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Prevalence of hepatitis C virus infection and its correlates in a rural area of southwestern China: a community-based cross-sectional study

Wanting Cheng,[1,2,3] Ya Yang,[1,2,3] Yibiao Zhou,[1,2,3] Penglei Xiao,[1,2,3] Yan Shi,[1,2,3] Jianchuan Gao,[1,2,3] Yue Chen,[4] Song Liang,[5,6] Wuli Yihuo,[7] Xiuxia Song,[1,2,3] Qingwu Jiang[1,2,3]

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WC and YY contributed equally.

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For numbered affiliations see end of article.

Correspondence to
Yibiao Zhou;
z_yibiao@hotmail.com

ABSTRACT

Objectives Hepatitis C virus (HCV) infection is a major public health problem in southwestern China. Our aim of the study was to assess the prevalence of HCV infection and its correlates in the Yi population of this region.

Methods A community-based survey was conducted to investigate sociodemographic characteristics and other associated factors for HCV infection in a rural area of southwestern China. Blood samples were collected and tested for antibodies to HCV. Anti-HCV positive samples were further assessed for HCV RNA.

Results A total of 2558 participants aged ≥14 years were included in our analysis. Of them, 2.8% (95% CI 2.2% to 3.5%) were positive for HCV antibody. Multiple logistic regression analysis revealed that sex (male vs female: adjusted OR (aOR)=3.30, 95% CI 1.80 to 6.07), marital status (unmarried vs married: aOR=0.27, 95% CI 0.09 to 0.80), ever using injection drug (aOR=28.65, 95% CI 15.9 to 51.64) and ever having blood transfusion (aOR=7.64, 95% CI 1.94 to 30.16) were significantly associated with HCV infection (indicated by positive HCV antibody). Stratified analysis by HIV infection found that in HIV-negative individuals, sex (male vs female: aOR=3.84, 95% CI 1.88 to 7.85), ever using injection drug (aOR=22.15, 95% CI 8.45 to 58.04), having multiple sexual partners (aOR=2.57, 95% CI 1.26 to 5.23), and ever having blood transfusion (aOR=16.54, 95% CI 4.44 to 61.58) were significantly associated with HCV infection and in HIV-positive individuals, ever using injection drug (aOR=8.96, 95% CI 3.16 to 25.38) was associated with HCV infection.

Conclusion The data suggested a higher risk of HCV infection in this area when compared with the rest of China and some unique associated factors. Rapid scale-up of targeted interventions are needed to prevent further transmission and consequent morbidities.

Strengths and limitations of this study

- The study was conducted in a rural area of Yi ethnic minority in southwestern China where drug abuse is a serious problem.
- Estimates provided in this study were community-based, which suggested a high prevalence of hepatitis C virus (HCV) infection in the rural area of Yi ethnic minority.
- Positive HCV antibody as an indicator of HCV infection might overestimate the burden of HCV infection.
- Young men who looked for jobs elsewhere were not sampled, which might result in an underestimation of the prevalence of HCV infection.
- There was no verification of self-reported information.

INTRODUCTION

Chronic infection with hepatitis C virus (HCV) is a major, growing public health concern and one of the leading causes of death globally.[1] Hepatitis B virus and HCV infections accounted for 96% (95% CI 94% to 97%) of viral hepatitis-related mortality in 2003.[1] There were estimated 1.75 million people newly infected with HCV worldwide in 2015, bringing the global total of people with hepatitis C infection to 71 million.[2] Approximately 704 000 people died of hepatitis C in 2013.[3] More than 90% chronic HCV infection can be cured by direct-acting antiviral medications.[3] However, 75%–90% of those with HCV infection were unaware of the infection and received no treatment, which eventually led to progressive liver fibrosis, cirrhosis and an increased risk of liver cancer.[4]

