



# BMJ Open Knowledge, attitude and psychological status of patients living with hepatitis C in five provinces in China: a cross-sectional survey

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## ABSTRACT

**Objective** This study investigated the knowledge, attitudes and psychological status of hepatitis C virus (HCV)-positive patients through a cross-sectional survey to provide scientific strategies for improving their treatment compliance and quality of life.

**Setting** The research was conducted in nine hospitals in five provincial administrative regions in China, namely Inner Mongolia, Jilin, Beijing, Hebei and Sichuan.

**Participants** A total of 457 patients were recruited for this study and 409 patients were included in the final analysis. The participants were 215 men and 194 women, with an average age of 59 years.

**Primary and secondary outcome measures** The primary outcomes were scores on scales assessing knowledge, attitudes and psychological status. The secondary outcomes were transmission of HCV, preference regarding the mode in which information about HCV was provided and factors affecting treatment.

**Results** Blood transfusion was the most common route of HCV transmission (42.7%), followed by surgery (15.9%) and blood donation/sale (8.7%). The misunderstanding of HCV and negative attitudes towards other HCV-positive patients were relatively common among HCV-positive patients and were more pronounced among rural and ethnic minority populations. HCV-positive patients were generally categorised as possibly having symptoms of depression. Patients with negative attitudes were more likely to have symptoms of depression (OR=0.6, 95% CI 0.4 to 0.8).

**Conclusions** HCV-positive patients had a poor understanding of HCV and a negative attitude towards other HCV-positive patients. It is very important to develop effective health education strategies to improve the knowledge, attitudes and mental health of HCV-positive patients and enhance treatment compliance.

## INTRODUCTION

Hepatitis C is a communicable disease caused by hepatitis C virus (HCV) and is a leading cause of chronic liver disease worldwide. Humans are generally susceptible to infection by HCV. HCV infection can lead to hepatocyte inflammation, necrosis, fibrosis, and even cirrhosis or liver cancer in severe cases. The seroprevalence of HCV is 2.8% globally.

## Strengths and limitations of this study

- This was a multicentre study.
- Participants had laboratory-confirmed hepatitis C virus (HCV) infections.
- Standardised scales were used.
- There were many relatively older participants, leading to selection bias.
- There may have been recall bias regarding the route of HCV transmission.

Approximately 71 million people are infected and 399 000 patients die from HCV infections every year.<sup>1 2</sup> China has a large HCV-positive population, accounting for approximately 1% of the total national population. A national survey showed that the rate of positivity for anti-HCV antibodies was 0.4% among those aged 1–59 years in 2006.<sup>3</sup>

A meta-analysis revealed that the pooled anti-HCV antibody positivity rate was 0.6% in the general population nationwide.<sup>4</sup> The number of new cases of hepatitis C has exceeded 200 000 each year since 2012 and has increased annually according to the surveillance data from the National Health Commission in China.<sup>5 6</sup>

The onset of hepatitis C is insidious and patients are generally asymptomatic early in the course of the infection. Therefore, the optimal timing of diagnosis and treatment is often missed.<sup>7</sup> Based on the viral hepatitis report in China in 2017, 20.9% of new hepatitis-related deaths were caused by HCV infections. Chronic hepatitis C (CHC) is diagnosed in patients who remain HCV-positive for 6 months and the rate of CHC is 55%–85%.<sup>2 8</sup> With the first 20 years after the diagnosis of CHC, the risk of progression to cirrhosis is 5%–15% and the risk of hepatocellular carcinoma is 2%–4%.<sup>9 10</sup> At the time of the initial diagnosis, 34.1% of HCV-positive patients already have cirrhosis and 1.4% have

hepatocellular carcinoma.<sup>11</sup> The WHO has set the goal of eliminating viral hepatitis as a public health threat by 2030, with a 65% reduction in mortality rate and a 90% reduction in incidence rate; the aim is to achieve these goals by improving the treatment rate to 80% and promoting preventive measures. However, only 13.4% of patients diagnosed with hepatitis C received treatment in 2016.<sup>2</sup> In China, 45% of patients who tested positive for anti-HCV antibodies did not receive further diagnostic work-ups and nearly 38.9% of patients diagnosed with hepatitis C did not receive antiviral treatment.<sup>12</sup> Therefore, HCV-positive patients bear an enormous disease burden due to the low rate of treatment.

