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ORIGINAL RESEARCH

Decision Conflict Faced by First-Degree Relatives of Liver Cancer Patients in Liver Cancer Screening: A Cross-Sectional Study in China

Jiawei Zhang, Jin Xia, Ningning Su, Yanfei Wu, Sihan Wang, Xiaoman Tao

Department of Hepatobiliary Surgery, Second Affiliated Hospital of Chongqing Medical University, Chongqing, People's Republic of China

Correspondence: Jin Xia, Department of Hepatobiliary Surgery, Second Affiliated Hospital of Chongqing Medical University, No. 288, Tianwen Avenue, Nanan District, Chongqing, 400010, People's Republic of China, Tel +86 15772329636, Email 300425@hospital.cqmu.cn

Purpose: This study aimed to investigate the level of decision conflict regarding liver cancer screening among first-degree relatives (FDRs) of liver cancer patients, and to explore its associations with decision preparation, social support, and health literacy management.

Patients and Methods: This cross-sectional study enrolled 172 FDRs of liver cancer patients from a tertiary general hospital in Chongqing, China. Data was collected using the General Information Survey, the Decision Conflict Scale, the Preparation for Decision-Making Scale, the Perceived Social Support Scale, and the Health Literacy Management Scale. Descriptive statistics, one-way analysis of variance (ANOVA), Pearson correlation analysis, and multivariate regression analysis were performed to identify factors influencing decision conflict.

Results: The total score of decision conflict was 33.37 (SD = 13.38). Specifically, 40.11% of participants (n = 69) reported clinically significant decision conflict (score $\geq$ 37.5), and an additional 36.63% (n = 63) reported scores between 25 and 37.5, indicating a tendency toward decisional delay. Multiple linear regression analysis identified the educational level of FDRs and prior liver cancer screening experience as significant determinants. Higher decision conflict scores were associated with lower decision preparation ($\beta = -0.562$, $P < 0.001$), lower social support ($\beta = -0.580$, $P < 0.001$), and lower health literacy management ($\beta = -0.232$, $P = 0.023$). The model accounted for 71.6% of the total variance.

Conclusion: FDRs of liver cancer patients experience moderate decision conflict regarding liver cancer screening. To address this issue, the development of structured decision aids incorporating liver cancer screening education and clear risk-benefit information is recommended. Interventions should prioritize enhancing patients' understanding and preparedness for decision making, particularly among individuals with lower educational attainment or no prior screening experience.

Keywords: liver cancer, first-degree relatives, FDRs, liver cancer screening, decision conflict, factor analysis

Introduction

Primary liver cancer is one of the most common malignant tumors worldwide and is characterized by high incidence and mortality rates.[1] According to the 2022 GLOBOCAN data, the incidence and mortality rates of liver cancer in East Asia were 17.8 new cases and 16.1 deaths per 100,000 people, respectively, ranking the highest globally.[1] In 2022, China accounted for 45.3% of global new cases and 47.1% of global deaths from primary liver cancer, contributing to more than half of the global liver cancer burden.[2,3] The high incidence of viral hepatitis in China, largely attributable to endemic risk factors, is clearly reflected in the reported 2020 incidence rates of 64.29 per 100,000 for hepatitis B virus (HBV) and 13.82 per 100,000 for hepatitis C virus (HCV). Chronic infection with either virus is a primary driver of this disease burden, with China historically exhibiting a high prevalence.[2,4,5] Liver cancer poses a significant threat to individual life and health and places a substantial burden on families and society. Early screening and diagnosis are key to improving the survival rate of patients with liver cancer.[6] National guidelines recommend semiannual surveillance using serum alpha-fetoprotein (AFP) testing combined with abdominal ultrasonography for individuals at high risk,

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including those with HBV or HCV infection, cirrhosis, or a family history of liver cancer.[7] This combined surveillance strategy is considered clinically appropriate and feasible at the population level and has been widely implemented in China.[8] Furthermore, although liver cancer screening has demonstrated cost-effectiveness in China—especially among populations with chronic HBV infection, for whom government-led public health programs have promoted basic screening services—the uneven distribution of healthcare resources, disparities in service delivery capacity, and variability in reimbursement and local implementation policies contribute to substantial differences in screening participation between urban and rural regions.[9]

Based on current guidelines and research, first-degree relatives (FDRs) of liver cancer patients represent one of the high-risk groups for liver cancer. Individuals with a family history of liver cancer have approximately twice the risk of developing the disease compared with those without such a history.[10] This elevated risk is not solely attributable to hereditary susceptibility; rather, it is largely shaped by intrafamilial clustering of HBV infection, shared lifestyle exposures, and household-level environmental risk factors.[11] This unique etiology, integrating both genetic and environmental risk factors, creates a distinct psychological and decision-making context for FDRs (familial cancer high-risk individuals), making their screening decisions different from those for other cancers.