Epidemiological data on HCV infection are critical for developing public health strategies towards HCV infection prevention, care and treatment. HCV infection has various transmission routes, of which the most important one is direct percutaneous exposures to blood (eg, transfusion or transplantation from infectious donors and injecting drug use).[4] Evidence for sexual transmission of HCV is controversial.[5] Injection drug use (IDU) has become the predominant route of HCV infection in China since the establishment of

a blood transfusion scrutiny system.[6] The Yi Prefecture is along a major heroin trafficking route located in southwestern China, and is an endemic area for HIV.[7 8]

HIV and HCV have overlapping transmission routes.[9] Persons with HIV/HCV coinfection generally have more rapid progression of liver fibrosis, and the mortality of hepatocellular carcinoma is higher among coinfected patients than patients with HCV monoinfection.[4 10–12]

Several studies have described the prevalence of HCV infection and its determinants among some Han populations such as IDUs and blood donors in China.[8 13 14] However, to date, few studies were community-based and studied the Yi people. The primary purpose of this study was to investigate the prevalence of HCV infection and its associated factors in a rural area in Yi Prefecture. We also explored the association between HCV and HIV as well as HIV-HCV coinfection.

METHODS

Study area and population

The Yi Prefecture is located in Southwest of China. Most residents are Yi ethnicity, a minority group in China. Because of rugged mountainous terrains and sparsely scattered population, it remains an underdeveloped place in China.[15] This region is noted for HIV epidemic because of drug trafficking through the neighbouring Yunnan Province.[16] The study adopted a two-stage sampling scheme. First, three counties (P, Z and M) were selected from the Yi Prefecture on the basis of similar social demographic characters (such as gender structure, economic status, custom, education level and sanitary facility) as well as high prevalence of HIV infection. Second, four towns were randomly selected from three counties (A and B from P County, C from Z county and D from M county) with a total of 27 villages for the study (figure 1). All local residents aged≥6 years, who had lived there for more than 6 months, were invited to participate in the survey. Considering the local geographic characteristic and high authority of village chiefs, the village chiefs were asked for assistance in participants' enrolment.

Data and blood sample collection

Our study was conducted during the period from October 2014 to August 2015. Experienced workers from the local Center for Disease Control (CDC) were further trained for the investigation. They informed all participants of the objectives, contents and potential risks of this survey. Participants were personally interviewed using a structured questionnaire, which covered demographic characteristics (including age, sex, ethnicity, marital status, education, occupation and annual income), sexual behaviour (including age of first sex, frequency of condom use and multiple sexual partners), drug misuse behaviour (including age of starting drug misuse, mode of drug misuse in the past 6 months and sharing syringe in the past 3 months) and history of blood transfusion.

Each participant had a finger prick and provided about 1 mL of blood for testing HCV antibody by using the Diagnostic Kit for HCV antibody (Colloidal Gold) (product of Livzon Pharmaceutical Group, Zhuhai, P. R. China, batch number: 2014080200, 50 persons per kit). Colloidal gold kits are simple, economic and reliable methods for detecting HCV antibody.[17] Product specifications show that the sensitivity and specificity of the colloidal gold kits are both higher than 95%. A 5 mL blood sample was collected from those with a positive screening result and transported to local township hospitals. Whole blood was centrifuged at 1000 rpm for 5 min and plasma was separated and stored at constant temperature of −20°C within 8 hours, and then were transported in ice to Shanghai for HCV RNA testing by using the HCV RNA Quantitative Fluorescence Diagnostic Kit (PCR Fluorescence Probing, level of detection: 25 IU/mL) (Sansure Biotech, San Diego, USA and Changsha, China).

Ethical considerations

The procedures of this study were reviewed and approved by the Ethical Review Committee of School of Public Health, Fudan University. Each potential participant was asked to sign a written informed consent. If the participants were younger than 18 years of age, their parents were asked to sign the written informed consent for them. At the end of the study, participants with positive results were informed of the results and provided with appropriate medical consultations, further examinations and treatments.

