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Self-management behaviors in adults with chronic hepatitis B: A structural equation model

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ABSTRACT

Background: Chronic hepatitis B is a serious and chronic health problem, requiring self-management to control the disease and related complications.
Objectives: To develop a structural model to identify how social support, self-efficacy and disease knowledge contribute to their self-management behaviors in adults with chronic hepatitis B.
Design: A cross-sectional study.
Settings: Hepatology units in two hospitals in Chongqing, China.
Participants: A total of 306 patients with chronic hepatitis B were recruited.
Methods: Data were collected using Social Support Rating Scale, Self-Efficacy for Managing Chronic Disease, Hepatitis B Knowledge Questionnaire and Chronic Hepatitis B Self-Management Scale. Structural equation model was applied to analyze the data.
Results: The final model showed good model fit. Social support directly influenced self-management behaviors ($\beta = 0.19$, $p < 0.01$), and indirectly influenced self-management behaviors ($\beta = 0.20$, $p < 0.01$) through self-efficacy. Self-efficacy directly influenced self-management behaviors ($\beta = 0.37$, $p < 0.05$). Disease knowledge indirectly influenced self-management behaviors ($\beta = 0.12$, $p < 0.05$) through self-efficacy.
Conclusions: Our findings indicated that social support, self-efficacy and disease knowledge directly or indirectly affected self-management behaviors in adults with chronic hepatitis B. This provides a theoretical basis for developing self-management interventions for patients with chronic hepatitis B, which may lead to health improvements in this population.

What is already known about the topic?

- Chronic hepatitis B infection is a global public health concern.
- Self-management is required to control chronic hepatitis B and associated complications.
- Few studies focus on the self-management behaviors among patients with chronic hepatitis B.

What this paper adds

- Patients with chronic hepatitis B were found to perform insufficient self-management behaviors.
- Social support, self-efficacy and disease knowledge directly or indirectly affected self-management behaviors in patients with chronic hepatitis B.
- Self-management behaviors should be improved for patients with chronic hepatitis B. The findings provide a theoretical basis for developing self-management interventions. Strategies to enhance social support, self-efficacy and disease knowledge should be addressed when developing interventions.

1. Introduction

Chronic hepatitis B infection is a major global health problem as it affects about 257 million people worldwide (World Health Organization, 2017). Chronic hepatitis B infection is endemic in China, with an estimated 93 million people with chronic hepatitis

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B infection according to the national hepatitis sero-epidemiological survey (Wang et al., 2016). Chronic hepatitis B is at high risk for developing into cirrhosis, hepatic decompensation and hepatocellular carcinoma (Fattovich et al., 2008). The chronic nature of chronic hepatitis B and its potential serious complications contribute to the patient's declining quality of life and economic and psychological burden (Keskin et al., 2013).

Self-management has been defined as an ability and process that an individual used to control his disease (Thorne et al., 2003). Self-management plays an important role in the management of chronic disease for facilitating better adjustment to the illness and reducing the likelihood of complications (Marks et al., 2005). Self-management is crucial for controlling chronic hepatitis B. Self-management for chronic hepatitis B refers to patients' active involvement in the daily activities to manage their symptoms, medications, lifestyle changes, and psychosocial issues (Kong et al., 2015). Patients with chronic hepatitis B should be responsible for the daily self-management to control their conditions, including adherence to antiviral drugs, regular follow-up visits, symptoms monitoring, dietary changes, abstaining from alcohol, moderate exercise, avoiding fatigue, and coping with negative emotion resulting from the illness (Lin et al., 2015; Xu and Liu, 2018; Yang et al., 2009). However, many patients with chronic hepatitis B did not adhere to the recommended self-management activities. Xu and Liu (2018) found 51.2% of patients with chronic hepatitis B had low adherence to oral antiviral drugs. In Lin et al.'s (2015) study, 39.1%, 57.5%, 48.0%, 74.6% and 36.6% of patients with chronic hepatitis B reported adherence of medication, follow-up visits, moderate exercise, abstaining from alcohol and emotion regulation, respectively. In another study (Yang et al., 2009), only 39.3% and 42.3% of patients with chronic hepatitis B were found to adhere to medication and follow-up visits, respectively. Exploring factors that influence self-management behaviors is important for developing interventions to promote self-management behaviors and enhance health outcomes for patients with chronic hepatitis B.