Despite the widely acknowledged benefits of early detection, participation in liver cancer screening in China remains suboptimal, with reported uptake rates of 62.3% in rural programs, 37.5% in urban areas, and 57.9% in regional projects such as the Huaihe River Basin initiative.[8,12] Decision conflict is increasingly recognized as a critical psychological factor influencing screening behaviors. First-degree relatives (FDRs) of cancer patients tend to encounter persistent uncertainty and experience decision conflict when making disease screening decisions.[13] This not only affects screening adherence but also poses challenges to the early detection and treatment of cancer.

Decision conflict (decision-making dilemmas) refers to a state of uncertainty about choices when individuals are faced with multiple risks and potential losses.[14] It is a common issue encountered by patients when making health-related decisions. As interest in shared decision-making grows, healthcare institutions are increasingly promoting its use in clinical practice. They are collaborating with patients in medical decision-making and offering effective decision-making aids.[15] The more FDRs engage in cancer risk communication and shared decision-making, the lower their decision conflict and the higher the cancer screening rate.[16] In China's traditional culture, patients are often passive recipients of medical advice within a paternalistic model of care.[17] Shared decision-making, a high-quality medical decision-making model, is widely advocated worldwide. However, its cultural adaptation and implementation within the Chinese healthcare context require further enhancement.[18]

Previous research has explored factors influencing the screening behaviors of FDRs of cancer patients, including those with colorectal, breast, and stomach cancer.[19–21] These studies enhance our understanding of the factors associated with screening behaviors among FDRs. They also assist healthcare workers in more effectively guiding screening practices. However, it should be noted that there are significant differences in screening methods and disease characteristics between these types of cancer and liver cancer; therefore, the relevant research findings cannot be directly applied to liver cancer screening. Currently, the decision-making preparation and decision conflict levels of FDRs of liver cancer patients during the screening decision-making process remain unclear. Additionally, most research on liver cancer screening has concentrated on optimizing clinical screening technologies and predicting epidemiological risks, while overlooking decision-making barriers in this group related to health belief conflicts, social support, and cognitive biases in medical information.[22,23] This creates many challenges to the delivery of precise decision support for FDRs of liver cancer patients.

Therefore, this study aims to investigate the level of decision conflict regarding liver cancer screening among FDRs of liver cancer patients and to explore its relationships with decision preparation, social support, and health literacy management. It also aims to provide healthcare professionals with a foundation for developing targeted interventions, while facilitating the cross-cultural adaptation of shared decision-making (SDM) within China's healthcare system.

Research Hypotheses

Within the Ottawa Decision Support Framework,[24] enhancing health literacy and social support for decision-makers during the decision-making process can mitigate decision conflict. Additionally, adequate decision preparation is essential for high-quality decision-making. Based on this framework, the authors proposed the hypothesis that first-degree relatives' decision readiness, social support, and health literacy management may significantly affect decision conflict and decision quality in FDRs of liver cancer patients.

This article addresses the following questions:

1. What are the levels of decision conflict in first-degree relatives of liver cancer patients regarding liver cancer screening?
2. What sociodemographic and health-related characteristics affect decision conflict in liver cancer screening among first-degree relatives?
3. What is the relationship between decision preparation, perceived social support, health literacy management, and screening decision conflict?

Materials and Methods

Study Design and Samples

This descriptive study was conducted across two campuses of a tertiary hospital in Chongqing, China. Participants meeting the inclusion criteria were recruited by convenience sampling between August 2024 and March 2025. The inclusion criteria were as follows: first-degree relatives (FDRs) of patients with liver cancer (including children, siblings, and parents of the patients) who were ≥ 18 years of age, able to communicate effectively, and willing to voluntarily participate with informed consent. The exclusion criteria included FDRs who had been diagnosed with liver cancer or other cancers, those with mental disorders or other serious illnesses (such as severe cardiopulmonary insufficiency), and those participating in other research studies. According to sample size estimation principles for multifactorial studies, the required sample size should be 5–10 times the number of variables.[25] This study included 25 variables. Considering a 10% rate of invalid questionnaire responses, the minimum required sample size was calculated as 138. In total, 176 questionnaires were distributed, and 172 valid responses were collected. This study adhered to the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines, with a completed checklist provided in Supplementary Material 1.