Statistical analysis

Data were entered using the EpiData software (V.3.1; the EpiData Association) and were imported to SPSS statistical package (V.17.0; IBM SPSS Institute) for management and analysis. Descriptive data were generated for sociodemographic variables. The proportions of positive anti-HCV and HCV RNA were calculated together with their 95% CIs. In univariate analysis, Pearson χ^2 test or Fisher's exact test was used to test the significance of associations between HCV infection and associated factors and crude ORs with 95% CIs were calculated. We then employed a stepwise selection approach (p value of entry ≤0.05, p value of removal ≥0.1) to produce a final multivariable model, which included important variables associated with HCV infection. Adjusted ORs and 95% CIs were calculated for identified associated factors. Stratified analysis was performed for individuals with and without HIV infection. All p values were reported as being two sided.

RESULTS

A total of 3164 individuals were recruited into our study. As local Yi indigenous culture considers 14 years of age as the start of adulthood for permitting sexual behaviours, the current analysis included 2558 individuals aged 14 years or older, who completed both the survey questionnaire

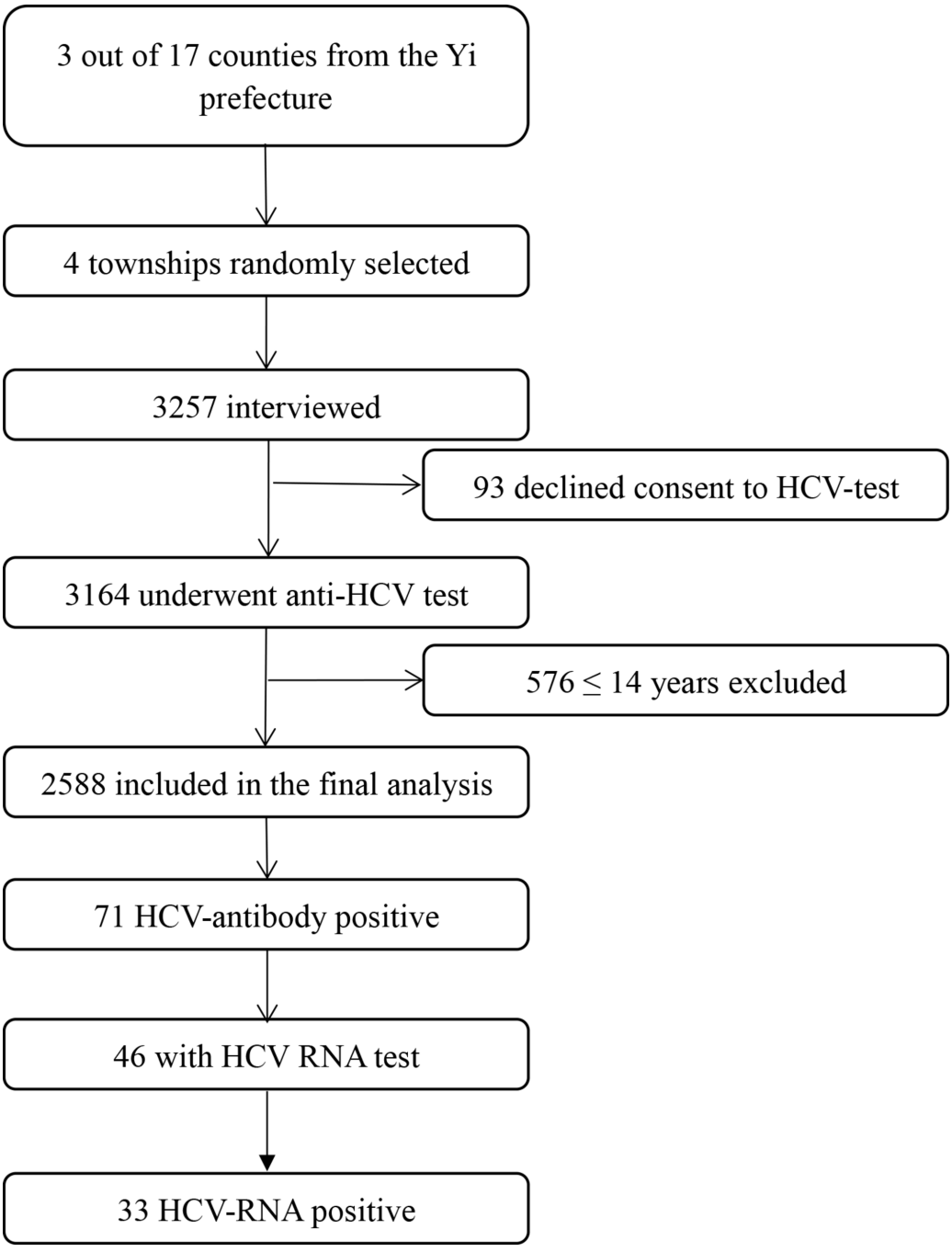

Figure 1 Flow chart demonstrating the selection of study participants. HCV, hepatitis C virus.

and HCV testing. Table 1 shows the demographic characteristics of the study participants. Participants were predominantly Yi people (97%). Most participants were women (65.1%), illiterate (64.7%), married (74.8%) and farmers (91.6%).

Table 2 shows the results for positive HCV antibody and HCV RNA testing. Of the participants, 2.8% (95% CI 2.2% to 3.5%) were positive for HCV antibody. Out of 71, 46 anti-HCV positive participants provided blood samples for HCV RNA testing, and 71.7% (95% CI 56.5% to 84.0%) of them were HCV RNA positive.