There have been a number of studies on HCV-related knowledge among HCV-positive patients, and the results indicated that the level of understanding of HCV was generally low.<sup>13 14</sup> In one study, only 37.3% of patients believed that HCV could be transmitted through sex and from mother to child.<sup>15</sup> HCV-positive patients may suffer stigmatisation and discrimination from others, including medical staff.<sup>16 17</sup> In addition, chronic infections and their influencing factors, including discrimination, can exacerbate depression and anxiety and reduce quality of life.<sup>18–20</sup> Therefore, this study was performed to investigate the knowledge, attitudes and psychological status of HCV-positive patients through a cross-sectional survey to provide a basis for the development of scientific strategies to improve treatment compliance and quality of life.

## MATERIALS AND METHODS

### Recruitment

The research was conducted in nine hospitals in five provinces in China, namely Inner Mongolia, Jilin, Beijing, Hebei and Sichuan. The study subjects were selected from those who visited the nine hospitals from March to June 2019 and were diagnosed with hepatitis C. The inclusion criteria were as follows: (1) older than 18 years; (2) infection confirmed by positive HCV antibody and HCV-RNA tests; and (3) provide signed consent form. The exclusion criteria included (1) having other serious diseases and (2) having memory disorders.

Written informed consent was obtained from the patients before recruitment.

### Patient and public involvement

No patients were involved in the design of the study. The results were disseminated to study participants through telephone interviews.

### Questionnaire

The patients were selected according to the inclusion criteria from among outpatients and inpatients in the selected medical institutions. After informed consent was obtained, further information was collected with questionnaires, including sociodemographic characteristics, possible route of transmission, knowledge of

HCV infections, attitudes towards HCV-positive patients, psychological health and factors affecting treatment.

The knowledge of HCV-positive patients was measured by a scale. This scale consists of 22 questions, covering three dimensions: the transmission of HCV, the prevention and treatment of HCV, and risky behaviours. Correct answers were scored as 1, while incorrect answers or those for which the respondent did not know the answer were scored as 0; the sum of the item scores yielded the aggregate scale score. The higher the score, the greater the level of knowledge. The 25th percentile and 75th percentile of the aggregate score were used to divide the scores into low, medium and high groups.

The attitudes towards patients infected with HCV were assessed with a 10-item scale adapted from the Toronto Chinese HBV Stigma Scale, with two items that were reverse indices.<sup>21</sup> Subjects could answer 'No', 'Not sure' or 'Yes' to each question, and those responses were assigned 1, 2 or 3 points, respectively (reverse questions were assigned 3, 2 or 1 point, respectively). High scores indicated positive attitudes towards other HCV-positive patients. The 25th percentile and 75th percentile of the aggregate score were used to divide the scores into low, medium and high groups.

Depressive symptoms in patients living with HCV were investigated using the Center for Epidemiologic Studies Depression (CES-D) scale from the National Institute of Mental Health. The scale consists of 20 items, 4 of which are reverse items. Each item had four responses, namely 'Rarely', 'Some', 'Occasionally' and 'Most', based on the frequency of the symptom; responses were assigned scores of 0, 1, 2 and 3, respectively (reverse items were scored 3, 2, 1 and 0, respectively). Scores of 15 and 20 were used as the cut-off values. A score below 15 indicated no depressive symptoms, scores from 15 to 20 indicated that depressive symptoms were likely, and scores above 20 indicated definite depressive symptoms.<sup>22 23</sup>

### Statistical analysis

EpiData (V.3.1; developed by Jens M Lauritsen and Michael Bruus, Odense, Denmark) was used for data entry and management. Continuous variables are described as mean and standard deviation (SD). Categorical variables are described as frequencies and proportions. The  $\chi^2$  test, analysis of variance or rank-sum test was used for univariate analysis. Spearman's correlation analysis was used to analyse the correlations between variables. Multivariate analysis was performed by logistic regression. A two-tailed p value <0.05 indicated statistical significance. All statistical analyses were performed with STATA V.15.0.

