of 50,000 Baht (~US$1661 [note: 1 Baht = US$0.03322; based on Thai Baht to US$ exchange rate on December 15, 2020][17]). A small proportion of respondents (7.8%) did not have any form of medical insurance (private or public). More than two-thirds (69.6%) self-reported having attended health screening within the recent 2 years (Table 1).

Table 1

Characteristics of respondents (n = 500).

	Number of respondents	
	N	%
Age group		
<25	90	18.0
25–34	100	20.0
35–44	100	20.0
45–54	110	22.0
≥55	100	20.0
Gender		
Male	240	48.0
Female	260	52.0
Level of education		
Primary school	8	1.6
Secondary school	87	17.4
Polytechnic	5	1.0
Vocational certificate	8	1.6
University	348	69.6
Postgraduate	44	8.8
Household income		
Under 18,000 Baht	36	7.2
18,001–24,000 Baht	41	8.2
24,001–35,000 Baht	66	13.2
35,001–50,000 Baht	120	24.0
50,001–70,000 Baht	123	24.6
70,001–160,000 Baht	86	17.2
Above 160,000 Baht	23	4.6
Declined to answer	5	1.0
Medical insurance*		
Private insurance – self pay	278	55.6
Private–corporate insurance	168	33.6
Public insurance [eg, national or subsidized]	318	63.6
Government employee insurance	2	0.4
None of the above	39	7.8
Self-reported last health screening within 2 yr		
Yes	348	69.6
No	152	30.4

Distribution of participants according to age, gender, education level, household income, medical insurance, and recent 2-yr health screening status.

1 Baht = US$ 0.03322.

* Each respondent could have more than 1 medical insurance attribute

3.2. Knowledge and awareness of liver-related health and diseases

At least 70% were aware that the liver is involved in the digestion, detoxification of the body and storage of vitamins and minerals. About 4 in 10 individuals were not aware that liver is involved in normal growth and health as well as blood clotting. At least 90% of the respondents recognized that eating a balanced diet, having quality sleep, getting vaccinated, going for regular screening, and exercising regularly were ways to protect and maintain their liver health (Table S1, Supplemental Digital Content, http://links.lww.com/MD2/A766).

Many were aware that long-term injury of the liver would lead to fibrosis (69.5%), cirrhosis is the final stage of liver scarring and could have a detrimental effect on the health (70.6%), hepatitis is an inflammation of the liver (72.0%), and liver cirrhosis can lead to complications including liver failure, cancer or death (93.8%). Although 71.0% knew liver fibrosis/cirrhosis is a key determi-

nant of liver-related disease progression and mortality, 63.6% were unaware of the various stages of liver scarring or fibrosis (Table S2, Supplemental Digital Content, http://links.lww.com/MD2/A767).

3.3. Knowledge and awareness of viral hepatitis B and C

Among the respondents, about one-quarter did not know that viral hepatitis is one of the key causes of liver failure in the world (24.6%) or that chronic viral hepatitis can cause liver cancer (27.6%) (Table S2, Supplemental Digital Content, http://links.lww.com/MD2/A767).

A higher proportion indicated being aware of HBV (408/500, 81.6%) than HCV (99/500, 19.8%) (Table 2). Majority (>80% consensus) agreed that hepatitis B and C could cause liver inflammation, liver failure and increase the risks of developing liver cirrhosis and cancer. However, respondents had the misperceptions that HBV or HCV is a bacterial infection (HBV: 49.5%, HCV: 46.5%), airborne (32.6%, 42.4%) or hereditary (40.4%, 48.5%). In addition, close to one-fifth of the respondents had expressed uncertainty ("Not sure" responses) to the statements asked in the survey. Majority (73%) were aware hepatitis B can be prevented by vaccination, however, only 9.1% rightly identified that hepatitis C is not preventable by vaccine (Table 2).

About 6 in 10 were aware that contact with an open wound, sharing nonsterile needles or needlestick injuries, perinatal transmission, sharing of razors and toothbrushes, tattoos or body piercing, or receiving blood products before 1990s were some of the transmission risks of HBV and HCV. Less respondents who were aware of HBV (42.4%) had rightly recognized sexual intercourse as a transmission mode compared to those aware of HCV (60.6%). More than half were aware that touching an infected person or mosquito bites are not transmission modes of hepatitis B and C. Less than one-quarter knew that HBV and HCV are not transmissible by the fecal–oral route, eating contaminated or raw seafood or dining with an infected person (Table 2).

