Factors Associated with Risk Behaviors Towards Hepatitis B Among Migrant Workers: A Cross-sectional Study Based on Theory of Planned Behavior

Hui Xiang
Chongqing Medical University
Mingjing Li
Chongqing Medical University
Meng Xiao
Peking University
Min Liu
Chongqing Medical University
Xiaoshan Su
Chongqing Medical University
Dashu Wang
Army Medical University
Ke Li
Beijing Institute of Technology
Rui Chen
Beijing Institute of Technology
Lin Gan
Chongqing Medical University
Kun Chu
Chongqing Medical University
Yu Tian
Nan'an CDC
Xiaojun Tang
Chongqing Medical University
Xun Lei (leixun521@163.com)
Chongqing Medical University

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Abstract

Background: Rural-to-urban migrant workers are susceptible to hepatitis B (HB) because they lack self-protection awareness and social support. The present study aimed to investigate the current status of risk behaviors (RB) regarding HB among migrant workers and the influencing factors defined by the Theory of Planned Behavior (TPB).

Methods: A cross-sectional study was performed by two-stage cluster sampling from June to December 2018 in Chongqing, China. Logistic regression was adopted to explore factors associated with HB-related RB and behavioral intention (BI).

Results: A total of 1299 migrant workers were recruited in the surveys, among whom 29.56% respondents have performed HB-related RB and 85.53% had the BI. 58.19%of respondents having sexual activities never wore a condom. The risk scores of attitudes towards behavior (AB), subjective norms (SN), experience of behavior (EB) and regret feeling (RF) were positively associated with BI, while the sores of AB, EB and BI were positively associated with RB.

Conclusions: A considerable proportion of migrant workers have had HB-related risk behaviors or had the behavioral intention. Theory-grounded education, focused on the identified TPB variables, may play a significant role in improving the cognition and behaviors towards HB.

Introduction

Hepatitis B (HB), a leading cause of human's liver cirrhosis and liver cancer, remains a major threat to global public health, particularly in the Asian-Pacific and sub-Saharan Africa regions [1]. There are nearly 2.57 billion hepatitis B surface antigen (HBsAg)-positive people, and 887,000 HB cases dying of liver damage and complications worldwide according to the data from the World Health Organization (WHO) in 2015,the WHO also urged countries to invest in eliminating hepatitis, especially low-and middle-income countries[2].As one of the countries with high HB endemicity reported by WHO, China has more than 90 million HBpatients and 100,000 annually new HBV infections[2]According to the National Hepatitis Seroepidemiology Survey in 2006,although the (HBsAg)-positive rate has already declined to 2.08%among Chinese aged from 1 to14,the (HBsAg)-positive rate in populations aged between 15 to 59 was 8.57% [3]. Nevertheless, the overall (HBsAg)-positive rate was still over 8% for Chinese adults in 2016 [4].

Hepatitis B virus (HBV)is mostly transmitted through blood or body fluids of infected individuals[4], and having sex contact and using contaminated injector are known as the major routes for HBV infection among adults [5, 6]. Therefore, risk behaviors related to HB refer to unprotected sex, whoring, multi-partner sex, sharing injectors for drug use and so on[6, 7].

Rural-to-urban migrant workers, almost accounting for the whole of internal migrant population in China, were commonly defined as people who left rural area where they used to live for towns or cities to seek better employment opportunities and higher-incomes[8].The latest Migrant Workers Monitoring Investigation Report of China showed that the number of migrant workers has increased to 288.36 million by 2018[9]. Most migrant workers are basically low educated, engage in low-incomes and low-skilled jobs, and most of them live a stressful life [10]. They are mostly at sexually active ages but commonly being single or away from their spouses[10]. And the majority of them have poor sex-related to knowledge and little self-protection awareness, insufficient social support and limited access to health care[8]. Therefore, migrant workers are more likely to have HB-related behavior mentioned above, in which case the risk of HBV infection will be increased among them. Previous surveys showed that construction workers had unprotected sex, commercial sex, casual sex, blood selling and drug use, accounting for 14.9%, 7.9%, 8.4% and 0.7% respectively[11, 12]And previous studies also found that migrant workers had relatively higher susceptibility to HBV infection compared with non-migrants and local dwellers[13].As summarized in a systematic review and meta-analysis by Zou et.al, the prevalence of viral hepatitis among rural to urban migrant workers was 0.45%and 38.5 higher odds of infection than general populations in China[13].In addition, the frequent flow of migrant workers is possible to enlarge HBV spread to general population facilitate the regional transmission across China [14].It is therefore important to know the status of HB-related risk behaviors of migrant workers and have insight into the determinants.

One of the most recognized theories to understand behaviors is the theory of planned behavior (TPB, Ajzen, 1991). TPB states three conceptual modules determine behavior:(1)attitude toward the behavior (AB), refers to favorable/unfavorable appraisal of the behavior;(2)subjective norms (SN), refers to perception of social pressure to perform/not perform the behavior;(3) perceived behavioral control (PBC), refers to the perceived ease or difficulty to perform the behavior. TPB postulates that AB, SN, and PBC lead to the formation of a behavioral intention. The more favorable the AB and SN are, and the greater the PBC is, the stronger would be a person's intention to perform the behavior in question, and the higher possibility that the person would go into action[15, 16]In addition, Previous studies also argued that some independent variables, like experience and/or regret of performing a behavior, would directly or indirectly influence the behavioral intention and worth being taken into account to improve the TPB framework[17, 18]. To address the issue of health behaviors, TPB variables has been widely adopted to interpret HIV/AIDS-related behaviors, particularly for the highly susceptible groups such as commercial sex workers and men who have sex with men (MSM) [19, 20] And previously TPB was also applied to explore determinants on smoking, drinking and health-seeking behaviors of people [21, 22]. Nevertheless, the study that examined HB-related risk behaviors of rural-to-urban migrants was rarely reported.

The present study was the first attempt to (1) understand the status of risk behaviors related to HB that performed by migrant workers and (2) detect what and how the factors motivate and influence the behavioral intention and practical behaviors on the basis of TPB theory.