## RESULTS

### Characteristics of subjects

A total of 457 patients were recruited for this study and 48 were excluded because they returned incomplete questionnaires. Therefore, 409 patients were included in the final analysis. The patients were 215 men and 194 women,

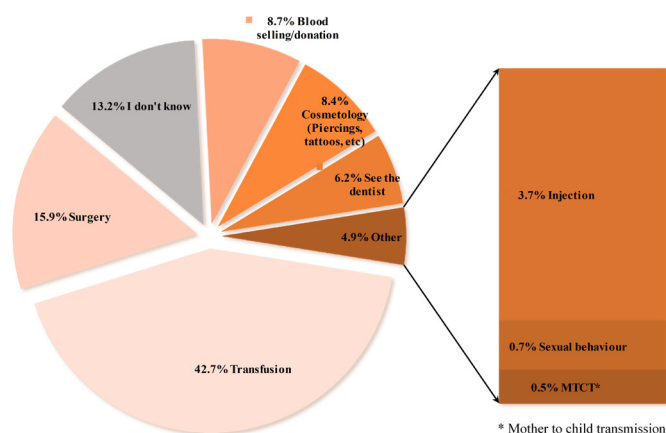
**Table 1** Characteristics of patients with hepatitis C

Characteristics	Sample size	Proportion (%)	Characteristics	Sample size	Proportion (%)
<b>Sex</b>			<b>Dietary habits</b>		
Male	215	52.5	Meat and fish	184	45.1
Female	194	47.6	Vegetables	82	20.1
<b>Age</b>			No habits	142	34.8
<65	292	71.3	<b>Marriage</b>		
≥65	117	28.7	Unmarried	3	0.7
<b>Nationality</b>			Married	374	91.4
Han	331	80.9	Divorced or widowed	32	7.8
Minority	78	19.1	<b>BMI</b>		
<b>Area</b>			Thin	22	5.4
Urban	119	29.2	Healthy	190	46.6
Rural	290	70.8	Overweight	113	27.7
<b>Education</b>			Obesity	84	20.3
Junior high or below	338	82.6	<b>Sexual behaviour (within 12 months)</b>		
Senior high	50	12.3	No	177	43.4
Bachelor or above	21	5.2	Yes	232	56.6
<b>Drinking alcohol</b>			<b>Number of sexual partners</b>		
Yes	125	30.6	1	224	96.7
No	284	69.4	≥2	8	3.3
<b>Smoking</b>			<b>Using condoms</b>		
Yes	150	36.8	No	17	7.2
No	259	63.2	Yes	215	92.8

BMI, body mass index.

with an average age of 59.0 (10.2) years. Details of the sociodemographic characteristics are shown in [table 1](#).

A retrospective analysis of the possible transmission of HCV showed that 42.7% of the patients claimed to have been infected with HCV during a transfusion, 15.9% during surgery and 8.7% during blood donation/sales. In total, 13.2% of the patients did not know how they had contracted HCV ([figure 1](#)).



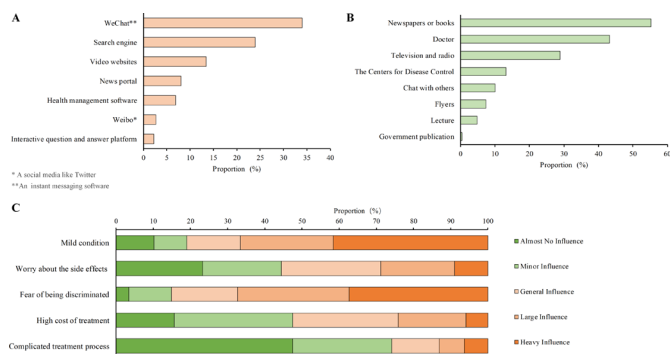
**Figure 1** Possible transmission routes of HCV in the study population . HCV, hepatitis C virus.