3.4. Attitude and behaviors toward screening and diagnosis of liver diseases

At least 1 in 2 respondents indicated their likelihood to seek doctor's consultation or screening for hepatitis if they were pricked accidentally by a used needle (52.7%), getting tattooed or body piercing from a place with low infection control standards

Table 2

Knowledge of the features and transmission risks of hepatitis B and C.

	N, %											
	Hepatitis B (N = 408)						Hepatitis C (N = 99)					
Question (correct response)	**Agree**		**Disagree**		**Not sure**		**Agree**		**Disagree**		**Not sure**	
Hepatitis . . .												
is a bacterial infection (disagree)	202	49.5%	112	27.5%	94	23.0%	46	46.5%	33	33.3%	20	20.2%
is a viral infection (agree)	307	75.2%	43	10.5%	58	14.2%	81	81.8%	9	9.1%	9	9.1%
can cause chronic inflammation of the liver (agree)	361	88.5%	11	2.7%	36	8.8%	92	92.9%	3	3.0%	4	4.0%
can cause liver failure (agree)	343	84.1%	14	3.4%	51	12.5%	88	88.9%	5	5.1%	6	6.1%
can be prevented by vaccination (agree for hepatitis B; disagree for hepatitis C)	298	73.0%	35	8.6%	75	18.4%	78	78.8%	9	9.1%	12	12.1%
is airborne (disagree)	133	32.6%	196	48.0%	79	19.4%	42	42.4%	43	43.4%	14	14.1%
is hereditary (disagree)	165	40.4%	154	37.7%	89	21.8%	48	48.5%	38	38.4%	13	13.1%
increases the risk of the development of liver cirrhosis and cancer (agree)	356	87.3%	15	3.7%	37	9.1%	88	88.9%	7	7.1%	4	4.0%
Hepatitis . . . can be transmitted . . .	**Agree**		**Disagree**		**Not sure**		**Agree**		**Disagree**		**Not sure**	
a. By touching an infected person (disagree)	82	20.1%	280	68.6%	46	11.3%	26	26.3%	65	65.7%	8	8.1%
b. Through sexual intercourse (agree)	173	42.4%	190	46.6%	45	11.0%	60	60.6%	29	29.3%	10	10.1%
c. Through blood, for example, contact with an open wound (agree)	257	63.0%	95	23.3%	56	13.7%	81	81.8%	9	9.1%	9	9.1%
d. By sharing nonsterile needles or through needlestick injuries (agree)	289	70.8%	67	16.4%	52	12.7%	84	84.8%	8	8.1%	7	7.1%
e. Fecal–oral route usually through contaminated food, for example, an infected person forgets to properly wash hands after using toilet and contaminate the food (disagree)	249	61.0%	78	19.1%	81	19.9%	69	69.7%	17	17.2%	13	13.1%
f. From pregnant mother to her baby at birth (agree)	256	62.7%	58	14.2%	94	23.0%	69	69.7%	16	16.2%	14	14.1%
g. By sharing of razors, toothbrushes (agree)	239	58.6%	93	22.8%	76	18.6%	73	73.7%	17	17.2%	9	9.1%
h. By receiving tattoos, body piercing from settings with poor infection control standards (agree)	279	68.4%	72	17.6%	57	14.0%	79	79.8%	11	11.1%	9	9.1%
i. By eating contaminated or raw seafood, for example, shellfish (disagree)	241	59.1%	87	21.3%	80	19.6%	54	54.5%	25	25.3%	20	20.2%
j. Having received blood (products) before around 1990s (agree)	250	61.3%	50	12.3%	108	26.5%	64	64.6%	16	16.2%	19	19.2%
k. Having received long-term kidney dialysis (agree)	156	38.2%	109	26.7%	143	35.0%	47	47.5%	32	32.3%	20	20.2%
l. By mosquito bites (disagree)	79	19.4%	218	53.4%	111	27.2%	26	26.3%	60	60.6%	13	13.1%
m. By dining together (eg, sharing food) with an infected person (disagree)	230	56.4%	104	25.5%	74	18.1%	60	60.6%	24	24.2%	15	15.2%

Proportion of respondents who had indicated "agree", "disagree" or "not sure" to the characteristics and the transmission risks of hepatitis B and C. The correct responses for each statement were indicated in the brackets.

