


BMJ Open Public awareness and influencing factors regarding hepatitis B and hepatitis C in Chongqing municipality and Chengdu City, China: a cross-sectional study with community residents

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ABSTRACT

Objective Hepatitis B and hepatitis C cause a heavy disease burden in China. This paper aims to investigate the public's knowledge on hepatitis B and hepatitis C in Chongqing municipality and Chengdu City, China.

Design A cross-sectional study was conducted from December 2016 to April 2017.

Setting Two communities from Chongqing and Chengdu were involved in this study.

Participants Data from 928 community residents were analysed.

Outcome Demographic characteristics, knowledge on hepatitis B and hepatitis C and sources of hepatitis knowledge were obtained from questionnaires. The participants' scores ranged from 0 to 24, and a test score about more than 14.4 (60% of the total score) was defined as sufficient knowledge.

Results Among the participants, only 36.10% presented sufficient knowledge on hepatitis B and hepatitis C, and about 40% were unaware of the two antidiscrimination policies in China. The sources of information about hepatitis were mainly from doctors and the internet. Unmarried individuals, people with secondary education and above and those with an annual income above US\$2108 tended to exhibit a higher level of knowledge on hepatitis B and hepatitis C.

Conclusions The community members demonstrated limited awareness and level of knowledge on hepatitis B and hepatitis C, particularly in relation to the antidiscrimination policies. Extensive health education should be provided to the public, particularly to those with low educational status and income.

INTRODUCTION

Viral hepatitis is a serious public health issue worldwide. Hepatitis B (HB) and hepatitis C (HC) affect 325 million people globally, causing 1.4 million deaths a year.^{1,2} HB and HC are the second major deadly infectious diseases after tuberculosis, and the number of people who are infected with hepatitis is nine times higher than those who suffer from HIV.² Globally, approximately 240 million

Strengths and limitations of this study

- Two items about hepatitis B antidiscrimination policies in China were involved in our questionnaire.
- Both hepatitis B and hepatitis C knowledge were investigated.
- The household surveys were employed to ensure the quality of data collected.
- Selection bias may exist in this study.
- The sample cannot represent the whole population of Southwest China.

people have chronic HB, and 130–150 million people suffer from chronic HC.³ The WHO estimates that 23.7 new HC virus (HCV) infections per 100 000 people emerged in 2015 in the world.⁴ HB-associated and HC-associated diseases continue to emerge as a major burden and serious public health challenge in China, having affected approximately 300 million people.⁵ And the 2018 China Statistical Yearbook reported millions of patients with HB and HC.⁶ The prevalence of HC has recently shown an increasing trend in China.^{7,8} In addition, the hepatitis testing and treatment service is not available and accessible to a large number of patients infected with hepatitis. Globally, only 9% of HB-infected people and 20% of HC-infected people had been tested and diagnosed by the end of 2015. Among those diagnosed with HB, only 8% (1.7 million people) were on treatment, and only 7% of those diagnosed with HC (1.1 million people) had started treatment in 2015.^{1,9} The global prevalence of chronic hepatitis is serious, particularly in certain developing countries, including China, Egypt and nine other countries that carry almost 50% individuals afflicted with the disease.⁹

Knowledge can reflect the health cognition of residents to a certain extent. A sufficient awareness level promotes a positive attitude that results in good practices.¹⁰ Moreover, several studies have noted that the lack of information about HB, especially the misconceptions about its transmission routes, is the main cause of discrimination against the people with the disease.¹¹ Most individuals are afraid to have physical contact with carriers, and several carriers have experienced rejection in schools or alienation of family and friends.¹¹ Furthermore, previous studies have shown that the public's poor knowledge, attitude and practice (KAP) towards hepatitis and hepatitis-related discrimination in China should not be neglected.^{12,13} Therefore, educating the public about hepatitis could help to reduce discrimination and social stigma against patients with hepatitis.

Currently, most subjects in the relatively scarce KAP studies are college students, medical staff and other specific populations.^{14–17} A lack of deep investigation on hepatitis-related knowledge among the general population is evident. Chongqing and Chengdu are rapidly developing cities with a large population in Southwestern China. Several studies have indicated that the HB and HC infections in Southern/Southwest China are serious.^{7,8,18} Therefore, this study investigates the public's knowledge and awareness on HB and HC in Chongqing municipality and Chengdu, China, to provide suggestions for effective hepatitis prevention and control strategies.