### Preference regarding the source of HCV-related information

Among all the methods of obtaining information about HCV, the most common offline method was reading books; 55.2% indicated that they obtained information from newspapers and other paper media sources; and 43.3% indicated that they obtained information from doctors. The most popular online channels were WeChat (34.0%), search engines (24.0%) and videos (13.5%), as shown in [figure 2A,B](#).

### Factors affecting the treatment of HCV-positive patients

Five common factors affecting the treatment of HCV-positive patients were ranked in order of importance from the perspective of the patients, with the most important factor ranked first. A total of 41.5% of the subjects believed that ‘my condition is mild’ had the greatest influence on their treatment, and 47.5% of the subjects thought that the ‘complicated treatment process’ had the least impact, as shown in [figure 2C](#). Each influencing factor was scored from 5 to 1. The average score for ‘fear of discrimination’ was 3.9 points, for ‘my condition is mild’ was 3.8 points, for ‘worry about the side effects of treatment’ was 2.7 points, for the ‘high cost of treatment’ was 2.7 points, and for ‘complicated treatment process’ was 2.0 points.



**Figure 2** Channel preference for HCV information of HCV-positive patients and factors affecting the treatment of HCV-positive patients. (A) Online channel preference for HCV information in patients living with HCV, (B) offline channel preference for HCV information in patients living with HCV, and (C) factors affecting the treatment of HCV-positive patients and the corresponding proportion. HCV, hepatitis C virus.

### Knowledge of HCV

The average knowledge score was 15.4, and the overall accuracy rate was 70.1%. Only 3.4% (14 of 409) of the subjects answered all the questions correctly. With regard to transmission, only 33.7% (138 of 409) of the subjects answered all 10 questions correctly, with an average score of 7.7. The question with the lowest percentage of correct responses was ‘HCV can be transmitted by a mosquito’, and only 51.1% (209 of 409) of the subjects answered this question correctly. Regarding prevention and treatment, only 20.5% (84 of 409) of the subjects answered all six questions correctly, with an average score of 4.4. The question with the lowest percentage of correct responses was ‘HCV can be prevented by vaccination’, and 41.6% (170 of 409) of the subjects mistakenly believed that there are vaccines to prevent HCV infection. There were six items regarding risky behaviours, and the average score was 3.4. A total of 9.8% (40 of 409) of the subjects answered all the questions correctly, while 89.0% (364 of 409) of the participants believed that smoking could aggravate hepatitis C (table 2).

### Attitude towards other HCV-positive patients

The majority of patients reported that their family members were aware of their infection (69.2%), and most patients were willing to recommend HCV testing to their family members (88.0%). There were still some patients whose relatives (10.4%) and friends (30.0%) were completely unaware of their infection. Only a small percentage of patients were willing to work/study (16.2%) or become partners (14.4%) with other HCV-positive patients (table 2). The mean overall attitude score was 24.3 (3.5).

### Psychological status of HCV-positive patients

The CES-D scale was used to evaluate the psychological status of HCV-positive patients, with a total possible score of 60 points. The mean CES-D score was 18.3 (5.2) points.

The details are shown in table 2. In total, 36.3% of the patients had no depression, 34.3% were likely to have symptoms of depression, and 29.4% had symptoms of depression. HCV-positive patients were generally categorised as possibly having symptoms of depression.

### Correlation and regression analyses of knowledge, attitudes and psychological status of HCV-positive patients

Spearman’s correlation analysis was performed for the knowledge, attitude and psychological status of the HCV-positive patients. The results showed that there was a negative correlation between the attitude and knowledge scores, with a correlation coefficient of  $-0.243$  ( $p < 0.05$ ). There was a negative correlation between the attitude and depression score, and the correlation coefficient was  $-0.278$  ( $p < 0.05$ ).

Knowledge, attitude and psychological status were included in the multifactor analysis as dependent variables. The knowledge of HCV-positive patients was related to age, location, nationality and attitude towards other HCV-positive patients. Elderly patients were more knowledgeable about HCV (OR=1.9, 95% CI 1.2 to 2.9), as shown in table 3. Patients belonging to ethnic minorities (OR=0.3, 95% CI 0.2 to 0.6) and those living in rural areas (OR=0.5, 95% CI 0.3 to 0.8) had lower knowledge scores than their counterparts. Meanwhile, patients with more positive attitudes had lower knowledge scores (OR=0.7, 95% CI 0.5 to 0.9). The psychological status of patients was only related to their attitude. Patients with a negative attitude were more likely to have symptoms of depression (OR=0.6, 95% CI 0.4 to 0.8).