Measures

General and Disease-Related Characteristics

The questionnaire collected basic demographic information and health-related data of FDRs. Demographic data included age, gender, education, occupation, family monthly income, insurance type, and residence. Health-related information covered smoking history, alcohol consumption history, past illnesses, history of liver disease, participation in liver cancer screening education, prior liver cancer screening experience, and the number of FDRs with liver cancer.

Decision Conflict

The decision conflict was measured using the Chinese version of the Decision Conflict Scale (DCS) adapted by Li.[26] The original DCS was developed by O'Connor.[27] The scale consists of three dimensions: information and values (Q1-Q6), decision support and effectiveness (Q7, Q9-Q11, Q13-Q16), and decision uncertainty (Q8, Q12), comprising a total of 16 items. A 5-point Likert scale (0–4 points) was used to rate each item. Item scores were averaged and then multiplied by 25 to generate a total score ranging from 0 to 100. Scores below 25.0 indicate no decision conflict, scores between 25.0 and 37.5 indicate a moderate level of decision conflict, and scores above 37.5 suggest a high level of decision conflict. Higher scores reflect greater decision conflict. In this study, the Cronbach's α coefficient of the scale was 0.907, while the reported reliability in the Chinese adaptation study was 0.897.

Preparation for Decision Making

Preparation for Decision Making was assessed using the Preparation for Decision Making Scale (Prep-DMS). The scale was developed by Bennett et al[28] and adapted into a Chinese version by Li.[26] It measures decision-makers' preparedness for doctor-patient communication and their perceived ability to make decisions. The scale consists of 10 items rated on a 5-point Likert scale (1–5). Item scores were summed, averaged, and multiplied by 20 to yield a total score ranging from 0 to 100. Higher scores indicate better decision preparation, with total scores below 60 suggesting insufficient decision preparation. In this study, the Cronbach's α coefficient of the scale was 0.935.

Perceived Social Support

This study used the Perceived Social Support Scale (PSSS) to assess individual's perceived social support.[29] The scale consists of 12 items across three dimensions: family, friends, and other support. A 7-point Likert scale was used, yielding total scores ranging from 12 to 84. Scores of 61–84 indicate high perceived support, scores of 37–60 indicate moderate support, and scores of 12–36 indicate low support. In this study, the Cronbach's α coefficient of the scale was 0.958.

Health Literacy Management

The Health Literacy Management Scale (HLMS), translated and validated by Sun et al, was used to assess health literacy.[30] The scale consists of 24 items across four dimensions: information acquisition, interactive communication, willingness to improve health, and willingness to provide economic support. A 5-point Likert scale was used, yielding total scores ranging from 24 to 120. Higher scores indicate better health literacy. In this study, the Cronbach's α coefficient of the scale was 0.968.

Data Collection

Trained researchers conducted face-to-face questionnaire surveys with study participants. Prior to data collection, participants were informed of the study purpose, significance, and relevant considerations, and written informed consent was obtained. Standardized instructions were provided, and questionnaires were distributed and collected immediately after completion. All responses were independently checked by two researchers for completeness and consistency. In total, 176 questionnaires were distributed, of which 172 were deemed valid after excluding two questionnaires with identical responses and two with more than 20% missing items, resulting in a valid response rate of 97%. The detailed participant recruitment process is presented in Supplementary Figure 1. Ethical approval for this study was obtained from the Ethics Review Committee of the Second Affiliated Hospital of Chongqing Medical University (Approval No. 2024IIT244).

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, version 26.0. Categorical data were described using frequencies and percentages and compared between groups using chi-square tests. Normally distributed continuous data were presented as mean ± standard deviation and compared using independent-samples t-tests or one-way analysis of variance (ANOVA). Pearson correlation analysis was used to examine associations between variables. To avoid excluding potentially relevant variables, factors that were statistically significant in univariate and correlation analyses were entered into the multiple linear regression model. Multicollinearity was assessed using the variance inflation factor (VIF). Cronbach's alpha coefficients were calculated to evaluate the reliability of the scales. A two-sided P value < 0.05 was considered statistically significant.