Self-efficacy has been suggested as a powerful factor of health-promoting behaviors (Geng et al., 2018). Self-efficacy refers to an individual's belief regarding his capability to carry out certain activities to achieve a desired outcome (Bandura, 1986). Self-efficacy was related to medication adherence, health behaviors and quality of life in patients with diabetes, liver cirrhosis and heart disease (Bowen et al., 2015; Dong et al., 2018; Wu et al., 2015). Self-efficacy has been shown to be a significant determinant of self-management in patients with diabetes and heart failure (Huang et al., 2014; King et al., 2010; Young et al., 2017).

Social support refers to the psychological and material resources provided by a social network (Langford et al., 1997). Patients with chronic disease depend on the support from their healthcare providers, families, caregivers and other significant others to make decisions and facilitate adjustments in their health behaviors (Lorig and Holman, 2003). Previous studies showed social support was associated with self-management behaviors and health outcomes in patients with diabetes, cancer survivors and heart disease (Arda Surucu et al., 2018; Geng et al., 2018; Reeves et al., 2014), but inconsistent evidence for these associations exists in patients with chronic obstructive pulmonary disease (Chen et al., 2017). Patients with chronic hepatitis B experience social isolation from their relatives, friends and colleagues due to the infectiousness of the illness (Ren et al., 2016), which may influence their self-management of the illness.

Social support was found to increase disease knowledge for patients with diabetes (Pan et al., 2018; Yang et al., 2017). Knowledge about the disease can increase the patients' confidence in controlling the disease, and strengthen their motivation (Yang et al., 2017). Lack of knowledge was considered as a barrier for engaging in disease self-management for older adults and patients with rheumatoid arthritis (Chaleshgar-Kordasiabi et al., 2018; Petroka et al., 2017). To effectively manage the disease, patients with chronic hepatitis B should equip themselves with knowledge on how to live with this illness and perform complex self-management activities. Previous studies found patients with chronic hepatitis B had knowledge deficits about transmission, treatment and sequelae of infection (Dam et al., 2016; Ha et al., 2013; Li et al., 2014).

Previous studies have explored the interrelationships of the above factors and self-management behaviors. Pan et al. (2018) found disease knowledge indirectly influenced self-management through self-efficacy, and social support indirectly influenced self-management through knowledge among individuals with type 2 diabetes. Cosansu and Erdogan (2014) reported social support had an indirect effect on self-management via self-efficacy in patients with diabetes. Living with chronic hepatitis B affects every aspect of the patient's life, and successful management of the condition is of great importance. However, there are limited studies focusing on the self-management behaviors among this population. Although evidence suggests the associations of social support, self-efficacy, disease knowledge and self-management behaviors in some chronic conditions, it is unknown if these effects are also similar for patients with chronic hepatitis B. Identifying the relationships of these factors and self-management behaviors is important to develop appropriate interventions to improve self-management behaviors for patients with chronic hepatitis B.

Therefore, in the current study, we tested the associations between social support, self-efficacy, disease knowledge and self-management behaviors using structural equation model to identify contributing factors on self-management behaviors in adults with chronic hepatitis B. Based on the literature review, we developed a model to test the following hypotheses (Fig. 1): (1) social support directly influences self-efficacy, disease knowledge and self-management behaviors; (2) social support indirectly influences self-management behaviors through self-efficacy or disease knowledge; (3) self-efficacy directly influences self-management behaviors; (4) disease knowledge has direct and indirect effects on self-management behaviors through self-efficacy.