METHODS

Study design and setting

A cross-sectional study was conducted in Chongqing and Chengdu, Southwest China, from December 2016 to April 2017. Chongqing is the only direct-controlled municipality in Southwest China. It has a gross domestic product (GDP) of 1.95 trillion Renminbi (RMB) in 2017 and ranks fifth place in the national urban economy. Moreover, this municipality has 33.9 million registered citizens with a 64% urbanisation rate. Sichuan Province has the largest population in Southwest China, and its provincial capital Chengdu has achieved a GDP of 1.39 trillion RMB in 2017. Furthermore, the total registered population in this municipality is 14.0 million, including an urban population of 7.8 million and a rural population of 6.1 million.

The criteria for community selection were (1) medium economic development level, (2) with transport facility, (3) high level of cooperation and (4) our research team already having contact with the community because of some other former health programmes. The local government and health department attach great importance to health and believe that the survey is conducive to promote the health of residents, so these communities are willing to help us enter the household to conduct survey. The two communities were selected for investigation as they met the criteria.

Sample size and participants

The sample size was determined using a cluster sampling based on the following formula: $n = Z_{\alpha/2}^2 \times \pi(1-\pi) / \delta^2$. $\pi=40\%$ was the predicted awareness rate among community residents based on previous research.¹⁹ Type I errors were $\alpha=0.05$ and $Z_{\alpha/2} = 1.96$, and the allowable error was $\delta=5\%$. Considering non-response, the sample size increased by 30%. The calculation formula was $n = 1.96^2 \times 40\%(1-40\%) / 5\%^2 \times (1+30\%) \approx 480$. More than 960 participants were acquired considering there are two communities.

The study was conducted from December 2016 to April 2017. The criteria for subject inclusion were as follows: residents (1) who were 15 years old or older, (2) without intellectual disability and (3) who agreed to participate voluntarily. Participants were selected by random cluster sampling, and their informed consent was obtained before the investigation. In Chongqing, five out of 18 residential buildings were randomly (random number table) selected in the target community, each building with 16 floors and four households on each floor. In Chengdu, 12 out of 20 residential buildings were randomly (random number table) selected in the target community, each with five floors and four households on each floor. Everyone who lived in these selected buildings and met the inclusion criteria was included in this investigation.

Study instrument

First, the initial draft of the questionnaire was developed based on an extensive research review following the study's objective. Second, by summarising the previous experience and consulting with experts, the questionnaire was further improved and perfected. Finally, prior to the formal investigation, we conducted a pilot survey with 30 residents from Chongqing and Chengdu, and the questionnaire was determined based on their feedback.

The final self-administered questionnaire had 35 items, which were grouped under three sections. The first section was related to the participants' demographic characteristics (six items), such as gender, age, marital status, locality, educational level and the annual per capita income. The second section involved 24 questions regarding transmission, symptoms, prevention and policies regarding HB and HC. The third section was designed to identify participants' sources of information (five items). We measured the second section (24 items, one point each), and their scores ranged from 0 (minimum) to 24 (maximum). A test score of 14.4 (60% of the total score) and above indicated sufficient knowledge,^{20–22} whereas scores below 14.4 implied insufficient knowledge.

Data collection

This survey was conducted by public health postgraduates who had received training about viral hepatitis, experienced working in community and engaged in public health studies. Following the required sample size, we contacted the local community neighbourhood committee and then entered each household with the guidance of the staff

from the neighbourhood committee. The face-to-face interviewer-administered survey was finished in the residents' buildings. The participants' answers were verified immediately. These surveys were anonymous, any privacy of the participants was not collected by the surveys.

Data analysis

The data were double-entered using EpiData V.3.1 and then cross-checked by two researchers. Statistical analysis was performed through SPSS V.23.0. Descriptive statistics were applied to illustrate the demographic characteristics and accurate response rates of the participants. Logistic regression was used to analyse the influencing factors of participants' knowledge about hepatitis by calculating 95% CIs. P values of less than 0.05 were considered statistically significant.