Methods

1. Study sites and sampling

Chongqing, located in southwestern China, is the largest municipality directly under the Chinese central government. It is regarded as "miniature China" because its geographic characteristics, urban-rural distribution and social-economic profile are close to the national average[23]. The city area of Chongqing,

one of the busiest places Chinese migrant workers keep flowing in, consists of nine administrative districts with an area of 5472.82 Km^2 and a population of 8.65 million, among which immigrants take about 23.5%[23, 24].The (HBsAg)-positive rate among migrant workers in the city area of Chongqing was 8.6% [25].And there were nearly 26,000 new infections of viral hepatitis in 2016 in terms of the Health Statistic Yearbook of Chongqing [24].

Two-stage stratified cluster sampling was performed to recruit participants between June 2018 and January2019. Firstly, nine districts of Chongqing's city area were categorized into three stratifications-more developed, medium developed and less developed-by economic development, geographic background and population density, and then three districts were randomly selected to represent for each stratification respectively. Secondly, two enterprises were purposively sampled in each district, including the manufacturing, construction, wholesale and retail industry, transportation industry, hotel and catering industry and community services. Local Center for Disease Control and Prevention, Health Supervision Institute, and Urban-rural Development Committee helped to coordinate with sampled units. The inclusion criteria of target individuals were (1) 18 years and above, (2) having been in the Chongqing's city area for at least six months, (3) not registered as Chongqing urban resident, (4) engaging mainly in the secondary or tertiary industry. Given a considerable part of migrant workers were low-educated or illiterate, trained investigators assisted to explain the questions in mandarin and Chongqing dialect. Subjects who were unable to understand the questionnaire items or refused to be surveyed were excluded. Participants were reassured that all responses would be anonymous and written informed consent was granted by each respondent. Surveys were conducted in relatively undisturbed environment and peak working hours were avoided to guarantee the quality of surveys. Completeness of each questionnaire was double-checked by investigators.

2. Study Instrument

The questionnaire was constructed basically in terms of the TPB on health-related to behaviors and perceptions in published studies[19, 20]. Experts in epidemiology and hepatology were involved to modify the logic and wordings of the questionnaire. A pilot survey was conducted with 90 migrant workers in nearby restaurants and construction sites. The final version consisted of nine modules with Cronbach's Alpha coefficients ranging from 0.759 to 0.968, and confirmatory factor analysis (CFA) showed a good fitting degree (χ^2/df = 1.859, RMSEA = 0.039, GFI = 0.900, AGFI = 0.883, CFI = 0.969, IFI = 0.969).TPB variables was assessed using a five-point semantic differential scale, and the average item score for each module was computed to be used as the scale score. The higher the scores are, the more risky the respondents would be. The definition of each modules and variable scales were shown in Table 1.The items of different dimensions and positive and negative items were sorted at intervals to prevent the respondents from having a Socially Desirable Responding or picking an initial scale for each item.

Table 1
Definition and item scales of each module in the questionnaire for HB-related behaviors

Modules	Definition	Variable scales
Social demographic	Respondents were asked about gender, age, hometown, ethnicity, education background, marital status, cohabitation with spouse/partner, accommodation condition, years of being a migrant worker, type of work, job position, working hours per day, monthly personal income, whether send money to the family, whether smoke, whether drink, HB vaccination behavior, willingness of vaccination against HB (only for those who was not vaccinated yet) .	-
HB knowledge	Knowledge level involves questions of individual's understanding on transmitted routes and preventive measures towards HB	Each correct response of knowledge on HB was scored as one point while incorrect response or unknown value zero.
TPB		
HB-relatedrisk behaviors (RB)	Unprotected sexual behaviors (never or rarely wear a condom), casual sexual behavior, commercial sexual behavior, homosexual behavior, IDUs, blood selling /transfusion illegally, and sharing toothbrushes/towels.	RB questions were valued by 5-point semanticdifferential scale: from "never" (1) to "often" (5). An example is "Have you had casual sex in the last six months?"
Behavioral intention (BI)	BI refers to person's readiness to perform a given behavior.	BI questions were measured by 5-point semantic differential scale: from"absolutely impossible"(1)to "absolutely possible"(5).An example is: "Is it possible for you to have commercial sexual behavior? "
Attitudes toward a behavior (AB)	AB refers to the degree to which performance of the risk behavior is positively or negatively valued.	AB questions were measured by 5-point semantic differential scale: from "very much unsafe"(1) to"very much safe"(5). An example is: "Do you think it is safe to have commercial sex?"
Subjectivenorms (SN)	SN refers the perceptions of social pressure to engage or not to engage in risk behaviors.	SN questions were measured by5-ponitsemantic differential scale: from"strongly agree"(1) to "strongly disagree"(5). An example is: "Do you agree with your friends if they advise you not to actany of the above behaviors?"
Perceived behavioral control(PBC)	PBC refers a person feels she/he is in control of a given risk behaviors.	PBC questions were measured by 5-point semantic differentialscale:from"verymuchable"(1) "very much unable"(5). An example is: "Are you able to decide whether or not have casual sex by yourself?"
Experience of behavior (EB)	EB was referred the safe or unsafe perception towards related to risk behaviors.	EB questions were measured by 5-point semantic differential scale: from stronglydisagree(1)tostrongly agree(5). An example is: "I had behaviors mentioned above to meet physiological needs."
Regret feeling (RF)	RF refers to an individual's psychological regret and shame on HB risk behaviors that he ever did and/or he plans to have. And RF includes retrospective regretand prospective regret.	RF questions were measured by 5-point semantic differential scale: from "very much"(1) to"not at all"(5). Examplesare: "Did you regret after having commercial sex behavior?" and "Will you regret if you had commercial sex?"