After adjustment for covariates, multiple logistic regression analysis showed that increased risks of HCV infection, indicated by positive HCV antibody, were significantly associated with sex (male vs female: aOR=3.30, 95% CI 1.80 to 6.07), marital status (unmarried vs married: aOR=0.27, 95%CI 0.09 to 0.80), ever using injection drug (aOR=28.65, 95% CI 15.9 to 51.64) and ever having blood transfusion (aOR=7.64, 95% CI 1.94 to 30.16) (table 3).

Tables 4 and 5 show the results for the correlates of HCV infection with and without HIV infection. The prevalence of HCV infection, indicated by positive HCV antibody, was higher among HIV-infected individuals than HIV-negative individuals (24.0%, 95% CI 16.6% to 31.5% vs 1.6%, 95% CI 1.1% to 2.2%). For HIV-negative participants, significant predictors for HCV infection were

Table 1 Demographic characteristics of the participants aged ≥14 years

Characteristic	No	%
Total	2558	
Township		
A	524	20.5
B	520	20.3
C	967	37.8
D	547	21.4
Sex		
Female	1664	65.1
Male	894	34.9
Age (years)		
14–24	409	16.0
25–34	577	22.6
35–44	760	29.7
45–54	545	21.3
≥55	267	10.4
Ethnicity		
Han	70	2.7
Yi	2481	97.0
Other	3	0.1
Missing	4	0.2
Education		
Illiterate	1656	64.7
Primary school and above	900	35.2
Missing	2	0.1
Occupation		
Farmer	2344	91.6
Student	155	6.1
Other	37	1.4
Missing	22	0.9
Annual income		
<1000	405	15.8
1000–2999	906	35.4
3000–4999	590	23.1
5000–9999	309	12.1
≥10 000	324	12.7
Missing	24	0.9
Marital status		
Unmarried	420	16.4
Married	1913	74.8
Divorced/Widowed	222	8.7
Missing	3	0.1

sex (male vs female: aOR=3.84, 95% CI 1.88 to 7.85), ever using injection drug (aOR=22.15, 95% CI 8.45 to 58.04), having multiple sexual partners (aOR=2.57, 95% CI 1.26 to 5.23) and ever having blood transfusion (aOR=16.54, 95% CI 4.44 to 61.58). Among HIV-infected participants, however, only ever using injection drug (aOR=8.96, 95% CI 3.16 to 25.38) was significantly associated with an increased risk of HCV infection.