Patient and public involvement

The public were involved in the design, conduct, reporting or dissemination plans of our research.

RESULTS

Demographic characteristics

A total of 1000 residents were surveyed, but 49 residents refused, with a response rate of 95.10% and finally obtained 939 valid questionnaires (498 from Chengdu and 441 from Chongqing). But 11 participants missed the important variable, total knowledge score, so 928 respondents (498 from Chengdu and 430 from Chongqing) were included for analysis. **Table 1** summarises the demographic characteristics of participants. A total of 457 (49.57%) participants were men, and 680 (73.52%) attained a secondary educational level and above. Among the participants, 821 (88.76%) were married, and 712 (78.94%) claimed to have an annual income of US\$4215 and below.

Knowledge on HB and HC

Among the 928 participants, 335 (36.10%) presented sufficient knowledge on HB and HC. Their mean knowledge score was 11.89 ± 5.52 . More than half (57.87%) were aware of the policy that employees who only carry HB surface antigen should not be rejected or fired by employers. Of the participants, 63.47% recognised that the HB test had been omitted from the physical examination for school admission and employment. Specially, the respondents were less likely to know that HB and HC could be transmitted sexually (35.34% and 33.51%, respectively) than through blood (78.34% and 58.84%, respectively) and mother-to-infant transmission (63.36% and 48.60%, respectively). Unfortunately, nearly half (42.67%) of the respondents had the misconception that HB can be transmitted by taking food together (**table 2**).

Table 3 presents that there were background differences between those with insufficient and sufficient knowledge. Their gender ($p=0.002$), age ($p<0.001$), marital status ($p<0.001$), education ($p<0.001$) and income ($p<0.001$) were statistically significant.

Table 1 Demographic characteristics of the respondents

Variables	Number	%
Gender (n=922)		
Man	457	49.57
Woman	465	50.43
Age (n=913)		
16–35	213	23.33
36–55	306	33.52
≥56	394	43.15
Marital status (n=925)		
Married	821	88.76
Single	47	5.08
Divorced or widowed	57	6.16
Length of residence (n=922)		
Permanent resident	858	93.06
Temporary resident	64	6.94
Education (n=925)		
Primary school and below	245	26.49
Secondary education	514	55.57
College and above	166	17.95
Income (US\$) (n=902)		
<2108	206	22.84
2108–4215	506	56.10
4215–6323	89	9.87
>6323	101	11.20

Such information could be privacy for some participants, and they have their rights to refuse to provide, that is, the reason for missing data. All missing data were from the community in Chongqing.

Multivariate analysis found that a sufficient knowledge level was more often observed in those with secondary education and above (compared with primary and below), year income higher than US\$2108 (compared with less than US\$2108) and unmarried individuals (compared with married people) (**table 4**).

Sources of hepatitis knowledge

In terms of the various ways of obtaining information regarding HB and HC, the first two ways were consultation with doctors (55.06%) and the internet (41.38%). The participants were more willing to consult a doctor (67.78%) if they had problems of HB. During the past 6 months, 28.45% of participants obtained HB-related knowledge through their peers, only 13.25% attended hepatitis-related lectures and 22.74% received advertisement manuals on hepatitis prevention and control (**table 5**).

DISCUSSION

This study aimed to describe the community residents' awareness on HB and HC and their knowledge sources

Table 2 Participants' knowledge regarding hepatitis B (HB) and hepatitis C (HC) (n=928)

Items	Awareness numbers (%)
HB	
Are patients with HB and HBV carriers the same?	405 (43.64)
Transmission routes (multiple choice quiz)	
Blood	727 (78.34)
Sex	328 (35.34)
Food	396 (42.67)
Mother to infant	588 (63.36)
Injection, acupuncture or tooth extraction	577 (62.18)
Handshake and hugs	639 (68.86)
Whether an individual can be protected by vaccination?	747 (80.50)
Newborn were vaccinated within 24 hours of birth	572 (61.64)
Whether an individual can be infected with HBV after vaccination?	135 (14.55)
The younger the person infected with HBV is, the more serious the illness is	250 (26.94)
The employer cannot refuse or dismiss workers who are only HBV carriers	537 (57.87)
The HB test item has been cancelled in physical examinations required by school enrolment and employment	589 (63.47)
HC	
Have you heard of HC?	582 (62.72)
HC can be identified from an individual's appearance	465 (50.11)
HC can cause cirrhosis and/or liver cancer	450 (48.49)
Transmission routes (multiple choice quiz)	
Blood	546 (58.84)
Sex	311 (33.51)
Needles used in body piercing or drug use	545 (58.73)
Mother to infant	451 (48.60)
Sneezes or coughs	407 (43.86)
Tattoo and tooth filling	393 (42.35)
A vaccine for HC is available	159 (17.13)
HC is curable	237 (25.54)