3. Data analysis

Survey data were double-checked and entered into a database by Epidata 3.1 (The EpiData Association, Odense, Denmark).All data were analyzed using IBM SPSS 22.0 (SPSS Institute, Chicago, USA). Categorical data were assessed by the number and proportion of responders. Continuous variables of socio-demographics, such as age, years of being a migrant worker, working hours per day, were converted into categorical variables and then described by number and proportion of responders. Knowledge levels of responders were divided into poor, medium and good by scores less than 7, 8 ~ 10, 11 ~ 13respectively [26]. TPB variable were involved as continuous variable with average scores. With regard to the association analyses, independent variables were identified as the variables in the modules of socio-demographics, HB knowledge and TPB framework, and the dependent variables were identified as behavioral intention and HB-related risk behaviors. For the dependent variables, behavioral intention was dichotomized into "never had an intent" and "had an intent for at least a behavior" and HB-related risk behaviors were dichotomized into "never had risk behavior" and "had at least once risk behavior". Univariate analyses were performed with independent variables of socio-demographic and HB knowledge with the two dependent variables by Chi-square tests. And independent variables with *P*-values less than 0.10 in the univariate analyses were subsequently inputted into the logistic regression models ($\alpha = 0.05$, $\beta = 0.10$) along with variables in TPB modules to detect the possible influence factors for the two dependent variables. Binary logistic regressions were fitted with the dependent variables by entering three blocks of variables: block I, socio-demographics and knowledge level; block II, TPB variables; block III, demographics, knowledge level and TPB variables. BI was not included in the block II and block III when it was regarded as dependent variable. Dummy variables were coded for

variables with more than two values, and variables stepwise entered into the models. Adjusted odds ratios (ORs) and 95% confidence intervals (CIs) were computed, and *P*-values less than 0.05 were deemed statistically significant.

Results

1. Basic characteristics

A total of 1528 migrant workers meeting the eligible criteria were recruited.1299 (85.02%) respondents completed the questionnaire, among whom758(58.35%) were females. The median age of respondentswas30.58 ± 21.18 years, ranging from 18 to 68. 901(69.36%) respondents were married or had a relationship, but 670(51.58%) respondents were not living with their spouse/partner. Meanwhile,43(26.33%) were single and 55(4.23%) were divorced/windowed. There were 443(34.10%) respondents having a monthly income above 4000 RMB and 451 (43.53%) regularly sending money back home. 626 (48.19%) respondents had an education background of junior school or below, 246(18.93%) respondents drank alcohol, and 921(70.90%) respondents showed a poor HB knowledge level. The top three accesses for the migrant workers to obtain HB knowledge and information were hearing from friends/family members (53.88%), followed by television or radio (38.12%) and internet or mobile phone (27.95%) respectively (Table 3).

2. HB behavior intention

1111(85.52%%) respondents ever had an intention to have risk behaviors in the last six months (Table 2). Respondents who have had an intention to perform casual sex, commercial sex, homosexual/anal sex, take drugs through sharing injectors, sell/transfuse blood illegally and share towels/toothbrushes were 55.65%, 36.26%, 73.90%, 26.10%, 31.18% and 53.50% respectively. As for condom use, more than half of the respondents (62.36%) were very willing to wear a condom when having HB risk sexual behaviors (Table 4).

Table 2
Characteristic differences inHB-related behaviors and behavioral intention

Variables		Risk behavioral intention				Risk behavior			
	Total	Non-risk behavioral intention group	Risk behavioral intention group	χ^2	*P*-value	Non-risk behavior group	Risk behavior group	χ^2	*P*-value
Gender									
Male	541	51(9.43)	490(90.57)	19.07	**< 0.001**	350(64.70)	191(35.30)	14.69	**< 0.001**
Female	758	137(18.07)	621(81.93)			565(74.54)	193(25.46)		
Age group									
18 ~ 30	632	64(10.13)	568(89.87)	22.52	**< 0.001**	419(66.30)	213(33.70)	10.78	**0.013**
31 ~ 40	252	39(15.48)	213(84.52)			191(75.79)	61(24.21)		
41 ~ 50	276	54(19.57)	222(19.57)			205(74.28)	71(25.72)		
51~	139	31(22.30)	108(77.70)			100(71.94)	39(28.06)		
Hometown									
Rural area in Chongqing	964	136(14.11)	828(85.89)	0.40	0.526	671(69.61)	293(30.39)	1.25	0.264
Rural area in other cities/provinces	335	52(15.52)	283(84.48)			244(72.84)	91(27.16)		
Ethnicity									
Han	1226	180(14.68)	1046(85.32)	0.77	0.380	865(70.55)	361(29.45)	0.14	0.708
Others	73	8(10.96)	65(89.04)			50(68.49)	23(31.51)		
Education background									
Primary school or below	153	33(21.57)	120(78.43)	10.53	**0.015**	110(71.90)	43(28.10)	4.10	0.251
Junior middle school	473	59(12.47)	414(87.53)			346(73.15)	127(26.85)		
High school	476	61(12.82)	415(87.18)			329(69.12)	147(30.88)		
College and above	197	35(17.77)	162(82.23)			130(65.99)	67(34.01)		
Marital status									
Single	343	39(20.74)	304(27.36)	3.65	0.161	248(72.30)	95(27.70)	3.45	0.178
Married/having a partner	901	140(15.54)	761(84.46)			634(70.37)	267(29.63)		
Divorced/widowed	55	9(16.36)	46(83.64)			33(60.00)	22(40.00)		
Live with Spouse/Partner									
No	670	112(16.72)	558(83.28)	5.63	**0.017**	465(69.40)	205(30.60)	0.71	0.399
Yes	629	76(12.08)	553(87.92)			450(71.54)	179(28.46)		
Accommodation									
Self-renting room/ Self-purchased house	767	126(16.43)	641(83.57)	5.78	**0.016**	542(70.66)	225(29.34)	0.05	0.830
Co-renting room/ Dormitory	532	62(11.65)	470(88.35)			373(70.11)	159(29.89)		
Years of being a migrant worker									
Six months -three years	486	71(14.61)	415(85.39)	1.21	0.547	346(71.19)	140(28.81)	0.22	0.897
Three years-six years	265	33(12.45)	232(87.55)			185(69.81)	80(30.19)		
More than six years	548	84(15.33)	464(84.67)			384(70.07)	164(29.93)		
Type of work									

[a]Secondary industry includes manufacturing industry and construction industry;

[b]Tertiary Industry includes catering industry, hotel attendant, logistics industry, wholesale /retail business and part-time jobs.

[c] Respondents only who have not inoculated would answer this question.