2. Methods

2.1. Study design and participants

A cross-sectional study was conducted from June to October 2017. Inclusion criteria were: (1) diagnosed with chronic hepatitis B for at least one year, (2) age of 18 years or older, (3) currently receiving antiviral therapy, (4) able to comprehend and communicate using Mandarin, and (5) willing to participate the survey. Patients were excluded if they were co-infected with hepatitis C, D or human immunodeficiency virus, or having alcohol- or

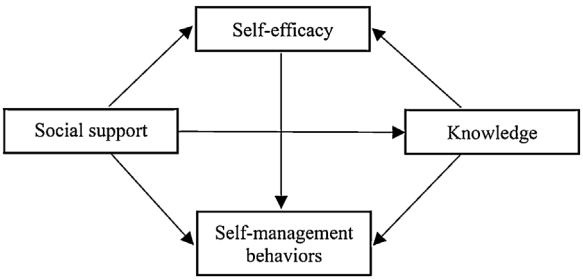

Fig. 1. Hypothetical model for factors influencing self-management behaviors in adults with chronic hepatitis B.

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drug-induced hepatitis or unable to complete questionnaires. A total of 306 patients participated in this study. Post-hoc power analysis (GPower version 3.1.7) showed that 306 respondents yielded a power of 100% and a large effect size (f^2) of 0.41 (Cohen, 1988) at a significant level of 5% (two-sided).

Participants were recruited from hepatology units in two hospitals in Chongqing, China using a convenience sampling. The eligible participants were invited to complete the questionnaire after they agreed to participate. The survey was anonymous and voluntary. The study protocol was approved by the ethics committee of the First Affiliated Hospital of Chongqing Medical University (2017170).

2.2. Measurements

Data was collected using a self-report questionnaire consisting of demographic and disease-related characteristics, and instruments measuring self-management behaviors, social support, self-efficacy and disease knowledge.

Demographic and disease-related characteristics included age (years), gender (male = 0, female = 1), educational level (primary school or below = 1, middle and high school = 2, college and university = 3), marital status (married = 1, single or divorced or other = 2), region of residence (urban = 1, rural = 2), disease duration (<10 years = 1, 11–20 years = 2, >20 years = 3) and family members with chronic hepatitis B infection (none = 0, yes = 1).

Self-management behaviors were assessed by the Chronic Hepatitis B Self-Management Scale (CHBSMS) (Kong et al., 2018). It is a 25-item assessment tool that measures four aspects of self-management: symptom (6 items), lifestyle (7 items), psychosocial coping (6 items) and disease information (6 items). Each item was scored by a 5-point Likert scale (1 = never do to 5 = always do). Higher scores indicate better engagement in self-management behaviors. The total score ranges from 25 to 125. The Cronbach's α and test-retest reliability of the total scale was 0.89 and 0.87, respectively (Kong et al., 2018). The Cronbach's α was 0.91 in this study.

Social support was assessed by the Social Support Rating Scale (SSRS) (Xiao, 1994). It comprises 10 items designed to evaluate objective support (3 items), subjective support (4 items), and support usage (3 items). The overall score ranges from 12 to 66. Higher scores indicate stronger social support. The scale showed good internal consistency (Cronbach's α = 0.89) and test-retest reliability (0.92) (Xiao, 1994). The Cronbach's α was 0.80 in this study.

Self-efficacy was assessed by the 6-item Self-Efficacy for Managing Chronic Disease (SEMCD) (Lorig et al., 2001). Each item was rated from 1 (not at all confident) to 10 (totally confident). The score was the mean of the six items. The overall score ranges from 1 to 10, with higher scores indicating greater self-efficacy. The Chinese version of this scale has been widely used in different settings with good psychometric properties. The Cronbach's α was 0.90 in this study.

Disease knowledge was assessed by Hepatitis B Knowledge Questionnaire developed by Wu et al. (2009). It consists of 14 questions about transmission, complications and treatments. A score of 1 was given for a correct answer and 0 for an incorrect or unknown answer. The overall score ranges from 0 to 14, with higher scores indicating better disease knowledge. The Cronbach's α was 0.75 in this study.