Table 2 Proportions of positive hepatitis C virus (HCV) antibody and HCV RNA in participants aged≥14 years

	No	Positive cases	Positive rate (95% CI)
HCV antibody	2558	71	2.8% (2.2 to 3.5)
HCV RNA	46	33	71.7% (56.5 to 84.0)

DISCUSSION

In our study, 2.8% (95% CI 2.2% to 3.5%) of residents aged ≥14 years were positive for HCV antibody. The prevalence was slightly lower (2.2%) when children were included. The prevalence of HCV infection, indicated by positive HCV antibody, in this region was significantly higher than the prevalence among residents aged 15–59 years in China (0.62%).[18] This difference may be explained, at least in part, by a high proportion of ever using injection drug (3.48%) in the study area. Our study sites are adjacent to the 'Golden Triangle' where large amounts of illicit heroin are produced and traded, resulting in a serious epidemic of drug abuse. This is also supported by a study (HCV infection: 4.3%) conducted in a rural area in Yunnan Province, China (2012), which was also noted for drug abuse.[19]

Consistent with previous studies, IDUs had a higher prevalence of HCV infection (39.3%).[20 21] HCV is transmitted primarily through direct percutaneous routes, including sharing contaminated needles or syringes.[22] In the past few years, some countries have implemented effective needle or syringe exchange programmes and showed a substantial decline of HCV infection.[23] Opiate substitution therapy and provision of antiviral therapy in IDUs also lead to a reduction of HCV transmission.[24] Promotion of opiate substitution therapy and high coverage of needle and syringe programmes can substantially reduce the risk of HCV transmission among IDUs.[25–27] China has launched methadone maintenance treatment (MMT) and needle and syringe exchange programmes (NSEP) for IDUs in response to HIV epidemics. The MMT is expanding, with a support from multiple ministries of the central government, while the NSEP has received less support both politically and financially.[28] Therefore, a scale-up of the NSEP and integration with other harm reduction projects as well as a removal of the societal and political barriers should be a priority for the Chinese health authorities. Routine monitoring and surveillance of HCV infection at MMT clinics would also provide valuable information for evaluating the effects of MMT and NSEP interventions.[29] Previous studies reported that treatment uptake among IDUs remained very low, making IDUs a priority in HCV treatment programmes.[30]

Table 3 Associated factors of hepatitis C virus (HCV) infection in participants aged≥14 years

Characteristic	No of participants	No of infections (%)	cOR (95% CI)	aOR (95% CI)
Township				
A	524	4 (0.8)	0.12 (0.042 to 0.34)**	
B	520	11 (2.1)	0.34 (0.17 to 0.67)**	
C	967	23 (2.4)	0.38 (0.22 to 0.65)**	
D	547	33 (6)	1	
Sex				
Female	1664	17 (1)	1	1
Male	894	54 (6)	6.23 (3.59 to 10.81)**	3.30 (1.80 to 6.07)**
Age (years)				
14–24	409	4 (1)	0.23 (0.078 to 0.66)**	
25–34	577	24 (4.2)	1	
35–44	760	31 (4.1)	0.98 (0.57 to 1.69)	
45–54	545	10 (1.8)	0.43 (0.20 to 0.91)*	
≥55	267	2 (0.7)	0.17 (0.41 to 0.74)*	
Ethnicity				
Han	70	1 (1.4)		
Yi	2481	70 (2.8)		
Other	3	0 (0.0)		
Education				
Illiterate	1656	38 (2.3)	1	
Primary school or above	900	33 (3.7)	1.62 (1.01 to 2.60)*	
Occupation				
Farmer	2344	70 (3)		
Student	155	0 (0.0)		
Other	37	1 (2.7)		
Annual income				
<1000	405	12 (3)	1	
1000–2999	906	28 (3.1)	1.04 (0.53 to 2.08)	
3000–4999	590	18 (3.1)	1.03 (0.49 to 2.16)	
5000–9999	309	8 (2.6)	0.87 (0.35 to 2.16)	
≥10 000	324	5 (1.5)	0.51 (0.18 to 1.47)	
Marital status				