Variables		Risk behavioral intention				Risk behavior			
Secondary industry[a]	584	71(12.16)	513(87.84)	4.59	**0.032**	407(69.69)	177(30.31)	0.28	0.594
Tertiary Industry[b]	715	117(16.36)	598(83.64)			508(71.05)	207(28.95)		
Job position									
Ordinary employee	1076	152(14.13)	924(85.87)	0.61	0.436	766(71.19)	310(28.81)	1.70	0.193
Group leader/ Administrator	223	36(16.14)	187(83.86)			149(66.82)	74(33.18)		
Working hours per day									
≤ 8 h	384	72(18.75)	312(81.25)	8.06	**0.005**	287(74.74)	9725.26)	4.84	**0.028**
> 8 h	915	116(12.68)	799(87.32)			628(68.63	287(31.37)		
Monthly personal income (RMB)									
< 2500	355	71(20.00)	284(80.00)	12.06	**0.002**	26775.21)	88(24.79)	6.68	**0.035**
2501 ~ 4000	501	62(12.38)	439(87.62)			352(70.26)	149(29.74)		
> 4000	443	55(12.42)	388(87.58)			296(66.82)	147(33.18)		
Do you regularly send money to your family?									
No	907	129(14.22)	778(85.78)	0.15	0.697	632(69.68)	275(30.32)	0.83	0.362
Yes	392	59(15.05)	333(84.95)			283(72.19)	109(27.81)		
Do you smoke?									
No	1008	164(16.27)	844(83.73)	11.74	**< 0.001**	741(73.51)	267(26.49)	20.41	**< 0.001**
Yes	291	24(8.25)	267(91.75)			174(59.79)	117(40.21)		
Do you drink?									
No	1053	167(15.86)	886(84.14)	8.64	**0.003**	771(73.22)	282(26.78)	20.65	**< 0.001**
Yes	246	21(8.54)	225(91.46)			144(58.54)	102(41.46)		
Level of HB knowledge									
Poor (0 ~ 7)	921	127(13.79)	794(86.21)	10.93	**0.004**	648(70.36)	273(29.64)	0.38	0.824
Medium (8 ~ 10)	305	41(13.40)	265(86.60)			214(69.93)	92(30.07)		
Good (11 ~ 13)	72	20(27.78)	52(72.22)			53(73.61)	19(26.39)		
HaveinoculatedHB vaccine									
No	647	86(13.29)	561(86.71)	1.45	0.228	451(69.71)	196(30.29)	0.33	0.564
Yes	652	102(15.64)	550(84.36)			464(71.17)	188(28.83)		
Willing to inoculate HB vaccine(N = 647)[c]									
No	398	57(14.32)	341(85.68)	0.68	0.410	285(71.61)	113(28.39)	1.50	0.221
Yes	249	30(12.05)	219(87.95)			167(67.07)	82(32.93)		

[a]Secondary industry includes manufacturing industry and construction industry;

[b]Tertiary Industry includes catering industry, hotel attendant, logistics industry, wholesale /retail business and part-time jobs.

[c] Respondents only who have not inoculated would answer this question.

Table 3
Access to hepatitis B (HB) knowledge(N = 1299)

Source of Obtaining HB Knowledge	N (%)
Friends or family members	848 (53.88%)
Television or radio	600 (38.12%)
Internet or cell phone APPs	440 (27.95%)
Newspaper or magazine	310 (19.70%)
Doctors	304 (19.31%)
Brochure or booklets	296 (18.81%)
Advertisement	172 (10.93%)
Health education or professional training	133 (8.45%)

Table 4
Behavioral intention and risk behaviors towards HB among migrant workers

Variables	N	%
Are you possible to have casual sex with people who are not your spouse/partner		
Absolutely impossible	576	44.34
It depends/Little possible	584	44.96
Possible/Absolutely possible	139	10.70
Are you possible to have commercial sex		
Absolutely impossible	828	63.74
It depends/Little possible	421	32.41
Possible/Absolutely possible	50	3.85
Are you possible to have homosexual/anal sex		
Absolutely impossible	960	73.90
It depends/Little possible	310	23.86
Possible/Absolutely possible	29	2.24
Are you willing to wear a condom when having sex?		
Very willing	810	62.36
Willing /Neutral	293	22.55
Unwilling/Absolutely unwilling	196	15.09
Are you possible to share the injector for intravenous drug use		
Absolutely impossible	1072	82.53
It depends/Little possible	215	16.55
Possible/Absolutely possible	12	0.92
Are you possible to sell or transfuse blood illegally		
Absolutely impossible	894	68.82
It depends/Little possible	351	27.02
Possible/Absolutely possible	54	4.16
Are you possible to share toothbrushes/towels with others		
Absolutely impossible	604	46.50
It depends/Little possible	521	40.10
Possible/Absolutely possible	174	13.40
Have you had casual sex with people who are not your spouse/partner in the last six months		
Never	1166	89.76
Rarely/seldom[a]	108	8.32
Sometimes / often	25	1.92
Have you had commercial sex in the last six months		
Never	1238	95.30
Rarely/ seldom	55	4.24
Sometimes / often	6	0.46
Have you had homosexual behaviors in the last six months		
Never	1259	97.00
Rarely/ seldom	36	2.77

[a] rarely-less than once per month; seldom-about twice per month; sometimes-about eight timesper month; often-more than twelve time per month

[b]multiple options, the sum of percentages of the options may be not equal to 100%.

Variables	N	%
Sometimes / often	4	0.03
Have you worn a condom when you were having sex (N = 842)		
Never	490	58.19
Sometimes/about half time	68	8.08
Frequently/every time	284	33.73
Reasons for never using condom (N = 490)*		
Have taken other methods of contraception	210	42.60
Uncomfortable to wear a condom	167	33.87
The partner did not ask	50	10.20
Trust in each other	49	9.96
Embarrassing if purchase condom	43	8.74
Do not know how to use condoms	38	7.72
Forgot to use	29	5.89
Too expensive	9	1.83
Have you sharedtheinjector for intravenous drug use in the last six months		
Never	1286	99.00
Rarely/ seldom	11	0.85
Sometimes / often	2	0.15
Reasons for sharing the injector(N = 13)[b]		
Difficult to get new injector	7	-
For saving money	4	-
Could' not refuse the request of others	2	-
Increase friendship and belongingness	1	-
Have yousoldortransfusedblood at illegal clinics in the last six months		
Never	1283	98.77
Rarely/ seldom	13	1.00
Sometimes / often	3	0.23
Reasons for selling or transfusing blood illegally (N = 16) [b]		
Too expensive to go to a regular hospital	7	-
More convenient	7	-
For making money	2	-
Have you shared toothbrushes/towels in the last six moths		
Never	1034	79.60
Rarely/ seldom	200	15.40
Sometimes / often	65	5.00
Reasons for sharing toothbrush or towel (N = 265) [b]		
Intimate relationship	156	58.87
Took other's by mistake	93	35.09
Did not mind	38	14.34

[a] rarely-less than once per month; seldom-about twice per month; sometimes-about eight timesper month; often-more than twelve time per month

[b]multiple options, the sum of percentages of the options may be not equal to 100%.