HBV, hepatitis B virus.

in Chongqing municipality and Chengdu City, China. Results indicated that the majority of them had a poor understanding about the two infectious diseases. Furthermore, their sources to obtain such knowledge were limited. Significant heterogeneities could be observed in different awareness and knowledge levels among residents with various characteristics. Special attention

Table 3 Background comparison between people with sufficient knowledge or not

Variables	Insufficient group (%)	Sufficient group (%)	P value
Gender (n=922)			0.002*
Man	316 (53.47)	141 (42.60)	
Woman	275 (46.53)	190 (57.40)	
Age (n=913)			< 0.001†
16–35	104 (17.84)	109 (33.03)	
36–55	190 (32.59)	116 (35.15)	
≥56	289 (49.57)	105 (31.82)	
Marital status (n=925)			< 0.001†
Married	527 (89.20)	294 (88.29)	
Single	18 (3.04)	29 (8.71)	
Divorced or widowed	47 (7.94)	10 (3.00)	
Education (n=925)			< 0.001†
Primary school and below	215 (36.38)	30 (8.98)	
Secondary education	315 (53.30)	199 (59.58)	
College and above	61 (10.32)	105 (31.44)	
Income (US\$) (n=902)			< 0.001†
<2108	167 (28.99)	39 (11.96)	
2108–4215	321 (55.73)	185 (56.75)	
4215–6323	47 (8.16)	42 (12.88)	
≥6323	41 (7.12)	60 (18.40)	

X² test was used to compare differences in categorical variables.

*Statistically significant (p<0.05).

†Statistically significant (p<0.001). Such information could be privacy for some participants, and they have their rights to refuse to provide, that is, the reason for missing data. All missing data were from the community in Chongqing.

should be paid to residents with low educational level and low income.

This study highlighted several issues that should be addressed by health education in China. First, HB can be transmitted through sexual behaviour, but only less than 40% of interviewees were aware of such fact, and the awareness rate was far lower than that in European researches, which were 63% and 78% in Germany and the Netherlands, respectively.²³ Second, remarkable misconceptions on the transmission route of HB are evident among the respondents, with 57.33% believing that HB could be transmitted through taking food together. However, the error rate of this information was only 31.0% in related research in Pakistan.²⁴ Such misconception in China would induce severe discrimination. Existing studies verified that this concept would result in community marginalisation among patients with HB in countries with the tradition of sharing foods.²⁵ Third, as shown by this study, the residents' understanding on

Table 4 Bivariate logistic regression to analyse the association between factors and knowledge level

Variables	OR	95% CI	P value
Gender			
Man	1		
Woman	1.20	0.87 to 1.65	0.265
Age group			
16–35	1		
36–55	1.29	0.81 to 2.05	0.280
≥56	0.87	0.52 to 1.44	0.587
Marital status			
Married	1		
Single	2.60	1.25 to 5.40	0.011*
Divorced or widowed	0.48	0.23 to 1.00	0.053
Education			
Primary school and below	1		
Secondary education	2.36	1.46 to 3.81	<0.001†
College and above	5.24	2.68 to 10.22	<0.001†
Income (US\$)			
<2108	1		
2108–4215	2.92	1.84 to 4.63	<0.001†
4215–6323	2.31	1.25 to 4.26	0.007*
≥6323	1.82	0.98 to 3.38	0.056
District			
Chengdu	1		
Chongqing	2.80	1.92 to 4.09	<0.001†

*Statistically significant ($p < 0.05$).

†Statistically significant ($p < 0.001$); all missing data were from the community in Chongqing.