Results

Demographic and Clinical Profiles of FDRs

This survey included 172 first-degree relatives of liver cancer patients, comprising 104 males (60.5%) and 68 females (39.5%). Participants were aged 21–62 years, with a mean age of 39.15 ± 11.16 years. Regarding place of residence, 77 participants lived in urban areas (44.8%), 64 in towns (37.2%), and 31 in rural areas (18.0%). Detailed demographic characteristics are presented in Table 1.

Comparisons of demographic characteristics by decision conflict scores revealed significant differences in age, education level, place of residence, occupation, monthly income, insurance type, participation in screening training,

Table 1 Differences in Decision Conflict Scores Based on Sociodemographic and Health-Related Variables (n=172)

Variables	N (%)	Decision Conflict Scores (M±SD)	P
Sex			
Male	104 (60.5)	33.46±12.92	0.912
Female	68 (39.5)	33.23±14.16	
Age			
18~<45	113 (65.7)	30.06±12.54	0.001
45~60	50 (29.1)	38.94±12.21	
>60	9 (5.2)	43.93±15.48	
Residence			
Urban	77 (44.8)	27.13±9.84	<0.001
Town	64 (37.2)	35.45±13.70	
Rural	31 (18.0)	44.56±11.93	
Education level			
Primary and below	23 (13.4)	47.96±10.48	<0.001
Middle school	30 (17.4)	42.92±8.86	
High school or technical secondary school	30 (17.4)	36.82±11.62	
College	44 (25.6)	26.56±9.09	
Bachelor's degree or above	45 (26.2)	23.89±9.99	
Occupations			
Public institutions or government agencies	16 (9.3)	22.76±7.63	<0.001
Company	49 (28.5)	25.48±9.85	
Freelance	91 (52.9)	40.83±11.80	
Retired personnel	3(1.7)	27.08±3.61	
Student	13 (7.6)	25.37±11.75	
Family income (monthly)			
<¥3000	35 (20.3)	44.87±13.62	<0.001
¥3000~¥5000	56 (32.6)	39.34±9.80	
>¥5000	81 (47.1)	24.27±8.44	
Insurance type			
Employee insurance or resident medical insurance	126 (73.3)	29.12±11.67	<0.001
Rural medical insurance	46 (26.7)	45.01±10.64	
No	0	——	
Smoking status			
Yes	50 (29.1)	36.16±12.83	0.08
No	122 (70.9)	32.23±13.48	
Drinking status			
Yes	41 (23.8)	36.24±13.47	1.15
No	131 (76.2)	32.47±13.28	
Past illnesses			
Yes	44 (25.6)	36.54±14.53	0.068
No	128 (74.4)	32.28±12.84	
History of liver disease			
Yes	61 (35.5)	32.97±13.94	0.772
No	111 (64.5)	33.59±13.12	
Screening educational background			
Yes	40 (23.3)	22.66±7.79	<0.001
No	132 (76.7)	36.61±13.04	
Previous screening history			
Yes	98 (57.0)	25.10±8.97	<0.001
No	74 (43.0)	44.32±9.96	

(*Continued*)

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Table 1 (Continued).

Variables	N (%)	Decision Conflict Scores (M±SD)	P
The number of FDRs with liver cancer			
One	144 (83.7)	33.08±13.16	0.809
Two or more	28 (16.3)	34.88±14.63	

and prior screening experience ($P < 0.05$). Participants who were older, had lower educational attainment and income levels, lived in rural areas, and had not received cancer screening training exhibited higher decision conflict scores ($P < 0.05$). No significant associations were observed between decision conflict scores and gender, smoking and drinking behaviors, health or disease history, or the number of first-degree relatives with liver cancer ($P > 0.05$).

Decision Conflict and Psychosocial Scores Among FDRs

In this study, the mean total decision conflict score among first-degree relatives of liver cancer patients was 33.37 ± 13.38. Among the three dimensions, scores were highest for information and values, followed by decision support and effectiveness, and decision uncertainty. A total of 132 participants (76.7%) scored ≥ 25.0, indicating the presence of decision conflict. Detailed results are presented in Table 2 and Supplementary Figure 2.