Variables	N	%
For saving money	8	3.01
[a] rarely-less than once per month; seldom-about twice per month; sometimes-about eight timesper month; often-more than twelve time per month		
[b]multiple options, the sum of percentages of the options may be not equal to 100%.		

3. HB risk behavior status

Table 2depictsthat 384(29.56%) migrant workers have performed HB-related risk behaviors in the last six months. Of all the respondents,133 (10.24%) have had causal sexual behavior, 61(4.7%)have had commercial sex, 40 (3.00%) have had homosexual/anal sex in the last six months. Among the 842 respondents having sexual behaviors, more than a half (58.19%) never worn a condom. To explore the reason why not using a condom, 210(42.60%) respondents indicated that they had other methods of contraception, 167(33.87%) respondents reported that it was uncomfortable to wear a condom, and 43(8.74%) respondents felt embarrassed to purchase the condom. There were 265 (20.40%) respondents having shared toothbrushes or towels with friends or family members, and13 (1.00%) respondents have shared injectors for intravenous drug use and 16 (1.23%) respondents havesold or transfused blood illegally(Table 4).

4. Influencing factors associated with behavioral intention

As table 2shows, univariate analyses indicated that the behavioral intention of respondents was significantly different with variables of gender, age, education background, living with spouse/partners, type of accommodation, type of work, working hours per day, monthly personal income, smoking, alcohol drinking and level of HB knowledge respectively ($P < 0.05$). Binary logistic regression detected that migrant workers with an education level of junior middle school (OR = 2.16, 95%CI:1.25 ~ 3.73), aged from 18 to 30 (OR = 3.49, 95%CI: 1.91 ~ 6.39) and from 31 to 40 (OR = 2.06, 95%CI: 1.13 ~ 3.77), were more intent to have HB-related behaviors, while thosebeing female (OR = 0.61, 95%CI: 0.39 ~ 0.95) were less likely to have the behavioral intention in the block Ⅱ. The scores of AB (OR = 9.36, 95%CI: 5.32 ~ 16.46), SN (OR = 2.20, 95%CI: 1.54 ~ 3.17), EB (OR = 1.92, 95%CI: 1.43 ~ 2.58) and RF (OR = 1.20, 95%CI: 1.05 ~ 1.38) modules had positive associations with the behavior intention for HB-related risk behaviorsin the block II. In the Block Ⅲ, migrant workers were younger(OR = 2.77, 95%CI: 1.41 ~ 5.43) and with the poor level of HB knowledge(OR = 2.10, 95%CI: 1.03 ~ 4.28)were more intent to have risk HB behavior, and the scores of AB (OR = 9.49, 95%CI: 5.32 ~ 16.91), SN (OR = 2.06, 95%CI: 1.44 ~ 2.95),EB (OR = 2.17, 95%CI: 1.60 ~ 2.94) and RF (OR = 1.23, 95%CI: 1.06 ~ 1.42) remainedto be positivelyassociated with the behavioral intention(Table 5).

Table 5
Factors associated with intention towards HB-related behaviors and behaviors among migrant workers

Variables	Intention towards HB-related behaviors						HB-related behaviors					
	Block ⅰ		Block ⅱ		Block ⅲ		Block ⅰ		Block ⅱ		Block ⅲ	
	OR[a]	95%CI[b]	OR[a]	95%CI[b]	OR	95%CI [a]	OR[a]	95%CI[b]	OR[a]	95%CI[b]	OR	95%CI [a]
Gender												
Male	ref				ref		ref				ref	
Female	**0.61**	**(0.39,0.95) ***			0.97	(0.58,1.61)	0.91	(0.66,1.24)			1.14	(0.82,1.57)
Age group												
51~	ref				ref		ref				ref	
18 ~ 30	**3.49**	**(1.91,6.39) *****			**2.77**	**(1.41,5.43) ** **	1.39	(0.91,2.13)			1.48	(0.94,2.33)
31 ~ 40	**2.06**	**(1.13,3.77) ***			1.92	(0.96,3.82)	0.90	(0.55,1.48)			0.94	(0.56,1.58)
41 ~ 50	1.54	(0.91,2.61)			1.60	(0.88,2.81)	1.05	(0.65,1.68)			1.02	(0.62,1.67)
Education background												
College and above	ref				ref							
Primary school or below	1.46	(0.74,2.88)			0.67	(0.31,1.46)	-	-			-	-
Junior middle school	**2.16**	**(1.25,3.73)** **			1.49	(0.80,2.76)	-	-			-	-
High school	1.37	(0.84,2.24)			1.00	(0.57,1.76)	-	-			-	-
Live together with Spouse/Partner												
No	ref				ref							
Yes	0.93	(0.62,1.40)			1.00	(0.64,1.58)	-	-			-	-
Accommodation												
Self-renting room/ Self-purchased house	ref				ref							
Co-renting room/ Dormitory	1.34	(0.90,2.01)			1.36	(0.87,2.13)	-	-			-	-
Type of work												
Secondary industry	ref				ref							
Tertiary Industry	1.08	(0.71,1.63)			0.91	(0.56,1.49)	-	-			-	-
Working hours per day												
≤ 8 h	ref				ref		ref				ref	
> 8 h	1.25	(0.85,1.82)			1.39	(0.90,2.13)	1.22	(0.92,1.64)			1.25	(0.93,1.69)
Monthly personal income (RMB)												
> 4000	ref				ref		ref				ref	
< 2500	0.92	(0.54,1.54)			0.87	(0.49,1.55)	0.86	(0.60,1.22)			0.77	(0.54,1.12)
2501 ~ 4000	1.16	(0.76,1.76)			1.03	(0.65,1.63)	0.94	(0.70,1.24)			0.85	(0.63,1.14)

[a]OR odds ratios; [b]CI, confidence intervals; * $P < 0.05$, ** $P < 0.01$ *** $P < 0.001$