2.3. Statistical analysis

Data analyses were performed using SPSS and AMOS version 20.0 (IBM Corporation, Armonk, NY). Categorical data were described by frequencies and percentages, and continuous data by means with standard deviations (SD). Bivariate analyses were conducted to examine the relationships between all variables. Structural equation model was used to test the relationships between study variables (Fig. 1). The bootstrap resampling technique was used in the structural equation model to obtain more stable and valid standard errors of the estimates. Path analysis was used to identify both direct and indirect relationships in the model. Standardized regression coefficients (β) and P values for β were reported for direct, indirect and total effects. Variables with nonsignificant coefficients were removed from the model. The model fit was assessed using the following model-fit indices (Hu and Bentler, 1999): relative chi-square (χ^2/df) test < 2 ($p > 0.05$), goodness of fit index (GFI) > 0.90, adjusted goodness of fit index (AGFI) > 0.90, comparative fit index (CFI) > 0.90, normed fit index (NFI) > 0.90, incremental fit index (IFI) > 0.90, Tucker-Lewis index (TLI) > 0.90, and root mean squared error of approximation (RMSEA) < 0.06. The Akaike information criterion (AIC) was applied to compare the modified model with the initial model. P value < 0.05 (two-sided) was considered statistically significant.

3. Results

3.1. Participants' characteristics

The characteristics of the participants are listed in Table 1. The mean age was 35.98 ± 10.34 years, with the range from 18 to 67 years. The majority were male (64.4%) and married (70.3%).

3.2. Bivariate analyses

The descriptive statistics for the study variables and correlation analyses are shown in Table 2. The mean scores of self-management behaviors, social support, self-efficacy and disease knowledge were 74.64 (SD = 14.85), 40.99 (SD = 8.57), 6.68 (SD = 1.93) and 8.03 (SD = 1.69), respectively, which were approximately 59.7%, 62.1%, 66.8% and 57.3% of the total score, respectively. Self-management behaviors were positively associated with social support ($r = 0.41$, $p < 0.01$), self-efficacy ($r = 0.50$, $p < 0.01$), and disease knowledge ($r = 0.37$, $p < 0.01$). Social support

Table 1
Sample characteristics (n = 306).

	N	%
Age (years)		
18–30	103	33.7
31–40	104	34.0
41–50	71	23.2
51–60	25	8.1
≥ 61	3	1.0
Gender		
Male	197	64.4
Female	109	35.6
Educational level		
Primary school or below	18	5.9
Middle and high school	142	46.4
College and university	146	47.7
Marital status		
Married	215	70.3
Single, divorced or other	91	29.7
Region of residence		
Urban	220	71.9
Rural	86	28.1
Disease duration (years)		
≤ 10	150	49.0
11–20	118	38.6
≥21	38	12.4
Family member with chronic hepatitis B		
No	115	37.6
Yes	191	62.4

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Table 2
Descriptive statistics and correlation coefficients among variables (n = 306).

	Self-management	Social support	Self-efficacy	Disease knowledge
Social support	0.41**			
Self-efficacy	0.50**	0.56**		
Disease knowledge	0.37**	0.46**	0.52**	
Age	−0.08	0.06	0.05	−0.02
Gender	0.08	−0.08	−0.05	0.00
Educational level	0.19**	0.09	0.16**	0.21**
Marital status	0.08	−0.11*	−0.07	−0.07
Region of residence	−0.17**	−0.14*	−0.09	−0.11*
Disease duration	0.05	0.06	0.06	0.08
Family history	−0.04	0.01	0.00	0.02
Mean	74.64	40.99	6.68	8.03
SD	14.85	8.57	1.93	1.69

Abbreviations. SD, standard deviation.
* $p < 0.05$.
** $p < 0.01$.

was positively associated with self-efficacy ($r = 0.56$, $p < 0.01$), and disease knowledge ($r = 0.46$, $p < 0.01$). Self-efficacy was positively associated with disease knowledge ($r = 0.52$, $p < 0.01$).

Relationships between demographics and study variables were investigated (Table 2). A higher level of education was related to better self-management behaviors, self-efficacy and disease knowledge ($r = 0.19$, 0.16, 0.21, respectively; $p < 0.01$). Patients living in rural area had lower level of social support, disease knowledge and self-management behaviors. Married participants reported higher level of social support. Age, gender, disease duration and family history were not significantly related to study variables.