Relatively higher scores were observed in the information and values dimension of liver cancer screening, with a larger proportion of participants selecting the neutral response option. The mean score of the Preparation for Decision Making Scale was 64.19 ± 15.68, with 74 participants (43.0%) scoring below 60, indicating insufficient decision preparation. The mean score of the Perceived Social Support Scale was 54.79 ± 13.08, and the Health Literacy Management Scale score was 86.66 ± 18.91. Overall, participants reported moderate levels of perceived social support and moderate abilities in accessing, understanding, and applying health-related information.

Inverse Associations Between Decision Conflict and Psychosocial Factors

Pearson correlation analysis showed that decision conflict was significantly negatively correlated with decision preparation ($r = -0.840$, $P < 0.001$), perceived social support ($r = -0.785$, $P < 0.001$), and health literacy management ($r = -0.746$, $P < 0.001$). All correlations reached statistical significance. Detailed results are presented in Table 3.

Table 2 Scores on Each Dimension of Decision Conflict for Liver Cancer Screening Among FDRs (Scores, M±SD)

Items	Number of Items	Overall Average	Item Average
Namely information and values	6	10.88±4.23	1.81±0.70
Decision support and effectiveness	8	8.36±4.21	1.05±0.53
Decision uncertainty	2	2.10±1.38	1.05±0.69
Decision conflict score	16	33.37±13.38	1.33±0.54

Table 3 Correlation Coefficients Between Decision Conflict Dimensions and Decision Preparation, Perceived Social Support, and Health Literacy Management in FDRs (*r*, n=172)

Variables	Namely Information and Values	Decision Support and Effectiveness	Decision Uncertainty	Total Decisional Conflict score
Decision preparation	−0.740	−0.773	−0.593	−0.840
Perceived social support	−0.671	−0.735	−0.579	−0.785
Health literacy management	−0.630	−0.701	−0.563	−0.746

Note: All *P*<0.001.

Table 4 Multiple Linear Regression Analysis of Factors Influencing Decision Conflict in Liver Cancer Screening Among FDRs

Variables	S. E	β	t	P	VIF	95% CI
Constant	0.245		11.070	0.000		0.003,5.427
Education level	0.745	−0.268	−3.481	0.001	2.893	−2.760,-0.265
Previous screening history	1.835	−0.135	−1.980	0.032	2.560	−7.871,-1.001
Decision preparation	0.066	−0.562	−5.852	0.000	5.346	−0.641,-0.327
Perceived social support	0.050	−0.580	−5.740	0.000	7.148	−0.313,-0.123
Health literacy management	0.069	−0.232	−2.302	0.023	6.003	−0.244,-0.054

Notes: Independent variable assignment status: education level (Primary and below=1, Middle school=2, high school or technical secondary school=3, college=4, Bachelor's degree or above=5); whether liver cancer screening had been done (0=no, 1=yes); decision preparation, perceived social support, and health literacy management (original values were used). Model fit: R^2=0.734, Adj. R^2=0.716, F= 40.109, *P*< 0.001.

Associated Factors for Decision Conflict

We assessed multicollinearity among the predictor variables by calculating the Variance Inflation Factor (VIF). The VIF values for each variable category in the final model were as follows: Education level (VIF=2.893), Previous screening history (VIF=2.560), Decision preparation (VIF=5.346), Perceived social support (VIF=7.148), Health literacy management (VIF=6.003). All VIF values were well below the threshold of 10, indicating no substantial multicollinearity. A multiple linear regression analysis was performed using the decision conflict score among FDRs of liver cancer patients as the dependent variable. Independent variables included those with statistical significance in univariate and correlation analysis. The results showed that five variables entered the regression equation: education level of FDRs (β = −0.268, P = 0.001), Previous screening history (β = −0.135, P = 0.032), decision preparation (β = −0.562, P < 0.001), perceived social support (β = −0.580, P < 0.001), and health literacy management (β = −0.232, P = 0.023). These variables accounted for 71.6% of the total variation. See Table 4 for details.

Discussion

This study aimed to investigate the level of decision conflict among first-degree relatives (FDRs) of liver cancer patients and to examine its associated influencing factors. The findings indicate that most FDRs experienced a moderate level of decision conflict (33.37 ± 13.38), which was lower than that reported by Jia et al[31] among surrogate decision-makers for ICU patients (43.33 ± 7.25). This disparity may be attributable to fundamental contextual differences between the two decision-making scenarios.