Attitudes towards other HCV-positive patients were related to ethnicity, dietary habits and psychological status. Patients belonging to ethnic minorities had a more negative attitude (OR=0.4, 95% CI 0.2 to 0.6). Patients with no dietary preferences had more positive attitudes (OR=1.8, 95% CI 1.2 to 2.9) than patients with a preference for fish or meat (table 4). At the same time, patients with symptoms of depression were more likely to have a negative attitude (OR=0.6, 95% CI 0.4 to 0.8), as shown in table 5.

## DISCUSSION

### HCV is mostly transmitted through blood in China

HCV can be transmitted through the exchange of blood, during sexual intercourse and vertically from mother to child. The exchange of blood is the most common mode of transmission of HCV in China, including blood transfusions, the use of blood products and the entry of blood through damaged skin mucosa.<sup>24</sup> Most of the patients diagnosed in China underwent blood transfusions or pheresis plasma before 1993. In this study, the majority of HCV-positive patients from five provinces claimed that they had been infected with HCV through transfusions (42.7%) and during surgeries (15.9%), which was consistent with previous research. To prevent the transmission of HCV via blood transfusion, China began screening

**Table 2** Answers to the questionnaire on knowledge, attitude and psychological status

<b>A. Knowledge</b>		<b>Answer</b>		
<b>Question</b>		<b>Accuracy (%)</b>		
A1. HCV can be transmitted through transfusions or blood products.		93.6		
A2. Having sexual behaviour without a condom carries a risk of HCV infection.		79.5		
A3. HCV can be transmitted from mother to child.		78.7		
A4. HCV can be transmitted by mosquito.		51.1		
A5. Eating with HCV patients can get you infected.		75.8		
A6. Public toilets may transmit HCV.		79.0		
A7. Having sex with more than one person can increase the risk of infection.		77.3		
A8. Sharing syringes with others can transmit HCV.		91.2		
A9. Sharing toothbrushes and razors with others can transmit HCV.		72.1		
A10. Tattooing and aesthetic surgery can transmit HCV.		70.2		
A11. Infection with HCV will progress to chronic hepatitis C definitely.		52.8		
A12. People who appear healthy can also be infected with HCV.		82.2		
A13. HCV can lead to liver cirrhosis or liver cancer.		95.8		
A14. HCV can be treated with antiviral drugs effectively.		91.0		
A15. HCV can be prevented by vaccination.		41.6		
A16. HCV patients without any noticeable symptoms do not require treatment.		74.3		
A17. Alcohol can accelerate hepatitis C progress.		95.6		
A18. Smoking can accelerate hepatitis C progress.		11.0		
A19. Using condoms during sexual behaviours can reduce the risk of infection.		78.7		
A20. Weight control is beneficial to the recovery.		71.6		
A21. HCV patients should eat more high-protein foods.		16.1		
A22. HCV patients should not involve in physical exercise.		64.1		
<b>B. Attitude</b>		<b>Answer</b>		
<b>Question</b>		<b>No (%)</b>	<b>Not sure (%)</b>	<b>Yes (%)</b>
B1. Are most of your family aware of your illness?		10.4	20.4	69.2
B2. Are most of your friends and colleagues aware of your illness?		30.0	15.4	54.6
B3. Are you willing to shake hands with or hug people infected with HCV?		16.7	29.5	53.8
B4. Are you willing to have dinner with people infected with HCV?		15.9	30.3	53.8
B5. Would you feel uncomfortable living with hepatitis C patients?*		57.7	24.8	17.5
B6. Do you think hepatitis C patients should be restricted or isolated?*		79.1	15.4	5.5
B7. Do you think the privacy of HCV patients should be protected by legislation?		12.3	17.8	70.0
B8. Are you willing to advise your family to have a test for HCV?		2.3	9.7	88.0
B9. Are you willing to work or study with people infected with HCV?		5.7	78.1	16.2
B10. Are you willing to be in a romantic relationship with a person with HCV?		9.1	76.5	14.4
<b>C. Psychological status</b>		<b>Score</b>		
<b>Question</b>		<b>Mean</b>	<b>SD</b>	
C1. I was bothered by things that usually don't bother me.		0.7	0.7	
C2. I did not feel like eating; my appetite was poor.		0.8	0.8	
C3. I felt that I could not shake off the blues even with help from my family or friends.		0.4	0.7	
C4. I felt that I was just as good as other people.*		2.6	0.7	
C5. I had trouble keeping my mind on what I was doing.		0.6	0.7	
C6. I felt that everything I did was an effort.		0.6	0.7	
C7. I thought my life had been a failure.		0.3	0.6	
C8. I felt hopeful about the future.*		2.7	0.6	