Only respondents who have indicated having heard of hepatitis B (408/500) or hepatitis C (99/500) responded to the above statements.

Table 3

Reasons for not attending health screening or receiving treatment from a hospital/clinic.

Question (correct response)		
Here are several reasons people have given for not attending health screening tests. Which of the following applies to you? [Multiple answers] (N = 59)	**N, %**	
Do not see a reason for going for health screenings tests since they feel they are healthy	32	54.2%
The doctor did not recommend health screening tests	11	18.6%
Health screenings tests are expensive	21	35.6%
Health screening tests are not routine	12	20.3%
Going for health screening tests is a hassle due to busy schedule	16	27.1%
Health insurance does not cover screening	14	23.7%
Fear of discrimination at workplace or socially if diagnosed with a disease, for example, HIV, cancer, mental illness, hepatitis etc during health screening	5	8.5%
Thinking of the more recent liver condition you have been diagnosed with, when did you start treating your condition after diagnosis? (N = 152)	**N, %**	
Right after diagnosis	73	48.0
1–2 mo	29	19.1
3–6 mo	14	9.2
<6 mo	20	13.2
Never had a treatment	16	10.5

	N, %					
Others also mentioned that these are the reasons for not receiving treatment from a hospital/clinic. Which of the following statements applies to you? [Multiple answers] (N = 45)	**Agree**		**Disagree**		**Not sure**	
Prescription treatment was too expensive	33	73.3%	9	20.0%	3	6.7%
Did not believe in Western medicine	18	40.0%	22	48.9%	5	11.1%
Did not believe that the condition was life-threatening	20	44.4%	20	44.4%	5	11.1%
Was hesitant because of the side-effects	28	62.2%	15	33.3%	2	4.4%
Was hesitant because it would disrupt normal life	19	42.2%	13	28.9%	13	28.9%
Doctor did not prescribe any treatment	22	48.9%	16	35.6%	7	15.6%
Doctor was not able to explain the treatment plan clearly	21	46.7%	19	42.2%	5	11.1%
Prescription medicine was not available in our area	22	48.9%	16	35.6%	7	15.6%
Was unable to receive treatment because of lack of insurance or being underinsured	23	51.1%	17	37.8%	5	11.1%
Doctor recommends observation and follow up without initiating treatment	27	60.0%	16	35.6%	2	4.4%

Reasons perceived by respondents who had not attended health screening as well as the proportion of respondents who had not received treatment from a hospital/clinic for their conditions and the reasons for their behavior.

Respondents who indicated not attending health screening, ever-diagnosed with liver disease(s), or never received treatment form hospital/clinic were directed to answer the above statements.

(70.4%), planning to get or are pregnant (89.3%), having unprotected sex with multiple partners (81.3%), or on long-term kidney dialysis (63.9%) (Figure S1, Supplemental Digital Content, http://links.lww.com/MD2/A771).

More than half were aware that elevated liver enzymes aspartate aminotransferase/alanine aminotransferase (AST/ALT) levels could indicate liver infection (56.0%) or liver damage (61.4%) or risks of liver cancer (62.8%). The specific diagnostic tests for HBV and HCV were correctly identified by 39.2% and 54.6% of the respondents respectively (Table S3, Supplemental Digital Content, http://links.lww.com/MD2/A768).

Reasons such as "they feel they are healthy" and "health screening tests are expensive" are commonly indicated by 54.6% and 35.6% of respondents who did not attend health screening, respectively (Table 3).

3.5. Respondent's and physician's interaction regarding attitudes and behaviors toward treatment of liver diseases

Among individuals who self-reported ever-been diagnosed with liver diseases, 76.3% sought treatment within 6 months of diagnosis while 10.5% never had a treatment. The commonest reasons for not seeking treatment in a hospital or clinic included "prescription treatment was too expensive" (73.3%), "hesitant because of the side-effects" (62.2%), and "doctor recommends observation and follow up without initiating treatment" (60.0%) (Table 3).