3.3. Structural equation model

Controlling for educational level, marital status and region of residence that were significantly associated with the study variables in bivariate analyses, the initial model (Fig. 1) indicated a satisfactory model fit ($\chi^2/df = 1.753$, $P = 0.119$; GFI = 0.992, AGFI = 0.955, NFI = 0.978, TLI = 0.957, CFI = 0.990; RMSEA = 0.050, 90%CI = 0.000–0.103). However, some path coefficients were nonsignificant, such as the path from disease knowledge to self-management behaviors, and the path from marital status to social support. Thus, the model was modified by removing the nonsignificant paths. Controlling for educational level and region of residence, the final model showed good model fit, and the model-fit indices improved ($\chi^2/df = 1.047$, $P = 0.388$; GFI = 0.994, AGFI = 0.976, NFI = 0.986, TLI = 0.998, CFI = 0.999; RMSEA = 0.012, 90%CI = 0.000–0.081). Compared to the initial model, the final model was further supported by a smaller AIC value ($AIC_{initial} = 54.767$ vs. $AIC_{final} = 37.236$), indicating better fit. The coefficients for all paths are shown in Fig. 2.

Standardized direct, indirect and total path estimates are summarized in Table 3. Social support was a positive predictor of disease knowledge ($\beta = 0.45$, $p < 0.05$), self-efficacy ($\beta = 0.41$, $p < 0.01$), and self-management behaviors ($\beta = 0.19$, $p < 0.01$). Social support also indirectly influenced self-management behaviors ($\beta = 0.20$, $p < 0.01$) through self-efficacy, and indirectly influenced self-efficacy ($\beta = 0.15$, $p < 0.01$) through disease knowledge. Self-efficacy had a direct effect on self-management behaviors ($\beta = 0.37$, $p < 0.05$). While disease knowledge did not directly influence self-management behaviors, it had an indirect effect on self-management behaviors ($\beta = 0.12$, $p < 0.05$) via self-efficacy. Further, disease knowledge was related to educational level, and social support was associated with region of residence. Educational level and region of residence had direct and indirect influences on self-management behaviors.

4. Discussion

This study offered evidence of the relationships of social support, self-efficacy, disease knowledge and self-management behaviors among adults with chronic hepatitis B, and provided understanding of the factors that may potentially improve their self-management behaviors. The structural model suggested that social support and self-efficacy were important predictors of self-management behaviors in patients with chronic hepatitis B. In addition, social support had a direct effect on self-efficacy and disease knowledge, and had an indirect effect on self-management behaviors through self-efficacy. Disease knowledge indirectly influenced self-management behaviors through self-efficacy. The hypotheses regarding the relationships among study variables are

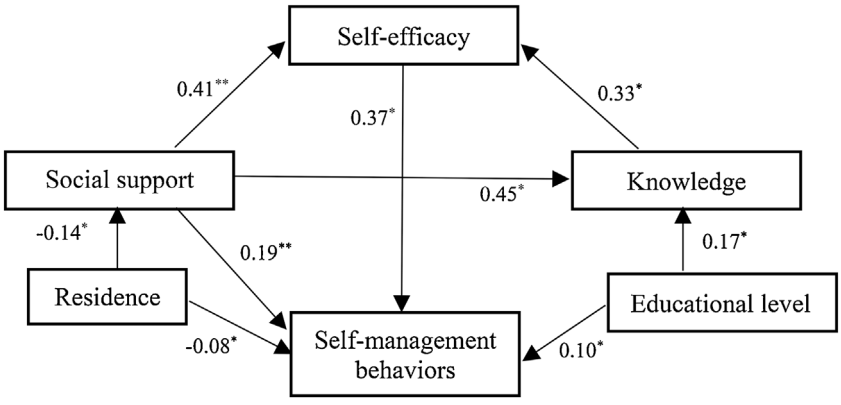

Fig. 2. The final model of self-management behaviors among adults with chronic hepatitis B (with standardized regression coefficients). *$p < 0.05$; **$p < 0.01$.

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Table 3
Direct, indirect and total effects of variables in the final model (n = 306).