HC is very limited, which may cause more frequent delay in diagnosis and treatment of HC.²⁶ Besides that, the respondents also exhibited little perception about HB antidiscrimination policies. Approximately 75% patients with HB in China had experienced discrimination, most of which were severe.^{27,28} What's more, only less than 10% of patients who suffered from discrimination knew there are organisations or institutes available to offer legal aid.¹² Therefore, more intensive health education about knowledge on HB and HC as well as the antidiscrimination policies should be delivered to the public; especially, the patients need to be taught how to protect their rights on employment and school enrolment. Finally, being consistent with other studies, this study also revealed that socio-demographic factors, including the educational level and income, affect the HB awareness level.^{29–33} Consequently, future health education should be tailored to the residents with low educational level and income.

We found that the participants' primary sources in acquiring HC-related knowledge were from their doctors, followed by the internet. Moreover, consulting a doctor was also the patients' preferred choice when they needed

Table 5 Sources of hepatitis knowledge for the respondents (n=928)

Items	N	%
Sources of hepatitis B and hepatitis C knowledge (multiple choice quiz)		
Relatives/friends	282	30.39
Internet	384	41.38
Newspapers/magazines	102	10.99
Doctors	511	55.06
Others	57	6.14
If you have a hepatitis B problem that you don't understand, what will you do?		
Ignore	20	2.16
Consult a doctor	629	67.78
Seek information through network	141	15.19
Consult with friends and relatives	103	11.10
Others	35	3.77
In the past 6 months, have you received any information about hepatitis from your companions?		
Yes	264	28.45
No	664	71.55
In the past 6 months, have you attended any lectures related to hepatitis?		
Yes	123	13.25
No	805	86.75
In the past 6 months, have you received a brochure on hepatitis prevention and control?		
Yes	211	22.74
No	717	77.26

to clarify certain information about hepatitis, which was inconsistent with results from other studies.^{23,34} For example, in other countries like Germany and the Netherlands, consulting family members was the primary source of obtaining information about hepatitis.²³ The interviewees also showed great trust with health professionals. However, the current health promotion about hepatitis in China seems far from enough. The results also indicate the lack of community health education activities about hepatitis, which is consistent with our previous qualitative study.³⁵ Importantly, the screening of HB virus (HBV)/HCV and healthcare services for patients need to be more accessible. However, traditional virological tests require blood sampling and strict storage conditions, which may restrain the coverage of the tests.³⁶ Therefore, there is a need to find a more advanced alternative to classical HBV and HCV virological tests. Actually, the point-of-care (POC) tests are increasingly being considered an alternative model for HBV and HCV screening, diagnosis and monitoring. POC tests have proven to be cost-effective in many countries.^{37,38} Currently, both the diagnosis rate



and treatment rate of HC are less than 10% in China, which is far from the goal set by the WHO to eliminate HC by 2030.³⁹ Substantial effective measures are essential to reach the goals.

Nevertheless, two limitations at least exist in this study. First, the study was only conducted in an urban area of Chongqing municipality and Chengdu (the capital of Sichuan Province); thus, the results could not represent the population's awareness on HB and HC of Southwest China. Second, the study was a cross-sectional survey, and this could hamper causality inference.

Conclusions

This study highlighted poor awareness and knowledge among community residents towards HB and HC, particularly to the relevant antidiscrimination policies. Lack of community health activities about hepatitis prevention and control is also an evident issue. Therefore, extensive health education should be provided in the community, especially among those with low educational level and income.

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Contributors HZ and YZ conceived and designed the study and contributed to data collection and manuscript revision. TL planned the statistical methods, analysed the data and contributed to all sections of the final paper. RW contributed to data collection, prepared the first draft of the manuscript and analysed the data. SS contributed to data analysis and manuscript review thoughtfully. All authors were involved in data interpretation and made substantial contributions to critically revising the manuscript and have given final approval of the manuscript.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were involved in the design, conduct, reporting or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Not required.

Ethics approval The ethics approval was obtained from the Chongqing Medical University ethics committee (2018023). Participation in the study was completely voluntary. The participants were assured of the confidentiality of their responses. In addition, informed written consent was obtained from all participants, and the data were analysed anonymously.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement The datasets used and/or analysed during the current study are available from the corresponding author [H.Z.] on reasonable request.