Continued



Table 2 Continued

A. Knowledge	Answer	
C9. I felt fearful.	0.4	0.7
C10. My sleep was restless.	0.9	0.8
C11. I was happy.*	2.5	0.7
C12. I talked less than usual.	0.4	0.7
C13. I felt lonely.	0.4	0.6
C14. People were unfriendly.	0.3	0.5
C15. I enjoyed life.	2.7	0.6
C16. I felt depressed.	0.4	0.6
C17. I felt that people disliked me.	0.3	0.5
C18. I could not get 'going'.	0.2	0.5
C19. I felt sad.	0.5	0.6
C20. I had crying spells.	0.5	0.4

\*Reverse question.  
HCV, hepatitis C virus.

blood donors for anti-HCV antibodies in 1993 and for HCV-RNA in 2015. New cases of the transmission of HCV through blood transfusions have rarely been reported since the initiation of screening.<sup>8</sup>

#### Knowledge of HCV among HCV-positive patients was generally low

There have been a number of studies on the knowledge of HCV among HCV-positive patients, and the results indicated that the level of knowledge was generally low, especially with regard to healthcare and treatment.<sup>13 14 25</sup>

In this study, the overall rate of accurate responses on the HCV knowledge test among HCV-positive patients was 70.1%, and the routes of transmission of HCV were relatively well understood. More than 70% of patients were aware that exchange of blood, sexual intercourse and childbirth are ways HCV can be transmitted. However, there are still many misunderstandings regarding prevention, treatment and risky behaviours. Only 41.6% of patients knew that there is no vaccine for HCV, and 25.7% mistakenly believed that no treatment is needed in the absence of symptoms. Some studies have suggested that the knowledge HCV-positive patients have about HCV may be related to their ethnicity, age and education level, but the conclusions have been controversial.<sup>25-27</sup>

In this study, patients of minority ethnicities and those living in rural areas had lower knowledge scores than those of Han ethnicity and those living in urban areas, suggesting that future health interventions should focus on ethnic minorities and rural residents. No significant differences were found in knowledge scores according to age or education level, possibly because the majority of patients included in this study were older and generally had a relatively lower education level. The lack of knowledge was an obstacle to accessing treatment. Patients with CHC generally had a low level of awareness of antiviral therapy, leading to poor treatment compliance and even

non-compliance in some patients.<sup>28</sup> Standardised health education can shorten the duration of treatment, delay the development of CHC and improve the achievement of a sustained virological response. It can also increase the efficiency of healthcare systems and improve patient access to treatment.<sup>4 29</sup>

In China, the majority of HCV-positive patients had blood transfusions or sold or donated blood in the 1990s and are generally over 50 years old. HCV-positive patients often obtain information about HCV through traditional offline channels due to their age; these included paper-based media sources and doctors. Therefore, the most popular sources of information for HCV-positive patients were doctor-led lectures and interactive discussions between doctors and patients.<sup>25 29</sup> Traditional offline interventions were effective but had the disadvantages of being expensive and time-consuming and having low compliance. With the development of communication technology, some organisations have explored more convenient online interventions.<sup>30</sup> In this study, 34.0% of the patients chose WeChat as a means of acquiring knowledge about HCV. WeChat is an instant messaging software launched by TenCent in 2011. It has been rapidly promoted due to its convenience, with approximately 800 million users in China.<sup>31</sup> WeChat has been integrated into healthcare as a platform on which to promote health consciousness. It has been used in strategies to prevent, manage and recover from many diseases in communities, hospitals and physical examination centres and has achieved success.<sup>32-34</sup> There have been no studies on the application of WeChat to the education of HCV-positive patients. The combination of online and offline health education models is also worth exploring.<sup>35</sup>