Surrogate decision-making for critically ill ICU patients often requires immediate choices under extreme pressure, which inherently increases uncertainty and the intensity of decision conflict. In contrast, liver cancer screening constitutes a personal health decision made for long-term well-being, allowing greater time for deliberation and reducing perceived urgency. Furthermore, life-or-death decisions in critical care settings-such as decisions regarding ventilator withdrawal-carry substantially higher perceived stakes than preventive screening decisions, thereby further amplifying conflict among surrogate decision-makers. These findings suggest the importance of developing decision support strategies that are tailored to the psychosocial characteristics of cancer screening contexts, rather than extrapolating directly from crisis-driven ICU decision models.

The study revealed that first-degree relatives (FDRs) of liver cancer patients exhibited the highest decision conflict scores in the information and values dimension among the three decision conflict domains. Although clinical guidelines explicitly identify FDRs as a high-risk population requiring regular surveillance,[11] many individuals demonstrated limited awareness of their inherited cancer risk.[32] This gap in risk-related knowledge may partly explain the elevated conflict observed in the information and values dimension. Notably, a substantial knowledge deficit was identified in this population, with more than 60% of participants lacking specialized education related to liver cancer screening. This deficit extended to limited understanding of individual risk stratification, including genetic susceptibility and behavioral

factors, as well as insufficient awareness of screening benefits and risks, particularly the clinical limitations of AFP testing.[33]

Consequently, when facing screening decisions, individuals may struggle to align their choices with personal health values or to rationally evaluate trade-offs. Compounding this issue, pervasive public misconceptions-such as the belief that hepatitis-related liver cancer occurs only after the development of cirrhosis-further impede risk perception and informed decision-making.[34] Although scores on the decision support, decision effectiveness, and decision uncertainty dimensions were relatively low in this study, they nonetheless indicate insufficient support from families, communities, and healthcare institutions for FDRs during liver cancer screening decision-making. Furthermore, influenced by traditional Chinese healthcare-seeking beliefs, individuals tend to rely on hospitals primarily for disease treatment rather than for preventive services.[35] The asymptomatic nature of early-stage liver cancer represents a major barrier to screening engagement.[36] Many individuals prioritize the immediate burdens of screening-particularly financial costs and anxiety related to test results-over long-term health benefits such as early detection and improved treatment outcomes.[37] These findings highlight the need for nurse-led community education programs aimed at correcting misconceptions about liver cancer, with a focus on early asymptomatic risk, the preventive value of screening, and realistic expectations regarding screening-related costs and outcomes, particularly within high-risk familial clusters.

Our analysis showed that lower educational attainment and the absence of prior screening experience were associated with higher levels of decision conflict regarding liver cancer screening among first-degree relatives (FDRs). FDRs with limited educational backgrounds often demonstrate constrained health literacy, which hampers their understanding of screening protocols and risk-benefit trade-offs.[38] This knowledge deficiency may manifest as heightened uncertainty during the decision-making process, particularly with respect to the necessity and methods of screening. Concurrently, screening-naive individuals experience amplified conflict due to unfamiliarity with clinical procedures and anxiety about potential outcomes. Similarly, we recommend clinicians deliver personalized decision support calibrated to patients' educational backgrounds and screening histories. Such tailoring may involve prioritizing simplified, visually supported educational materials for individuals with lower educational attainment, providing step-by-step procedural explanations and anticipatory guidance for those without prior screening experience, and incorporating family members into counseling sessions for FDRs reporting limited social support. Such tailored interventions should facilitate shared decision-making through explicit risk communication, enabling value-congruent choices while mitigating conflict intensity.

Our study found that 43% of first-degree relatives (FDRs) of liver cancer patients had a decision-making readiness score below 60. Correlation analysis demonstrated a strong negative association between decision preparation and decision conflict ($r = -0.840$, $P < 0.001$), consistent with findings reported by Zhang et al.[39] These results indicate that FDRs were insufficiently prepared in terms of perceiving decision-making effectiveness and communicating with healthcare professionals during the screening decision-making process. This insufficiency may be partly attributable to the heavy workloads and time constraints faced by healthcare workers, which limit opportunities for sustained engagement with family members of cancer patients and hinder the effective promotion of cancer screening.[40] Adequate decision preparedness requires effective communication with healthcare providers, a clear understanding of screening-related information, accurate perception of personal health risks, and familiarity with the screening decision-making process.[41] When FDRs are inadequately prepared in these domains, they are more likely to experience anxiety and confusion during decision-making. In addition, they may demonstrate limited ability to discern essential information needs or to articulate relevant questions based on their level of understanding, as well as insufficient awareness of key considerations in screening decisions. Collectively, these factors contribute to poor decision preparation and increased decision conflict. This suggests that structured pre-consultation tools, such as question prompt lists or brief preparatory materials provided before clinical encounters, may help FDRs better articulate concerns and engage more effectively in screening-related discussions.