Only 59.1% of respondents diagnosed with hepatitis had received doctor's prescription medicine from a hospital or a clinic. In contrast, 51.8% relied on functional foods (foods fortified with vitamins and/or minerals) and 33.6% relied on over-the-counter products. At least one-quarter (28.2%) sought treatment in the forms of herbal products or homeopathy (Fig. 1A).

Interestingly, 67.8% indicated that their doctors had mentioned the association between viral hepatitis and liver cancer, and about half received educational materials from their doctors to facilitate their understanding (Fig. 1B).

3.6. Impact of 1992 hepatitis B vaccine inclusion into EPI

There were no significant differences in terms of responses toward knowledge of vaccination for HBV and HCV, the

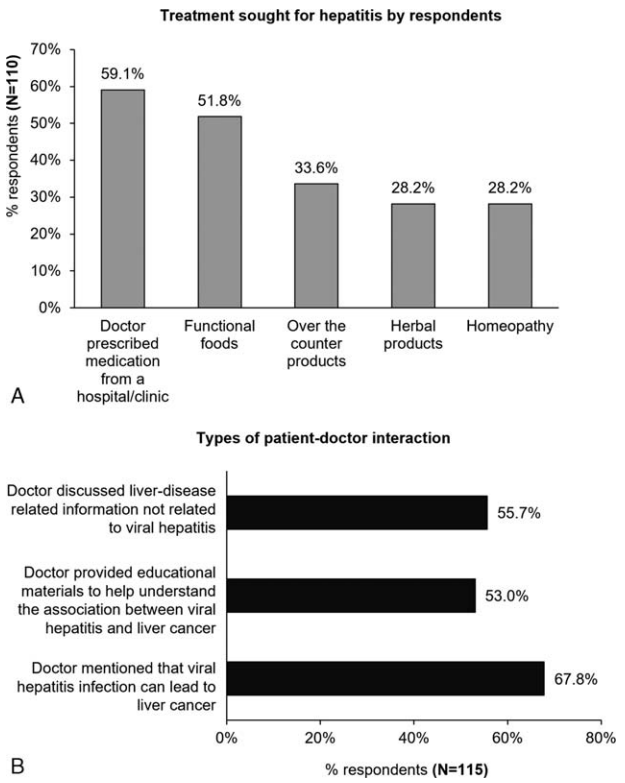

Figure 1. Respondents-physician interaction regarding seeking treatment or health-related information for hepatitis-related liver diseases. (A) Types of treatment sought for hepatitis by respondents who had been diagnosed with hepatitis. (B) Types of information shared by doctors to their patients regarding liver diseases, including but not limited to hepatitis.

awareness of the Thai HBV vaccination program and World Health Organization eradication goal as well as the proportion of self-reported health screening attendance between individuals aged <25 years (individuals born after EPI) and aged ≥25 years (among individuals born before EPI). On the contrary, a significantly higher proportion of individuals aged ≥25 years had self-reported attending health screening tests for any liver disease than individuals aged <25 years (70.1% vs 56.2%; $P = .028$) (Table S4, Supplemental Digital Content, http://links.lww.com/MD2/A769).

3.7. Factors associated with liver index score

Bivariate analysis revealed that the overall liver index was associated with age (25–34 years and ≥55 years), education (university), high income (>50,000 Baht [US$ 1661]), ever-been diagnosed, health screening status in the recent 2 years and possessed at least 1 medical insurance. The knowledge and awareness of liver and liver diseases and the association with liver cancer/failure (Section 1 liver index) was significantly associated with 25–34 years, university education, ever-been diagnosed, and attended health screening in the recent 2 years. On the other hand, ≥55 years, being university educated and possessing at least 1 medical insurance was significantly associated with the attitude of the respondents toward screening, diagnosis, and treatment of liver diseases (Section 2 liver index) (Table 4).

Having high household income, having attended health screening, and ever-been diagnosed with liver disease were found to be independent predictors of the overall liver index in a multivariate analysis. The section 1 liver index was significantly associated with being female and having attended health screening while no significant associations were found among the variables and section 2 liver index (Table 5).

Being diagnosed with HBV or HCV was significantly associated with better section 1 liver index, while being diagnosed with any other liver disease was significantly associated with better overall liver index and section 1 liver index (Table S5, Supplemental Digital Content, http://links.lww.com/MD2/A770).