Endogenous Variables	Predicting Variables	Standardized direct effect		Standardized indirect effect		Standardized total effect	
		β	P	β	P	β	P
Social support	Region of residence	−0.14	0.018*			−0.14	0.018*
Disease knowledge	Social support	0.45	0.012*			0.45	0.012*
	Region of residence			−0.06	0.023*	−0.06	0.023*
	Educational level	0.17	0.019*			0.17	0.019*
Self-efficacy	Social support	0.41	0.009**	0.15	0.007**	0.56	0.007**
	Disease knowledge	0.33	0.012*			0.33	0.012*
	Region of residence			−0.08	0.025*	−0.08	0.025*
	Educational level			0.05	0.015*	0.05	0.015*
Self-management	Social support	0.19	0.007**	0.20	0.008**	0.39	0.012*
	Self-efficacy	0.37	0.013*			0.37	0.013*
	Disease knowledge			0.12	0.012*	0.12	0.012*
	Region of residence	−0.08	0.044*	−0.06	0.028*	−0.14	0.009**
	Educational level	0.10	0.025*	0.02	0.012*	0.12	0.012*

Abbreviations. β, standardized regression coefficient.
* $p < 0.05$.
** $p < 0.01$.

supported except for the direct effect of disease knowledge on self-management behaviors.

In this study, the mean score of self-management behaviors was approximately 60% of the total score, indicating insufficient self-management behaviors among this population, which supported the previous findings (Lin et al., 2015; Xu and Liu, 2018; Yang et al., 2009). The self-management behaviors should be promoted in patients with chronic hepatitis B. As hypothesized, social support was an important factor influencing self-management behaviors among patients with chronic hepatitis B. Appropriate support is strongly related to better physical and psychological health outcomes; this may enhance patients' sense of responsibility to manage their health behaviors (Yang et al., 2017). Our result was in line with previous studies in which a positive association between social support and self-management behaviors has been observed in patients with diabetes, cancer survivors and chronic heart disease (Arda Surucu et al., 2018; Geng et al., 2018; Reeves et al., 2014). A qualitative study showed social support and social interactions were important in patients' success in fighting the disease and adopting self-management behaviors, and a lack of support was a barrier to self-management behaviors (Chaleshgar-Kordasiabi et al., 2018). Patients with chronic hepatitis B frequently face social stigma, and experience substantial psychosocial stress (Modabbernia et al., 2013), which may affect them getting support. Our result found patients with chronic hepatitis B did not get enough support from their social networks. Therefore, it is crucial to help enhance their support from families, healthcare providers, communities, and other sources to cope with the illness and increase their self-management behaviors.

In the final model, social support also indirectly influenced self-management behaviors through self-efficacy, indicating patients with better social support could have higher confidence in performing self-management behaviors. A possible explanation may be that social stigma associated with chronic hepatitis B infection may reduce the size of support network and limit the opportunity for patients to express their feelings and concerns, and may thus reduce their confidence in managing the illness. In addition, social support seemed to play an important role in obtaining knowledge about chronic hepatitis B. These results further suggest that interventions targeted at enhancing social support may benefit patients in managing chronic hepatitis B.

In addition to social support, self-efficacy emerged as an important predictor of self-management behaviors, which supported the previous findings (Huang et al., 2014; Wilski and Tasiemski, 2016; Young et al., 2017). This indicated patients with higher self-efficacy were more likely to engage in recommended health behaviors, such as dietary modifications, exercise and medication. At the same time, the effects of social support and knowledge on self-management behaviors were mediated by self-efficacy in the final model, which further proved the importance of self-efficacy in the self-management behaviors among patients with chronic hepatitis B. As shown in previous studies, self-efficacy acted as the mediator between some factors (e.g. social support, disease knowledge, perceived interference and provider-patient communication) and self-management behaviors (Cosansu and Erdogan, 2014; Geng et al., 2018; Pan et al., 2018). Further, self-efficacy interventions have been successful in improving self-management behaviors in patients with diabetes (Ahmad Sharoni et al., 2018; Shi et al., 2010). Dong et al. (2018) suggested patients' confidence in managing their conditions should be routinely assessed. The assessment of self-efficacy in our study showed patients did not have enough self-efficacy to manage chronic hepatitis B, which, in turn, influenced their self-management of the illness. Our results provide evidence that self-efficacy constitutes useful intervention target for patients with chronic hepatitis B as well.