Notably, perceived social support and health literacy management among first-degree relatives (FDRs) of liver cancer patients were negatively correlated with decision conflict, consistent with previous findings.[42] Higher levels of social support may alleviate decision conflict through multiple pathways. At the emotional level, care and encouragement from family members, friends, and healthcare professionals can help reduce anxiety and fear associated with screening decisions. From an informational perspective, shared knowledge and experiences related to liver cancer screening can

enhance FDRs' understanding of screening benefits, risks, and precautions, thereby supporting more informed choices. In addition, instrumental support may partially relieve financial concerns, reducing cost-related anxiety during the decision-making process. Overall, greater perceived social support is associated with lower decision conflict and a higher likelihood of screening participation among FDRs.[43]

First-degree relatives (FDRs) with higher levels of health literacy management typically demonstrate stronger capacities for information acquisition, comprehension, and processing. They are more capable of actively seeking and critically evaluating liver cancer screening information, thereby enabling more accurate assessments of personal health risks and screening needs. In addition, such individuals tend to communicate more effectively with healthcare professionals to clarify concerns and articulate decision-related needs. Healthcare providers may consider implementing targeted health literacy interventions, particularly those focusing on navigating screening-related information and enhancing communication with healthcare professionals, for FDRs identified as having lower baseline literacy levels. Such efforts may improve individuals' understanding of screening-related information, facilitate balanced consideration of potential benefits and risks, and help reduce uncertainty during the screening decision-making process.

Limitations and Strengths of the Study

Although this study adhered to recommended sample size criteria for multivariate analysis, several limitations should be acknowledged. First, participants were recruited from a single region and a single tertiary hospital using convenience sampling, which may limit the generalizability of the findings to other settings. Second, the cross-sectional design precludes causal inference, and reliance on self-reported measures may introduce recall and reporting bias. These factors should be considered when interpreting the results. Future studies employing longitudinal designs, multi-center sampling, and diverse healthcare contexts are needed to examine temporal changes in decision conflict and to strengthen causal interpretation.

Despite these limitations, this study provides meaningful contextual evidence by examining decision conflict and decision readiness related to liver cancer screening among first-degree relatives, a high-risk yet understudied population in China. By clarifying the associations among decision conflict, decision preparation, perceived social support, and health literacy management, this study contributes incremental but practically relevant insights into screening-related decision barriers within the Chinese healthcare context. The findings may inform the development of targeted decision support interventions and serve as a foundation for future interventional and longitudinal research.

Conclusion

In summary, this study found that first-degree relatives of liver cancer patients in China experience moderate levels of decision conflict regarding screening. Higher decision conflict was associated with lower decision preparation, limited perceived social support, lower health literacy management, lower educational attainment, and a lack of prior screening experience. Although causal relationships cannot be inferred due to cross-sectional design, these findings help identify subgroups that may be more vulnerable to difficulties in screening-related decision-making. From a clinical practice perspective, potential supportive approaches may include the use of simplified and visually oriented decision aids to address information gaps, family-inclusive counseling to strengthen support networks, and clear procedural explanations tailored for first-time screeners. Overall, within the context of China's high hepatitis B prevalence and elevated familial risk of liver cancer, these findings provide preliminary, context-specific empirical evidence that may inform the development of future, hypothesis-driven decision support strategies. Longitudinal and interventional studies are needed to evaluate their effectiveness.

Abbreviations

FDR, First-degree relatives; DCS, Decision Conflict Scale; Prep-DMS, Preparation for Decision Making Scale; PSSS, Perceived Social Support Scale; HLMS, Health Literacy Management Scale; VIF, variance inflation factor.

Data Sharing Statement

The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

Ethics Approval and Consent to Participate

This study was performed in line with the principles of the Declaration of Helsinki. Study approval was obtained from the Ethics Review Committee of the Second Affiliated Hospital of Chongqing Medical University (Approval No. 2024IIT244). Informed consent was obtained from all participants included in the study.

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Disclosure

The authors report there are no conflicts of interest in this work.

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