**Table 3** Multiple analysis of knowledge by ordinal logistic regression

Variable	OR	95% CI	P value
<b>Sex</b>			
Male	Ref		
Female	0.79	0.50 to 1.27	0.330
<b>Age</b>			
<65	Ref		
≥65	1.88	1.21 to 2.91	0.005
<b>Education</b>			
Junior or below	Ref		
Senior	0.91	0.48 to 1.72	0.768
Bachelor or above	2.01	0.63 to 6.40	0.236
<b>Ethnicity</b>			
Han	Ref		
Minority	0.33	0.19 to 0.55	<0.001
<b>Area</b>			
Urban	Ref		
Rural	0.47	0.26 to 0.83	0.009
<b>Occupation</b>			
Farmer	Ref		
Retired	1.49	0.79 to 2.81	0.221
Other	1.52	0.63 to 3.67	0.355
<b>Drink</b>			
Yes	Ref		
No	0.72	0.45 to 1.14	0.155
<b>Smoke</b>			
Yes	Ref		
No	0.64	0.41 to 1.01	0.054
<b>Dietary habits</b>			
Meat and fish	Ref		
Vegetables	0.74	0.43 to 1.27	0.276
No habits	1.31	0.85 to 2.03	0.221
Attitude	0.67	0.49 to 0.91	0.011
Psychological status	0.99	0.96 to 1.03	0.673

The coefficient was category-dependent for ordinal variables. Ref, reference.

### Mental health of HCV-positive patients should not be neglected

Generally, symptoms of depression were more common in HCV-positive patients than in the general population. This study showed that the CES-D scale score of HCV-positive patients was 18 points. Previous studies have shown that CES-D scores in healthy people are often less than 13, with an average score of approximately 8.<sup>36</sup> HCV-positive patients were generally categorised as being in a predepressive state. People with chronic diseases frequently suffer physical, economic and social impairments, resulting in mental disorders. As hepatitis C is an

**Table 4** Multiple analysis of attitude by ordinal logistic regression

Variable	OR	95% CI	P value
<b>Sex</b>			
Male	Ref		
Female	0.89	0.54 to 1.45	0.632
<b>Age</b>			
<65	Ref		
≥65	0.85	0.54 to 1.34	0.632
<b>Education</b>			
Junior or below	Ref		
Senior	1.66	0.84 to 3.27	0.142
Bachelor or above	1.76	0.58 to 5.30	0.317
<b>Ethnicity</b>			
Han	Ref		
Minority	0.35	0.21 to 0.59	<0.001
<b>Area</b>			
Urban	Ref		
Rural	1.07	0.59 to 1.93	0.831
<b>Occupation</b>			
Farmer	Ref		
Retired	0.67	0.36 to 1.25	0.204
Other	0.81	0.33 to 1.97	0.636
<b>Drink</b>			
Yes	Ref		
No	1.46	0.91 to 2.34	0.116
<b>Smoke</b>			
Yes	Ref		
No	1.18	0.74 to 1.86	0.486
<b>Dietary habits</b>			
Meat and fish	Ref		
Vegetables	1.49	0.87 to 2.55	0.147
No habits	1.82	1.16 to 2.86	0.010
Knowledge	0.69	0.52 to 0.91	0.009
Psychological status	1.01	0.97 to 1.05	0.515

The coefficient was category-dependent for ordinal variables. Ref, reference.

infectious disease, patients with hepatitis C are stigmatised and discriminated against, which aggravates their psychological trauma.<sup>16</sup> This study also found that patients with depression symptoms had negative attitudes towards other HCV-positive people. Therefore, the psychological status of HCV-positive patients is still worthy of attention during treatment.