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REFERENCES

- World Health Organization. Global hepatitis report, 2017, 2017. Available: <http://apps.who.int/iris/bitstream/handle/10665/255016/9789241565455eng.pdf?sequence=1> [Accessed 11 Aug 2018].
- World Health Organization. World hepatitis day 2019: invest in eliminating hepatitis, 2019. Available: <https://www.who.int/campaigns/world-hepatitis-day/2019> [Accessed 8 Oct 2019].
- World health organization. Global health sector strategy on viral hepatitis 2016-2021, 2016. Available: <https://www.who.int/hepatitis/strategy2016-2021/ghss-hep/en/> [Accessed 12 Jul 2018].
- World Health Organization. Fact sheets: hepatitis C, 2019. Available: <https://www.who.int/en/news-room/fact-sheets/detail/hepatitis-c> [Accessed 1 Oct 2019].
- Wang F-S, Fan J-G, Zhang Z, *et al*. The global burden of liver disease: the major impact of China. *Hepatology* 2014;60:2099–108.
- National Bureau of Statistics of China. China statistical yearbook 2018, 2018. Available: <http://www.stats.gov.cn/tjsj/ndsj/2018/index.htm> [Accessed 9 Dec 2019].
- Liu Z, Yang Q, Shi O, *et al*. The epidemiology of hepatitis B and hepatitis C infections in China from 2004 to 2014: an observational population-based study. *J Viral Hepat* 2018;25:1543–54.
- Zhu B, Liu J, Fu Y, *et al*. Spatio-temporal epidemiology of viral hepatitis in China (2003–2015): implications for prevention and control policies. *Int J Environ Res Public Health* 2018;15:1. doi:10.3390/ijerph15040661
- World Health Organization. World hepatitis day 2017: eliminate hepatitis, 2017. Available: <http://www.who.int/campaigns/hepatitis-day/2017/event/en/> [Accessed 3 Jan 2018].
- Singh A, Purohit BM, Bhambal A, *et al*. Knowledge, attitudes, and practice regarding infection control measures among dental students in central India. *J Dent Educ* 2011;75:421–7.
- Yu L, Wang J, Zhu D, *et al*. Hepatitis B-related knowledge and vaccination in association with discrimination against hepatitis B in rural China. *Hum Vaccin Immunother* 2016;12:70–6.
- Han B, Yuan Q, Shi Y, *et al*. The experience of discrimination of individuals living with chronic hepatitis B in four provinces of China. *PLoS One* 2018;13:e0195455.
- Huang J, Guan ML, Balch J, *et al*. Survey of hepatitis B knowledge and stigma among chronically infected patients and uninfected persons in Beijing, China. *Liver Int* 2016;36:1595–603.
- Al-Shamiri H-M, AlShalawi F-E, AlJumah T-M, *et al*. Knowledge, attitude and practice of hepatitis B virus infection among dental students and interns in Saudi Arabia. *J Clin Exp Dent* 2018;10:54–60.
- Kabir A, Tabatabaei SV, Khaleghi S, *et al*. Knowledge, attitudes and practice of Iranian medical specialists regarding hepatitis B and C. *Hepat Mon* 2010;10:176–82.
- Kwiatkowski CF, Fortuin Corsi K, Booth RE. The association between knowledge of hepatitis C virus status and risk behaviors in injection drug users. *Addiction* 2002;97:1289–94.
- Yang Y, Yan M, Yue M, *et al*. Prevalence of hepatitis B and knowledge about hepatitis B among migrant workers in Shandong Province, China: a cross-sectional study. *Iran Red Crescent Med J* 2015;17:e26725.
- Chen E-Q, Ma Y-J, Wang J, *et al*. Prevalence of hepatitis B virus infection in Western China: epidemiological survey results of general adult population. *Future Virol* 2018;13:fvl-2018-0051
- Huang D, Yu Y. Questionnaire survey on the construction of hepatitis B prevention and treatment demonstration zone and the knowledge awareness rate of hepatitis B prevention and control among residents in Wuwei, Gansu Province, China. *Health Vocational Education* 2011;29:123–4.