Variables	Intention towards HB-related behaviors						HB-related behaviors					
	Block Ⅱ		Block Ⅲ		Block Ⅳ		Block Ⅱ		Block Ⅲ		Block Ⅳ	
	OR[a]	95%CI[b]	OR[a]	95%CI[b]	OR	95%CI [a]	OR[a]	95%CI[b]	OR[a]	95%CI[b]	OR	95%CI [a]
Do you smoke?												
No	ref				ref		ref				ref	
Yes	1.35	(0.77,2.38)			1.09	(0.58,2.06)	1.43	(0.99,2.03)			1.32	(0.92,1.89)
Do you drink?												
No	ref				ref		ref				ref	
Yes	1.58	(0.93,2.71)			1.54	(0.84,2.83)	**1.63**	**(1.18,2.26) ****			**1.57**	**(1.12,2.19) ****
Level of HB knowledge												
Good (11 ~ 13)	ref				ref							
Medium (8 ~ 10)	**2.01**	**(1.12,3.60) ***			1.65	(0.86,3.20)	-	-			-	-
Poor (0 ~ 7)	**2.30**	**(1.22,4.33) ***			**2.10**	**(1.03,4.28) ***	**-**	**-**			**-**	**-**
TPB variables												
AB			**9.36**	**(5.32,16.46) *****	**9.49**	**(5.32,16.91) *****			**1.29**	**(1.02,1.63) ***	1.27	(0.99,1.61)
BI			**-**	**-**	**-**	**-**			**1.38**	**(1.07,1.76) ***	**1.42**	**(1.10,1.82) ****
SN			**2.20**	**(1.54,3.17) *****	**2.06**	**(1.44,2.95) *****			1.19	(1.00,1.41)	1.16	(0.97,1.38)
PBC			1.10	(0.98,1.24)	0.99	(0.86,1.14)			1.01	(0.92,1.11)	0.95	(0.86,1.05)
EB			**1.92**	**(1.43,2.58) *****	**2.17**	**(1.60,2.94) *****			**1.29**	**(1.07,1.56) ****	**1.23**	**(1.01,1.50) ***
RF			**1.20**	**(1.05,1.38) ****	**1.23**	**(1.06,1.42) ****			1.10	(0.99,1.24)	**1.13**	**(1.02,1.25) ***

[a]OR odds ratios; [b]CI, confidence intervals; * $P < 0.05$, ** $P < 0.01$ *** $P < 0.001$

5. Influencing factors associated with HB-related risk behaviors

As table 2shows, univariate analyses indicated that the risk behavior of respondents was significantly different with variables of gender, age, working hours per day, monthly personal income, smoking and alcohol consumption respectively (P < 0.05). Binary logistic regression detected thatsmoking (OR = 1.43, 95%CI: 1.01 ~ 2.03) and drinking (OR = 1.63, 95%CI:1.18 ~ 2.26) were positivelyassociated with HB-related risk behaviors in the block Ⅱ. In the block Ⅲ, modules of AB(OR = 1.29, 95%CI:1.02 ~ 1.63), BI(OR = 1.38, 95%CI:1.07 ~ 1.76) and EB (OR = 1.29, 95%CI:1.07 ~ 1.56) were positivelyassociated with risk behaviors.In the block Ⅳ, adjusted withsocio-demographics, TPB modules ofBI (OR = 1.42, 95%CI:1.10 ~ 1.82), EB (OR = 1.23, 95%CI:1.01 ~ 1.50) and RF (OR = 1.13, 95%CI:1.02 ~ 1.25), werepositivelyassociated with risk behaviors (Table 5).

Discussion

The Action Plan for Prevention and Treatment of Viral Hepatitis in China (2017–2020) has underlined the significance to prevent and control of viral hepatitis,particularly for those who are susceptible to the disease and possible to spread the transmission[27]. Rural-to-urban migrants may play a crucial role in the cross-regional diffusion of HBV in China due to their frequently seasonal moves over workplaces and homelands[13]. Existing evidence showed that the proportion of migrant workers who performed risk behaviors related to sexually transmitted diseases (STDs) were relatively high[13]. Our findings, verifying this point, detected that about one-third of participants had at least once of HB-related risk behaviors during in the last six months, although the proportion of migrant workers' causally extramarital sex (10.24%) and commercial sex (4.7%) were lower than those reported in studies conducted in Shanghai (15.22%) and Zhejiang (5.7%)[28].In addition, 2.80% of migrant workers had admitted to have homosexual behaviors, which reminds us to also pay attention because MSM have been referred to be highly risky for STDs[19].

Although the Chinese Ministry of Health has advocated condom use to prevent STD ssince 2006 [29],in our study a considerably big proportion of migrant workers (58.19%)never wore a condom when having any types of sexual behaviors. This finding was in line with the high rate of condom nonuse for migrant

workers in Hefei, China (52.68%%)[12].Regarding the potential barriers for condom use, having taken other contraception methods, uncomfortable to wear and no requirement by the partner took the top three positions. Those indicate that wearing a condom was only viewed as a contraception way but not understood as a protection from STDs by migrant workers, and the pleasant sensation outdid the perception of disease infection. All those have pointed to the weak knowledge and awareness of STDs among migrant workers, which is right consistent with the generally low level of HB knowledge for respondents in our study. In fact, protected sex with a condom has been proved to be significantly practical and cost-effective to prevent STD transmission[19],and therefore, extensive publicity for condom usage is in need to be strengthened among migrant workers. Meanwhile, vending machines for condoms (better for free) could be set near by migrant workers' living areas to cope with the embarrassed feeling mention by the respondents[30].

Similar as we though, there was a small part of respondents having a history of injector sharing for drug use (1.00%) and illegal blood selling/transfusion (1.23%), in line with studies with the migrant workers in eastern China[12, 28]. Blood transmission, a significant route of HBV infection as well as sexual transmission, should not be neglected. In addition, one-fifth of participants in our study were detected sharing personal hygiene products like toothbrushes and/or towels, which would amplifythe possibility of HBV infection through the broken skin[31]. Therefore, health educationtargeting those issues need to be enhanced with migrant workers.

Approximately one-third of migrant workers admitted having had HB-related risk behaviors,moreover, nearly 90% of respondents expressed that they would like to perform some risk behaviors sometime. This is a potential threat as behavioral intention indicates a possibility for a person to have actual behavior. Therefore, educational intervention on altering behavior intention and self-protection cognition is crucial in addition to directly regulating on risk behaviors.