4. Discussion

This study highlighted that a substantial proportion of Thai population had suboptimal awareness and knowledge pertaining to liver-related health and diseases, including but not limited to

Table 4

Bivariate analysis of the respondents' characteristics with the overall liver index and sectional liver indices.

		Overall liver index			Section 1 liver index			Section 2 liver index		
		Crude odd ratio (COR)	95% CI	*P*-value	Crude odd ratio (COR)	95% CI	*P*-value	Crude odd ratio (COR)	95% CI	*P*-value
Age (ref: <25 yr old)	*25–34 yr old*	2.35	(1.32, 4.23)	.004	2.78	(1.55, 5.07)	.001	1.53	(0.86, 2.72)	.147
	35–44 yr old	1.28	(0.72, 2.28)	.405	0.99	(0.55, 1.76)	.963	0.98	(0.55, 1.74)	.951
	45–54 yr old	1.12	(0.64, 1.98)	.697	0.98	(0.56, 1.72)	.931	1.00	(0.57, 1.76)	.989
	55 yr old and above	2.25	(1.26, 4.05)	.006	1.47	(0.83, 2.62)	.184	2.04	(1.15, 3.66)	.016
Gender	*Female vs male*	1.00	(0.70, 1.42)	.990	0.97	(0.68, 1.38)	.858	1.38	(0.97, 1.96)	.074
Education	*University vs not*	2.28	(1.47, 3.59)	<.001	1.96	(1.27, 3.06)	.003	1.61	(1.05, 2.49)	.031
Household income (>50,000 Baht)	*Yes vs no*	1.79	(1.26, 2.56)	.001	1.34	(0.94, 1.90)	.107	1.68	(1.18, 2.40)	.004
Self-reported ever diagnosed liver disease	*Yes vs no*	1.91	(1.30, 2.82)	.001	2.97	(2.00, 4.46)	<.001	0.93	(0.63, 1.36)	.698
Self-reported last health screening within 2 yr	*Yes vs no*	5.68	(3.70, 8.91)	<.001	3.89	(2.59, 5.94)	<.001	5.15	(3.37, 8.01)	<.001
Possess at least one medical insurance	*Yes vs no*	2.63	(1.31, 5.65)	.009	1.79	(0.91, 3.63)	.095	1.59	(0.81, 3.18)	.180

Bivariate logistic regression was performed to examine the association of the overall and sectional liver indices with the respondents' age, gender, education, household income, status of ever being diagnosed with liver disease, status of recent (2-year) health screening and medical insurance status. Variables with $P < .25$ in the bivariable logistic regression analysis were considered in the multivariable logistic regression.

All variables that had $P < .25$ in the bivariate analysis were included in the multivariate analysis.

1 Baht = US$ 0.03322.

CI = confidence intervals.

Table 5

Multivariate analysis of the respondents' characteristics with the overall liver index and sectional liver indices.

		Overall liver index			Section 1 liver index			Section 2 liver index		
		(Adjusted odds ratio) AOR	95% CI	*P*-value	(Adjusted odds ratio) AOR	95% CI	*P*-value	(Adjusted odds ratio) AOR	95% CI	*P*-value
Age (ref: <25 yr old)	*25–34 yr old*	1.75	(0.91, 3.38)	.094	2.13	(1.11, 4.13)	.025	1.28	(0.68, 2.41)	.445
	35–44 years old	1.10	(0.57, 2.13)	.779	0.86	(0.45, 1.65)	.654	0.95	(0.50, 1.81)	.878
	45–54 yr old	0.84	(0.43, 1.64)	.612	0.79	(0.41, 1.51)	.472	1.01	(0.52, 1.94)	.985
	55 yr old and above	1.64	(0.85, 3.18)	.144	1.14	(0.6, 2.18)	.690	1.78	(0.93, 3.44)	.085
Gender	*Female vs male*	-	-	-	-	-	-	1.55	(1.04, 2.32)	.031
Education	*University vs not*	1.66	(0.99, 2.8)	.055	1.57	(0.94, 2.61)	.084	1.09	(0.65, 1.82)	.748
Household income (>50,000 Baht)	*Yes vs no*	1.53	(1.00, 2.32)	.048	1.23	(0.81, 1.87)	.334	1.39	(0.92, 2.10)	.118
Self-reported ever diagnosed liver disease	*Yes vs no*	1.82	(1.19, 2.80)	.006	2.86	(1.87, 4.42)	<.001	-	-	-
Self-reported last health screening within 2 yr	*Yes vs no*	4.99	(3.19, 7.95)	<.001	3.48	(2.25, 5.45)	<.001	5.07	(3.26, 8.02)	<.001
Possess at least one medical insurance	*Yes vs no*	1.72	(0.75, 4.11)	.204	1.24	(0.56, 2.81)	.603	1.00	(0.46, 2.17)	.992