Continued

Table 3 Continued				
Characteristic	**No of participants**	**No of infections (%)**	**cOR (95% CI)**	**aOR (95% CI)**
Unmarried	420	4 (1.0)	0.28 (0.10 to 0.78)*	0.27 (0.093 to 0.80)*
Married	1913	63 (3.3)	1	1
Divorced/Widowed	222	4 (1.8)	0.54 (0.19 to 1.50)	0.45 (0.15 to 1.42)
Ever using injection drug				
No	2469	36 (1.5)	1	1
Yes	89	35 (39.3)	43.80 (25.58 to 75.00)**	28.65 (15.9 to 51.64)**
Having multiple sexual partners				
No	2163	40 (1.8)	1	
Yes	395	31 (7.8)	4.52 (2.79 to 7.32)**	
Condom use				
Always	629	15 (2.4)	0.93 (0.50 to 1.70)	
Occasionally	489	19 (3.9)	1.53 (0.87 to 2.69)	
Never	1440	37 (2.6)	1	
Ever having blood transfusion				
No or unknown	2534	67 (2.6)	1	1
Yes	24	4 (16.7)	7.36 (2.45 to 22.14)**	7.64 (1.94 to 30.16)**
HIV infection status				
Negative	2428	40 (1.6)	1	
Positive	129	31 (24.0)	18.88 (11.33 to 31.47)**	

*p<0.05; **p<0.01.
aOR, adjusted OR; cOR, crude OR.

Table 4 Univariable and multivariable analysis of variables associated with hepatitis C virus (HCV) infection among participants without HIV infection aged≥14 years

Characteristic	No of participants	No of infections (%)	cOR (95% CI)	aOR (95% CI)
Total	2428	40 (1.6)		
Township				
A	510	2 (0.4)	0.13 (0.030 to 0.59)*	
B	519	11 (2.1)	0.73 (0.33 to 1.62)	
C	913	13 (1.4)	0.49 (0.23 to 1.05)	
D	486	14 (2.9)	1	
Sex				
Female	1607	12 (0.7)	1	1
Male	821	28 (3.4)	4.69 (2.37 to 9.28)*	3.84 (1.88 to 7.85)**
Age (years)				
14–24	400	2 (0.5)	0.19 (0.042 to 0.83)*	
25–34	536	14 (2.6)	1	
35–44	697	14 (2)	0.76 (0.36 to 1.62)	
45–54	529	8 (1.5)	0.57 (0.24 to 1.38)	
55	266	2 (0.8)	0.28 (0.064 to 1.25)	
Ethnicity				
Han	68	0 (0.0)		
Yi	2353	40 (1.7)		
Other	3	0 (0.0)		
Education level				
Illiterate	1575	23 (1.5)	1	
Primary school and above	851	17 (2)	1.38 (0.73 to 2.59)	
Occupation				
Farmer	2216	40 (1.8)		
Student	154	0 (0.0)		
Other	36	0 (0.0)		
Annual income				
<1000	386	7 (1.8)	1	
1000–2999	846	15 (1.8)	0.98 (0.40 to 2.42)	
3000–4999	557	9 (1.6)	0.89 (0.33 to 2.41)	
5000–9999	294	6 (2)	1.13 (0.38 to 3.39)	
≥10 000	321	3 (0.9)	0.51 (0.13 to 1.99)	