Similar with previous studies, logistic regressions suggested that migrant workers who were male, at younger age, with lower educational background and at lower knowledge level would be more intended to act HB-related risk behaviors[17]. Compared with females, most males are less perceived with disease risk and overestimate their own health status[32]. Compared with older ones, young people are right in a sexually active period and will probably have more sexual demands[28]. Compared with higher educated ones, people with lower education tend to be less cognitive for disease prevention[33].Compared with individuals at a higher knowledge level, those with weak HB knowledge may lack understanding of HB and be less aware of self-protection against the disease[32]. Consistent with the study on HIV-related behaviors in northwest Ethiopia, there was a positive association between drinking and performing risk behaviors. It is to some extent because drinking probably results in more opportunities for casual sex and unprotected sex for migrant workers [34].

As adjusted by socio-demographics, migrant workers scored higher points ofAB and SN were more intended to act risk behaviors, and those scored higher points of BI were more likely to have performed HB-related risk behaviors. All these can be exactly interpreted by the typical TPB framework – AB and SN, produced from behavioral beliefs and normative beliefs, will act on BI, and then work together with BI to trigger the behavior[16]. That is, if migrant workers have a more favorable attitude towards HB-related risk behaviors and less perceived social pressure upon acting the behaviors, they would be more intended to do so, and also be more likely put into practice[15]

To strengthen the interpretability of the practical behaviors of migrant workers, two socio-psychological modules - EB and RF - were introduced into the typical TPB framework. As we expected, the two variables were positively associated with both behavioral intention and practical risk behaviors. Previous studies argued that daily decision making would be affected by the actual emotional experience, and successful implementing of risk behaviors in the past appears to render migrant workers more likely to repeat in the future[35]. Besides, the stronger regret feeling migrant workers have, the less intended they would be and also less likely to perform risk behaviors. It is because regret representing a negative consciousness and an emotional reaction to persons' intention or behaviors[17].Given migrant workers showed low perception and poor self-protection against HBV infection, health educational campaigns are necessary to improve their cognition and behaviors as mentioned above. Considering friends/family members, television/radio and internet /cell phone APPs are widely popular sources for migrant workers to gain health knowledge and information, peer education will work, and the health education through the combination of new and traditional media will be also encouraged. Besides, only half of migrant workers have inoculated HB vaccine in our study. It is partially because free HB immunization program is not offered to people aged above 15 currently in China[3]. Therefore, a sound compensation system is in expectation to provide extra financial support for HB-susceptible adults including migrant workers to expand the coverage of the HB vaccine.

There were some limitations necessary to be noticed. Firstly, causal inference based on the associations observed in our study might be more or less limited as it was in cross-sectional study design. Secondly, selection bias, giving rise to an imbalance of occupation distribution between the sampled participants and the whole population of Chongqing's migrant workers, might be introduced as it was non-random sampling. In addition, report bias, mostly assumed as an underestimate of acting risk behaviors, might be inevitable due to the personal privacy and social desirability, although anonymity of respondents was reassured.

Conclusions

There was one-third of migrant workers having had HB-related risk behaviors and nearly 90% of migrant workers intended to act risk behaviors in the present study. The Condom was poorly used among migrant workers for STDs prevention. Migrant workers who were male, less educated, poorer in HB knowledge and at a younger age have the stronger intention of HB-related risk behaviors, while those who were drinking alcohol were more likely to have performed risk behaviors. As completed with innovative variables of EB and RF, the TPB framework played well in interpreting the influencing factors, showing that migrant workers have a more positive attitude and less subject norm towards risk behaviors would be more intended and then be more likely to act. Accordingly, more attention should be paid to both improving the disease perception and self-protection awareness, as well as helping migrant workers to regulate their behaviors. Meanwhile, theory-grounded health educational interventions, targeting the key influencing factors proposed by the analyses, are in need of peer education and the combination of both new and traditional media.

Declarations

Ethic Approval and Consent to participate:

The present study was approved by Institutional Review Broad of CQMU (No. 2018016), and the informed consent was obtained from every respondents included in the study.

Consent for publication:

All of the authors have approved the manuscript and agreed to publish the study.

Availability of supporting data:

Not applicable.

Competing interests:

The authors declare no competing interests.

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Authors' contributions:

XL and XJT conceived and designed the study. XL, HX, MX, ML,YT, XSS,DSW, KL, RC performed field surveys and data collection. HX, ML and XL conducted data analyses. HX, LMJ, and XL drafted the manuscript. XJT reviewed and polished the manuscript. All the authors have cautiously read and approved the final version of the manuscript.