Multivariate logistic regression was performed to examine the association of the overall and sectional liver indices with the respondents' age, gender, education, household income, status of ever being diagnosed with liver disease, status of recent (2-year) health screening and medical insurance status. Statistical significance was assessed at $P < .05$.

1 Baht = US$ 0.03322.

CI = confidence intervals.

viral hepatitis. Notably, 4 times as many respondents were aware of HBV than HCV suggesting a significant gap in the awareness among the Thai population with regards to the different types of viral hepatitis. This could be explained by the decreasing prevalence of HCV through the years, whereby this phenomenon was associated with efforts in managing the transmission risks of blood-borne pathogens such as HIV.[5] Furthermore, surveillance and public health efforts advocated for HCV screening were generally targeted toward high-risk groups such as HIV-infected individuals and persons who inject drugs, instead of the general population.[18,19] This suggests there is a potential need to increase public health efforts to increase awareness about viral hepatitis even among general population.

Although there was an overall awareness about viral hepatitis as the main etiology of liver failure/cancer, respondents expressed confusion or lack of awareness pertaining to the characteristics and associated transmission risk of hepatitis B and C, which is consistent with previous studies.[20,21] These misperceptions (e.g. being airborne or dining with or touching an infected person) hint at the existence of social stigma or discrimination toward individuals diagnosed with HBV or HCV.[22,23] Additionally, the concept that HCV could be prevented by a vaccine, is a common misperception that exists not only among the local community but also globally.[24]

Besides the basic knowledge and awareness on viral hepatitis, the survey also assessed the respondent's awareness toward the national vaccination policy in Thailand. The implementation of HBV vaccine into EPI did not have a significant impact on the community's awareness toward national vaccination policy and World Health Organization hepatitis eradication goal, despite the successful reduction in HBV prevalence in Thailand.[3,6] This appears consistent with findings by Darwish et al,[25] whereby vaccination status had no impact on the knowledge on hepatitis B among medical students although it was accounted for by the gain for hepatitis-related knowledge during their medical training. Additional studies would be required to explore this observation in the general population. Furthermore, there is also a need to improve the attitude and behaviors of the Thai community toward screening and diagnosis as well as treatment of liver diseases.

A substantial proportion of Thai population lacked the knowledge of screening tests (eg, liver enzymes level test) and the relevant diagnostic tests for liver diseases. Importantly, <70% attended screening in recent 2 years despite the consensus (>90%) that regular screening was important to maintain and protect their liver health. The perception of being healthy was a common reason cited by the respondents for not attending health screening. This is a concerning observation as the clinical presentation of the symptoms of liver diseases in patients typically occur at advanced disease stages.[16,26]

Cost-related issues are also considered to be another common reason as a barrier of compliance toward screening, diagnosis, and treatment.[27,28] In Thailand, there are 3 health insurance schemes with differing health screening packages applicable to different population groups: civil servant medical benefit scheme (government officers and their dependents), social security scheme (SSS) (private sector employees), and universal health coverage scheme (rest of the population).[29] Civil servant medical benefit scheme and universal health coverage provides coverage for a range of health screening/laboratory tests. On the other hand, SSS had mainly provided support for health screenings related to occupational-related risk screening in the past.[29,30] Since January 2017, support for HBsAg screening among people born before 1992 was also covered under the SSS, while HCV screening was not covered.[31,32] Most of the Thai population did not know about the scheme(s) coverage due to lack of public promotion. This could account for the finding that 35.6% had perceived health screening tests as expensive. It was also interesting to note that more than half cited that "prescription medicine is expensive" as a reason for not receiving treatment when treatment costs incurred under these health insurance schemes are covered by the Thai government.[10,31] Although antiviral therapy for CHB has been covered by all health insurance schemes for a long time, oral antiviral therapy for CHC is recently covered this year as part of the viral hepatitis eradication goals in Thailand.[33] This potentially suggests that

many are unaware of government support for the treatment of viral hepatitis. Reasons influencing this was not explored in this study and would warrant further investigation.