Contrary to our hypothesis, the direct path from disease knowledge to self-management behaviors in the initial model was nonsignificant, suggesting knowledge alone did not lead to behavioral change, rather, knowledge indirectly affected self-management behaviors through self-efficacy, which was in line with another study (Pan et al., 2018). Two recent studies also found nonsignificant association between disease knowledge and self-management behaviors (Dong et al., 2018; Jacobson et al., 2018). Jaarsma et al. (2017) pointed out that knowledge was necessary, but insufficient for self-care behavior change, and the skills to use knowledge was necessary to make self-care practices. Our result showed most patients had inadequate knowledge regarding chronic hepatitis B, which was consistent with previous findings (Dam et al., 2016; Ha et al., 2013; Li et al., 2014). Interventions to improve and use disease knowledge should be provided for patients with chronic hepatitis B due to the indirect effect of knowledge on self-management behaviors.

The final model also revealed the effects of educational level and region of residence on self-management behaviors. Rural patients with chronic hepatitis B tended to have lower social support; this may affect their disease knowledge, self-efficacy and self-management behaviors. Previous studies reported that rural patients with chronic hepatitis B had lower medication adherence (Xu and Liu, 2018), and the self-awareness of viral hepatitis status was significantly lower in the less educated rural patients with chronic hepatitis B (Ahn et al., 2018). These findings suggested that

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particular attention should be given to patients with lower educational level or living in rural area, as they may be even less adherent to the recommended self-management behaviors.

To our best knowledge, this is the first study to investigate the factors influencing self-management behaviors among patients with chronic hepatitis B using structural equation model, and the findings provided valuable information for healthcare providers working with chronic hepatitis B. However, there are some limitations in this study. First, although structural equation model is a powerful tool for this purpose, the cross-sectional design could carry result bias. Longitudinal research is needed to determine causal relationships among the study variables. In addition, this study was conducted in Chinese population with chronic hepatitis B and the generalizability of our findings to other populations might be considered with caution. Moreover, we used self-report questionnaires in this study, which may result in social desirability, recall and reporting bias. Finally, there may be some other factors which are important in explaining self-management behaviors for patients with chronic hepatitis B are not included in our study. Future study should consider assessing other potential factors, such as stigma and depression.

Our findings have some practical implications for nurses and other healthcare providers involved with chronic hepatitis B care. The model suggests a multifaceted intervention should be developed to reduce potential barriers to self-management for this population. First, we suggest that self-management interventions should be provided and strengthened extensively for patients with chronic hepatitis B. Second, social support is key for self-management in patients with chronic hepatitis B. Strategies to enhance social support should be addressed in the self-management programs to facilitate more effective self-management interventions for patients with chronic hepatitis B. Third, interventions should go beyond disease education and include behavior change strategies aimed at improving self-efficacy. To ensure optimal self-efficacy, more attention should be given to the assessment of self-efficacy (Marks et al., 2005). Further, interventions to promote self-management behaviors should be ongoing and tailored for patients with chronic hepatitis B. Lastly, rural patients often have issues in accessing quality healthcare services. More attention should be paid to improve self-management behaviors among rural patients with chronic hepatitis B. Educational background should also be considered during the clinical process.

5. Conclusion

Despite the limitations, our study presented several significant factors related to self-management behaviors for adults with chronic hepatitis B. The model provides a theoretical basis for developing self-management interventions for this population. Interventions should focus on improving social support, self-efficacy, and disease knowledge, which will directly or indirectly benefit self-management for patients with chronic hepatitis B.

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Authors' contributions

LNK designed the study, collected data, analyzed and interpreted data, wrote and revised the manuscript. WFZ designed the study, analyzed data, wrote and revised the manuscript. LL designed the study, interpreted data, and revised the manuscript. QSL advised in designing the study, collected data, and critically revised the manuscript. TW advised in designing the study, collected data, and critically revised the manuscript. YLL advised in designing the study, collected data, and critically revised the manuscript. All authors read and approved the final version of the manuscript.

Declaration of Competing Interest

No conflict of interest has been declared by the authors.

We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us.

We confirm that we have given due consideration to the protection of intellectual property associated with this work and that there are no impediments to publication, including the timing of publication, with respect to intellectual property. In so doing we confirm that we have followed the regulations of our institutions concerning intellectual property.

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