- 20 Cheung J, Lee TK, Teh C-Z, *et al.* Cross-sectional study of hepatitis B awareness among Chinese and Southeast Asian Canadians in the Vancouver-Richmond community. *Can J Gastroenterol* 2005;19:245–9.
- 21 Hafeez Q-U-A, Butt AS, Ahmed F. Management of chronic hepatitis B: knowledge and practices of physicians in Pakistan. *J Clin Exp Hepatol* 2018;8:342–51.
- 22 LIU C, LÜ Y-kui. Analysis on hepatitis B related KAP among migrants in Beijing. *Chinese J Health Educ* 2015;31:23–6. Chinese.
- 23 Crutzen R, Görnitz AS. Public awareness and practical knowledge regarding hepatitis A, B, and C: a two-country survey. *J Infect Public Health* 2012;5:195–8.
- 24 ul Haq N, Hassali MA, Shafie AA, *et al.* A cross sectional assessment of knowledge, attitude and practice towards hepatitis B among healthy population of Quetta, Pakistan. *BMC Public Health* 2012;12:692.
- 25 Hajarizadeh B, Wallace J, Richmond J, *et al.* Hepatitis B knowledge and associated factors among people with chronic hepatitis B. *Aust N Z J Public Health* 2015;39:563–8.
- 26 Duan Z, Jia J-D, Hou J, *et al.* Current challenges and the management of chronic hepatitis C in mainland China. *J Clin Gastroenterol* 2014;48:679–86.
- 27 Kan Q, Wen J, Xue R. Discrimination against people with hepatitis B in China. *Lancet* 2015;386:245–6.
- 28 Valizadeh L, Zamanzadeh V, Bayani M, *et al.* The social stigma experience in patients with hepatitis B infection: a qualitative study. *Gastroenterol Nurs* 2017;40:143–50.
- 29 Zheng J, Li Q, Wang J, *et al.* Inequality in the hepatitis B awareness level in rural residents from 7 provinces in China. *Hum Vaccin Immunother* 2017;13:1005–13.
- 30 Thompson MJ, Taylor VM, Jackson JC, *et al.* Hepatitis B knowledge and practices among Chinese American women in Seattle, Washington. *J Cancer Educ* 2002;17:222–6.
- 31 Thompson MJ, Taylor VM, Yasui Y, *et al.* Hepatitis B knowledge and practices among Chinese Canadian women in Vancouver, British Columbia. *Can J Public Health* 2003;94:281–6.
- 32 Joukar F, Mansour-Ghanaei F, Naghipour MR, *et al.* Nurses' knowledge toward hepatitis B and hepatitis C in Guilan, Iran. *Open Nurs J* 2017;11:34–42.
- 33 Yau AHL, Ford J-A, Kwan PWC, *et al.* Hepatitis B awareness and knowledge in Asian communities in British Columbia. *Can J Gastroenterol Hepatol* 2016;2016:1–8.
- 34 Yuan L, Yan L, Shujiang M. Epidemiological surveys on the knowledge, attitude and behavior of viral hepatitis among community residents in Shenzhen. *Chinese J Dis Control* 2012;16:867–70.
- 35 Li T, Su S, Zhao Y, *et al.* Barriers to the prevention and control of hepatitis B and hepatitis C in the community of southwestern China: a qualitative research. *Int J Environ Res Public Health* 2019;16:231.
- 36 Fourati S, Feld JJ, Chevaliez S, *et al.* Approaches for simplified HCV diagnostic algorithms. *J Int AIDS Soc* 2018;21:e25058.
- 37 Barbosa JR, Cortes VF, Portilho MM, *et al.* Performance of point of care assays for hepatitis B and C viruses in chronic kidney disease patients. *J Clin Pathol* 2018;71:879–84.
- 38 Shivkumar S, Peeling R, Jafari Y, *et al.* Accuracy of rapid and point-of-care screening tests for hepatitis C: a systematic review and meta-analysis. *Ann Intern Med* 2012;157:558–66.
- 39 World Health Organization. Progress report on access to hepatitis C treatment: focus on overcoming barriers in low- and middle-income countries, 2018. Available: <https://www.who.int/hepatitis/publications/hep-c-access-report-2018/en/> [Accessed 27 Jan 2019].