Continued

Table 4 Continued

Characteristic	No of participants	No of infections (%)	cOR (95% CI)	aOR (95% CI)
Marital status				
Unmarried	401	1 (0.2)	0.12 (0.016 to 0.86)*	
Married	1823	38 (2.1)	1	
Divorced/Widowed	201	1 (0.5)	0.24 (0.032 to 1.72)	
Ever using injection drug				
No	2401	31 (1.3)	1	1
Yes	27	9 (33.3)	38.23 (15.93 to 91.71)*	22.15 (8.45 to 58.04)**
Having multiple sexual partners				
No	2074	24 (1.2)	1	1
Yes	354	16 (4.5)	4.04 (2.13 to 7.70)*	2.57 (1.26 to 5.23)**
Condom use				
Always	599	10 (1.7)	1.20 (0.56 to 2.60)	
Occasionally	466	11 (2.4)	1.71 (0.81 to 3.62)	
Never	1363	19 (1.4)	1	
Ever having blood transfusion				
No or unknown	2407	37 (1.5)	1	1
Yes	21	3 (14.3)	10.68 (3.01,37.81)*	16.54 (4.44 to 61.58)**

*p<0.05; **p<0.01.
aOR, adjusted OR; cOR, crude OR.

Table 5 Univariable and multivariable analysis of variables associated with hepatitis C virus (HCV) infection among HIV-infected participants aged≥14 years

Characteristic	No of participants	No of infections (%)	cOR (95% CI)	aOR (95% CI)
Total	129	31 (24)		
Township				
A	14	2 (14.3)	0.36 (0.073 to 1.77)	
B	1	0 (0.0)		
C	54	10 (18.5)	0.49 (0.204 to 1.18)	
D	60	19 (31.7)	1	
Sex				
Female	56	5 (8.9)	1	
Male	73	26 (35.6)	5.64 (2.00 to 15.90)**	
Age (years)				
14–24	9	2 (22.2)	0.89 (0.16 to 4.97)	
25–34	41	10 (24.4)	1	
35–44	62	17 (27.4)	1.17 (0.47 to 2.90)	
45–54	16	2 (12.5)	0.44 (0.086 to 2.29)	
≥55	1	0 (0.0)		
Ethnicity				
Han	2	1 (50)		
Yi	127	30 (23.6)		
Other	0	0 (0.0)		
Education level				
Illiterate	80	15 (18.8)	1	
Primary school and above	49	16 (32.7)	2.10 (0.93 to 4.77)	
Occupation				
Farmer	127	30 (23.6)		
Student	1	0 (0.0)		
Other	1	1 (100)		
Annual income				
<1000	19	5 (26.3)	1	
1000–2999	59	13(22)	0.79 (0.24 to 2.61)	
3000–4999	33	9 (27.3)	1.05 (0.29 to 3.76)	
5000–9999	15	2 (13.3)	0.43 (0.07 to 2.61)	
≥10000	3	2 (66.7)	5.60 (0.41 to 76.05)	

Continued

Table 5 Continued

Characteristic	No of participants	No of infections (%)	cOR (95% CI)	aOR (95% CI)
Marital status				
Unmarried	19	3 (15.8)	0.48 (0.13 to 1.79)	
Married	89	25 (28.1)	1	
Divorced/Widowed	21	3 (14.3)	0.43 (0.12 to 1.58)	
Ever using injection drug				
No	67	5 (7.5)	1	1
Yes	62	26 (41.9)	8.96 (3.16 to 25.38)**	8.96 (3.16 to 25.38)**
Having multiple sexual partners				
No	88	16 (18.2)	1	
Yes	41	15 (36.6)	2.60 (1.13 to 5.98)*	
Condom use				
Always	29	5 (17.2)	0.68 (0.23 to 2.05)	
Occasionally	23	8 (34.8)	1.75 (0.64 to 4.79)	
Never	77	18 (23.4)	1	
Ever having blood transfusion				
No or unknown	126	30 (23.8)	1	
Yes	3	1 (33.3)	1.60 (0.14 to 18.27)	

*p<0.05; **p<0.01.
aOR, adjusted OR; cOR, crude OR.