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References

1. Howell J, Van Gemert C, Lemoine M, Thursz M, Hellard M: **Overview of hepatitis B prevalence, prevention, and management in the Pacific Islands and Territories**. *Journal of gastroenterology and hepatology* 2014, 29(11):1854-1866.
2. **World Health Organization. World Health Organization. Hepatitis B** [http://www.who.int/news-room/fact-sheets/detail/hepatitis-b]
3. **National Bureau of Disease Prevention and Control of China. The National Epidemiological Serosurvey Result of Hepatitis B** [http://www.chinacdc.cn/dcbg/200804/t20080423_34870.htm]
4. Qiu Y, Ren J, Yao J: **Healthy adult vaccination: An urgent need to prevent hepatitis B in China**. *Human vaccines & immunotherapeutics* 2016, 12(3):773-778.
5. L Z, S R, W Z: **On the sexual transmission dynamics of hepatitis B virus in China**. *Journal of theoretical biology* 2015, 369(undefined):1-12.
6. A R, R A, JE V, A A, N Z, W M, M B, E M, A E, M S: **HCV, HBV, and HIV seroprevalence, coinfections, and related behaviors among male injection drug users in Arak, Iran**. *AIDS care* 2014, 26(9):1122-1126.
7. Martinson FE, Weigle KA, Royce RA, Weber DJ, Suchindran CM, Lemon SM: **Risk factors for horizontal transmission of hepatitis B virus in a rural district in Ghana**. *American journal of epidemiology* 1998, 147(5):478-487.
8. X C, IR R, T Y, R C: **Work stress, life stress, and smoking among rural-urban migrant workers in China**. *BMC public health* 2012, 12(undefined):979.
9. **National Bureau of Statistics. Migrant Workers Monitoring Investigation Report of China in 2018. 2019 (In Chinese)** [Available online: http://www.stats.gov.cn/tjsj/zxfb/201904/t20190429_1662268.html]
10. C Z, Q G, H Y, L C, X F, W J: **Quality of life in China rural-to-urban female migrant factory workers: a before-and-after study**. *Health and quality of life outcomes* 2013, 11(undefined):123.
11. Wei L, Zhou J, Tan Z, Li D, Wang Q: **Survey on HIV / AIDS related prevention knowledge, attitudes and high-risk behavior among migrant workers in Chongqing**. *Chinese Journal of Family Planning* 2010, 18(07):411-413
12. Xin Q, Huang Y, Hu C, Wang J, Zhang X, Zhang Z, Yang L, Huang F: **High-risk behaviors and condom use among migrant workers at construction sites**. *Journal of Chinese Public Health* 2010, 26(07):914
13. Zou X, Chow EP, Zhao P, Xu Y, Ling L, Zhang L: **Rural-to-urban migrants are at high risk of sexually transmitted and viral hepatitis infections in China: a systematic review and meta-analysis**. *BMC infectious diseases* 2014, 14:490.
14. Lau JT, Thomas J: **Risk behaviours of Hong Kong male residents travelling to mainland China: a potential bridge population for HIV infection**. *AIDS Care* 2001, 13(1):71-81.
15. Ajzen I, Fishbein M: **Understanding attitudes and predicting social behavior**. *Englewood Cliffs NJ* 1980.
16. Ajzen I: **Constructing a TpB Questionnaire: Conceptual and Methodological Considerations**. 2006.

17. CJ S, AS G, CK G, EA M, AD B, M C: **Feel good now or regret it later? The respective roles of affective attitudes and anticipated affective reactions for explaining health-promoting and health risk behavioral intentions**. *Journal of applied social psychology* 2019, 49(6):331-348.
18. JC L-J, A P-G, FJ O-R: **Behavioral Intention to Gamble Among Adolescents: Differences Between Gamblers and Non-gamblers-Prevention Recommendations**. *Journal of gambling studies* 2019.
19. Andrew BJ, Mullan BA, de Wit JB, Monds LA, Todd J, Kothe EJ: **Does the Theory of Planned Behaviour Explain Condom Use Behaviour Among Men Who have Sex with Men? A Meta-analytic Review of the Literature**. *AIDS and behavior* 2016, 20(12):2834-2844.
20. Abamecha F, Godesso A, Girma E: **Intention to voluntary HIV counseling and testing (VCT) among health professionals in Jimma zone, Ethiopia: the theory of planned behavior (TPB) perspective**. *BMC public health* 2013, 13:140.
21. Su X, Li L, Griffiths SM, Gao Y, Lau JT, Mo PK: **Smoking behaviors and intentions among adolescents in rural China: the application of the Theory of Planned Behavior and the role of social influence**. *Addictive behaviors* 2015, 48:44-51.
22. van Lettow B, de Vries H, Burdorf A, Conner M, van Empelen P: **Explaining young adults' drinking behaviour within an augmented Theory of Planned Behaviour: temporal stability of drinker prototypes**. *British journal of health psychology* 2015, 20(2):305-323.
23. **Bureau of Statistics of Chongqing, China 2018. statistical yearbook. 2018 (In Chinese)** [Available online: http://tjj.cq.gov.cn//tjnj/2018/indexch.htm]
24. **Health commsssion of Chongqing,China. 2016, Health Statistic Yearbook. 2017 (In Chinese)** [http://wsjkw.cq.gov.cn/sjfx/]
25. Gong.T., gong.Y., Deng.D., Ye.M.L.: **A Cross- Sectional Study On Hepatitis B In Migrant Workers Of Chongqing (In Chinese)**. *Modern Preventive Medicine* 2007(20):3842-3844.
26. Health CMo: **The national prevent and control plan of HB in China(2006~2010)**. *Chinese Pratical Journal of Rural Doctors* 2006(08):1-4.
27. **Action plan for prevention and treatment of viral hepatitis in China(2017-2020) (In Chinese)**. *Chinese Journal of Virology* 2018, 8(01):1-5.
28. Pan X, Zhu Y, Wang Q, Zheng H, Chen X, Su J, Peng Z, Yu R, Wang N: **Prevalence of HIV, syphilis, HCV and their high risk behaviors among migrant workers in eastern China**. *PloS one* 2013, 8(2):e57258.
29. **HIV Prevention and Control Regulations 2006 (In Chinese)** [Available online: http://www.nhc.gov.cn/wjw/zcjd/201304/d46a4092080040c1bec7d7428ead4bd0.shtml]
30. **Abstract on the Reply to the Proposal No. 0834 (Medical and Sports No. 094) of the Fourth Session of the 12th National Committee of the CPPCC. 2016 (In Chinese)** [Available online: http://www.nhc.gov.cn/wjw/tia/201611/620feea7ddc54a418ff1a6c233bb0e2c.shtml]
31. Madiba TK, Nkambule NR, Kungoane T, Bhayat A: **Knowledge and Practices Related to Hepatitis B Infection among Dental and Oral Hygiene Students at a University in Pretoria**. *Journal of International Society of Preventive & Community Dentistry* 2018, 8(3):200-204.
32. Liu C, Lvu YK: **Analysis on hepatitis B related KAP among migrants in Beijing (In Chinese)**. *Chinese Journal of Health Education* 2015, 31(11):1029-1032.
33. A M, P V-M, D A-L, A S-R, P G-R, M G-L, E G-M, L M-B, J N-C, D P-P *et al*: **Sexual risk among Colombian adolescents: knowledge, attitudes, normative beliefs, perceived control, intention, and sexual behavior**. *BMC public health* 2018, 18(1):1377.
34. K T, B W, H G: **Sexual behavior and vulnerability to HIV infection among seasonal migrant laborers in Metema district, northwest Ethiopia: a cross-sectional study**. *BMC public health* 2015, 15(undefined):122.
35. M P, J C: **Sexual behavior and perceived risk of HIV/AIDS among young migrant factory workers in Nepal**. *The Journal of adolescent health : official publication of the Society for Adolescent Medicine* 2006, 38(3):237-246.