There was a similar proportion of individuals receiving hepatitis treatment in the form of prescription medication (59.1%) and functional foods (51.8%). Furthermore, at least one-quarter sought out herbal products (traditional treatment) or homeopathy for treating hepatitis. In a 2019 study, 32.6% of Thai worker population used herbal and traditional medicines in the treatment of chronic diseases including liver diseases.[34] Another cross-sectional study on herbal medicine usage associated the high prevalence of herbal medicine usage with education, rural residence, low quality of life and multiple chronic conditions.[35] This is a concern as HBV and HCV are effectively managed through antiviral drug treatments,[5] which typically requires patient-physician communication. As such, there is a need to educate the general population and promote communications between the health-care professionals and the community on the effective management of HBV and HCV.

Multivariate analysis identified income, recent health screening status and being diagnosed with liver disease(s) as significant predictors of the awareness and knowledge of liver health and disease(s) as well as the attitude toward screening, diagnosis, and treatment. Similar to other studies, higher income was associated with better knowledge, attitude, and behavior toward liver-related health and diseases.[36,37] Recent health screening can be identified as a form of proactive health-seeking behavior, whereby respondents seized opportunities for early diagnosis and treatment, undertake or share prevention measures to reduce transmission risks or disease progression.[38] Being diagnosed with liver disease(s) was previously reported to be associated with better knowledge, awareness and behaviors.[36–38] Interestingly, being diagnosed with any type of liver disease (eg, hepatitis B, hepatitis C, or other liver diseases) was positively associated with the better knowledge and awareness of liver-related health and diseases. However, consistent with a 2016 study by Atlam et al,[39] there was no association of self-reported diagnosis of any liver disease with the attitude toward screening, diagnosis and treatment. This suggests that while the knowledge of diagnosis information could contribute to the awareness and knowledge of liver-related health and diseases, it might not ameliorate the attitude toward screening, diagnosis, and treatment.

The study findings raised the importance of increasing the knowledge and improving the attitudes and practices of the Thai population toward screening, diagnosis, and treatment for, but not limited to, viral hepatitis. The findings also suggested a need to improve physicians-to-patients communication to actively educate patients about the associated risks as well as available treatment regimens of viral hepatitis for more effective management of viral hepatitis-related liver diseases in Thailand.

There are some limitations within this study. This is a self-administered online study whereby the respondents self-reported their data, and no causal associations could be made. Data validation could not be performed as recall bias could not be excluded. Short, nonleading and interval questions with a set of exhaustive answer options were included in the survey questionnaire to reduce self-reported recall bias. Individuals without internet access or comfort of online administration might be under-represented. Furthermore, majority of the respondents have at least university or higher levels of education, insinuating individuals with lower education levels could therefore also be under-represented. As such, further investigation with larger study population is warranted. Thailand is made up of different regions with high and low prevalence of HBV and HCV.[3,40–42] Respondents in these regions could have varying levels of awareness and knowledge toward liver diseases as well as different attitudes and behaviors toward screening, diagnosis, and treatment, which could have an impact on the liver index score. Factors influencing this could be further explored in future studies.

5. Conclusion

The study highlights a degree of misperception and lack of in-depth understanding toward hepatitis (especially HCV) related liver diseases. Findings also implied poor attitudes and knowledge toward screening, diagnosis, and treatment of liver diseases. More efforts would be required to raise the awareness of government support for screening tests and treatment of viral hepatitis to address cost-related barriers. Furthermore, based on the factors identified by multivariate analysis, there is an implication to encourage proactive health-seeking behaviors such as health screening for early diagnosis and treatment and promote precautionary measures to facilitate reducing transmission risks within the community.

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Author contributions

TT led and all authors (TT, PP, BLN, and SS) contributed to the concept or design, analysis, or interpretation of data, drafting of the article, and critical revision for important intellectual content. SS contributed to the execution and acquisition of data and led manuscript writing. TT, PP, BLN, and SS had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

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