Individuals who have ever undergone a blood transfusion have a higher risk of HCV infection. Blood transfusion was one of the main routes of HCV transmission.[22] China has taken steps to halt illegal blood collection, contributing to a decrease of new HCV infections.[31] However, care for patients with chronic HCV infection is an ongoing challenge.[32]

Men had a higher prevalence of HCV infection than women, probably because drug misuse was more common in men (8.3%) than women (0.9%) in our study. Similar results were found in Poland.[33] Age was not independently associated with HCV infection, which is inconsistent with results from other studies,[34 35] and different epidemiological profiles might be a reason.[36] For example, nosocomial infection was a predominant risk factor in Taiwan, which is age related.[34] There were no significant differences in the distributions of ethnicity, education level, occupation and annual income between HCV-positive and HCV-negative individuals. Our study population was predominantly Yi people (97%) with similar sociodemographic background and lifestyle. Married individuals had a higher prevalence of HCV infection as evidenced by previous studies.[5 37]

The prevalence of HCV/HIV coinfection was 1.2% in the current study, equivalent to 24% of HCV in HIV-positive people. Results of the stratified analysis suggested that the prevalence of HCV in HIV-positive individuals was much higher than that in HIV-negative ones. A further comparison showed that HIV-positive compared with HIV-negative individuals had a constantly higher prevalence of HCV infection across all subgroups, which is likely resulted from depressed immunity due to HIV infection.[38] Another possible explanation is that people at higher risk for HIV infection is also at higher risk for HCV infection.[11] These results highlighted the necessity of routine HCV testing for all HIV-infected individuals, and also suggested that preventing HIV infection should be included as a part of HCV control strategies.

Among HIV-positive people, ever using injection drug was the only significant factor for HCV infection. A strong positive correlation has been reported between injection drug use and HIV/HCV coinfection.[39] In our study, of the 31 subjects with the coinfection, twenty-six (83.9%) were ever IDUs. Having multiple sexual partners is a well-defined risk factor for HCV infection,[5 35] however, it was not significant in HIV-infected individuals. Having multiple sexual partners is less important for HCV infection as compared with ever using injection drug in HIV-infected individuals.[39]

There are several limitations in this study. We used anti-HCV as an indicator for HCV infection, and there might be some false-positive results. Fifteen percent to 50% of patients with acute HCV infection clear HCV spontaneously.[23] Our estimate for the prevalence of HCV infection could be conservative, because many young men who looked for jobs elsewhere were a high-risk population for drug abuse and were not able to participate in the study. In addition, the history of drug abuse and other high-risk behaviours relied on self-reporting with no further verification, which might result in a misclassification bias for the estimation of associations between study factors and HCV infection. The size of HIV-infected people was small and there might be lack of an adequate statistical power to detect certain associations. The cross-sectional design did not allow us to know the causal relationship between associated factors and HCV infection.

Conclusion

Our results revealed a high risk of HCV infection, indicated by positive HCV antibody and its significant associations with drug abuse, sex, marital status and blood transfusion. We also found that the correlates of HCV infection varied in HIV-negative and HIV-positive individuals. It is vital to implement comprehensive and effective intervention programmes to reduce the risk of HCV transmission and achieve adequate access to HCV treatment, especially for people who are IDUs.

Author affiliations
[1]Department of Epidemiology, School of Public Health, Fudan University, Shanghai, China
[2]Key Laboratory of Public Health Safety, Ministry of Education, Fudan University, Shanghai, China
[3]Centre for Tropical Disease Research, Fudan University, Shanghai, China
[4]School of Epidemiology and Public Health, Faculty of Medicine, University of Ottawa, Ottawa, Canada
[5]Department of Environmental and Global Health, College of Public Health and Health Professions, University of Florida, Gainesville, USA
[6]Emerging Pathogens Institute, University of Florida, Gainesville, USA
[7]Puge Centre for Disease Prevention and Control, Sichuan, China

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Data sharing statement The data that support the findings of this study are available from the Center for Tropical Disease Research, Fudan University, but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of the Center for Tropical Disease Research, Fudan University.

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