According to the results of this study, only 53.8% of HCV-positive patients were willing to have physical contact with other infected people. Only 16.2% were willing to work and study with HCV-positive individuals. A total of 24.2% of patients still believed that eating with others can result

**Table 5** Multiple analysis of psychological status by ordinal logistic regression

Variable	OR	95% CI	P value
<b>Sex</b>			
Male	Ref		
Female	1.43	0.90 to 2.28	0.130
<b>Age</b>			
<65	Ref		
≥65	1.47	0.95 to 2.26	0.084
<b>Education</b>			
Junior or below	1.00		
Senior	1.40	0.75 to 2.60	0.289
Bachelor or above	1.45	0.48 to 4.33	0.507
<b>Ethnicity</b>			
Han	Ref		
Minority	1.56	0.94 to 2.58	0.083
<b>Area</b>			
Urban	Ref		
Rural	1.03	0.59 to 1.81	0.914
<b>Occupation</b>			
Farmer	Ref		
Retired	0.58	0.31 to 1.09	0.089
Other	0.61	0.25 to 1.50	0.285
<b>Drink</b>			
Yes	Ref		
No	1.42	0.90 to 2.24	0.135
<b>Smoke</b>			
Yes	Ref		
No	1.00	0.64 to 1.56	0.998
<b>Dietary habits</b>			
Meat and fish	Ref		
Vegetables	0.71	0.42 to 1.19	0.198
No habits	0.85	0.55 to 1.32	0.479
Knowledge	0.80	0.61 to 1.05	0.104
Attitude	0.59	0.44 to 0.80	0.001

The coefficient was category-dependent for ordinal variables.  
Ref, reference.

in HCV infections, indicating that discrimination against HCV-positive patients remains relatively common. At present, the main factors affecting treatment compliance of HCV-positive patients are the low level of knowledge, poor socioeconomic conditions and concerns about the side effects of antiviral drugs. In addition, some patients did not seek medical treatment due to fear of stigmatisation.<sup>37 38</sup> This study found that the fear of discrimination and the severity of the illness were the most important factors affecting the treatment of HCV-positive patients. The complicated treatment process and the associated cost were not the most important concerns of patients.

Presently, the treatment compliance of HCV-positive patients is poor, which not only increases the disease burden but also makes the prevention and treatment of hepatitis C challenging in China. The elimination of the stigmatisation of and discrimination against HCV-positive patients should be a primary focus of strategies intended to improve treatment compliance among HCV-positive patients.

### Health education for patients is worth of more attention

In general, it is important for communities and hospitals to provide health education programmes, especially for HCV-positive people. Health education for HCV-positive patients has been shown to be effective at changing risky behaviours.<sup>39</sup> Effective interventions to improve compliance and treatment in HCV-positive patients are urgently needed. In addition, direct-acting antiviral (DAA) therapy has been shown to have reliable treatment compliance and outcomes in Chinese patients since it was approved in 2017.<sup>40</sup> Therefore, consideration should be given to the coverage of DAAs by the national health insurance to facilitate the elimination of hepatitis C.

This study is a multicentre study with a large sample size, with participants who had been laboratory-confirmed, and we used standardised scale to measure depression, which made the study stronger. However, this study suffers from two main limitations. First, there are more older participants selected, leading to selection bias. Second, there may have been recall bias regarding the route of HCV transmission since the infection happened a long time ago.

### CONCLUSIONS

We found that the most common mode of HCV infection was through blood transfusion. We recommend screening with anti-HCV and HCV-RNA tests in older people who have received blood transfusions. Some HCV-positive patients have a negative perception of other HCV-positive patients. It is important to reduce the stigmatisation of and discrimination against HCV-positive individuals through health education. The misunderstanding of hepatitis C and discrimination against HCV-positive individuals were more pronounced among the rural population and ethnic minorities, and these populations should receive more attention. HCV-positive patients experience psychological trauma. Patients with negative attitudes are more likely to have symptoms of depression. Therefore, it is very important to explore effective health education strategies to improve the knowledge, attitudes and mental health of HCV-positive patients and enhance treatment compliance.

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