# Association of cancer prevention awareness with liver cancer screening participation rates among a high-risk population: results from rural Anhui Province

**Zhenqiu Zha[1], Yili Lyu[1], Lingli Liu[2], Tengfei Dong[2], Beijing Cheng[2], Linsheng Yang[2], Zhirong Liu[1]**

[1]Chronic Noncommunicable Diseases Prevention and Treatment Department, Anhui Provincial Center for Disease Control and Prevention, Public Health Research Institute, Hefei, Anhui 230601, China;

[2]Department of Epidemiology and Biostatistics, School of Public Health, Anhui Medical University, Hefei, Anhui 230032, China.

*To the Editor:* Liver cancer (LC) is one of the most commonly diagnosed cancers and the leading cause of cancer mortality in the world, with approximately 905,677 new cases and 830,180 deaths in 2020.[1] Clearly, the huge burden exerted by LC highlights the need to effectively decrease the incidence and mortality of LC.

Unfortunately, survival rates of LC have been maintained at a low level to date. A recent meta-analysis showed that the age-standardized 5-year LC survival rate in China was 10.1% in 2003 to 2005 and 12.1% in 2012 to 2015.[2] The poor prognosis of LC may be partly attributed to the advanced stages once diagnosed for most patients, suggesting that early detection, early diagnosed, and early treatment of LC are warranted.[3]

A population-based cancer screening program targeting LC in high-risk areas of rural China was initiated in 2007, in which combinations of B-scan ultrasound and serum alpha-fetoprotein (AFP) were recommended for screening high-risk populations. A study in Shanghai had revealed that this screening program was effective in reducing the mortality and burden of LC.[3] However, available evidence indicated that the compliance of LC screening programs in the Chinese population was unsatisfactory. Thus, it is necessary to explore associated factors for participation rates (PRs) in the population-based LC screening program.

Some studies found that lower cancer prevention awareness was associated with lower PRs of cancer screening programs.[4-6] However, whether cancer prevention awareness could influence PRs of LC screening program remains unknown in China.

This study aimed to explore the association between cancer prevention knowledge and LC screening PRs using data from the ongoing population-based cancer screening program in Anhui Province.

This was a cross-sectional study conducted in Anhui Province from 2015 to 2019. Under the framework of the screening program for LC, this study was conducted in the regions of Anhui Province with high morbidity and mortality of LC. Men aged 35 to 64 years and women aged 45 to 64 years in the selected areas were recruited. Signed informed consent was obtained from each participant. Exclusion criteria included participants (1) with definite diagnosis of LC, (2) suffering from other cancers, (3) suffering from other serious diseases, and (4) not taking care of themselves.

During the screening program, a total of 180,756 people answered the health factor questionnaire (HFQ), of which 46,425 people were assessed as high-risk individuals for LC. High-risk individuals of LC were defined as having upper gastrointestinal symptoms, having poor eating habits, having a family history of gastrointestinal cancer, having self-reported gastrointestinal illness, or having hepatitis B positivity. Non-high-risk individuals were defined as people who did not meet the above conditions. Of all high-risk individuals for LC, 4204 participants provided completed data on health knowledge questionnaires (HKQs) and were included in the final analysis. Flowchart of the study population selection is shown in Supplementary Figure 1, http://links.lww.com/CM9/A864.

The HKQ included 11 items (seven single-choice questions and four multiple-choice questions), mainly assessing

Access this article online

Quick Response Code:

Website: www.cmj.org

DOI: 10.1097/CM9.0000000000001735

**Correspondence to:** Linsheng Yang, Department of Epidemiology and Biostatistics, School of Public Health, Anhui Medical University, Hefei, Anhui 230032, China
E-Mail: yanglinsheng@ahmu.edu.cn;
Zhirong Liu, Anhui Provincial Center for Disease Control and Prevention, Hefei, Anhui 230601, China
E-Mail: lzr@ahcdc.com.cn



Chinese Medical Journal 2022;135(4)

**Received:** 19-03-2021; **Online:** 22-10-2021 **Edited by:** Jing Ni

general cancer knowledge, comprehensive prevention, and treatment knowledge. The knowledge scores (range: 0–22) were calculated as follows: correct answers were given one-point, wrong answers or "other" answers were given 0 points, and the last question was excluded. In this study, Cronbach alpha of the HKQ was 0.833, suggesting adequate reliability.

The HFQ included demographic characteristics (marital status, education, and yearly income per household unit) and details on the source of drinking water, smoking habits, alcohol consumption, dietary habits, mental health, history of major digestive diseases, family history of cancer, clinical manifestations, physical examination, and 2-week medication history. All 4204 people included in the final analysis were tested for hepatitis B surface antigen (HBsAg) using the nationally approved kit method.

A contingency table stratified by sex was used to describe the characteristics of the study population for the total sample. Overall and group-specific PRs (the proportion of the population participating in serum AFP or/and B-ultrasound) were calculated and reported. A Chi-square test was used to examine the difference between the PR of high-risk individuals who answered the HKQ and the PR of those who did not and examine the associations of PRs with cancer prevention knowledge scores, demographic characters, and other covariates. Logistic regression models were used to examine the association between cancer prevention knowledge scores and PRs after adjustment for covariates.

Participants were divided into three groups based on the tertile of knowledge scores: T1 (1–10), T2 (11−15), and T3 (≥16). Crude odds ratios (ORs) and 95% confidence interval (CI) were calculated. Adjusted factors in multivariable models included sex (male and female), age (<50 and ≥50 years old), marriage (married and unmarried/widowed/divorced), education (illiterate, primary school, and junior high school and above), income (0–10,000, 10,001–30,000, 30,001–50,000, and >50,000 Yuan), smoking habit (yes/no), alcohol consumption (yes/no), family history of cancer (yes/no), digestive system diseases (yes/no), and HBsAg testing (negative/positive).

A total of 4204 high-risk individuals were included in the final analysis, including 2796 (66.5%) men and 1408 (33.5%) women, with a mean age of 52.3 years (age range: 35–64 years). The mean of cancer prevention knowledge scores was 13.78 ± 4.30 (13.81 ± 4.37 for men; 13.73 ± 4.30 for women). Approximately, 94.1% of participants were married. There were differences in education and economic status between men and women, with higher education and economic status in men than those in women. The prevalence of smoking was 48.3%, which was higher in men (71.5%) than that in women (16.6%). Compared with women (3.8%), more men (66.8%) drank alcohol. The rate of family history of cancer was 30.0% (26.2% for men, 37.4% for women). About 7.7% and 15.8% of participants reported a history of digestive system disease and HBsAg testing in some subgroup populations, respectively. [Supplementary Table 1, http://links.lww.com/CM9/A747]

There were differences in several characteristics between the high-risk individuals included and those excluded from the final analysis. Compared with the excluded high-risk individuals, younger, less-educated, non-smoker, and non-drinker individuals who have lower income, less family history of cancer, and few digestive system diseases and were less likely to participate in LC screening were included ($P < 0.05$) [Supplementary Table 2, http://links.lww.com/CM9/A747].

Of 4204 high-risk individuals for LC, 1899 participated in screening with serum AFP and/or B-scan ultrasound, with an overall PR of 45.2%. The PRs for all participants in the first, second, and third tertiles of cancer prevention knowledge scores were 40.9%, 47.2%, and 46.1%, respectively. PRs were higher in women than those in men (59.2% *vs*. 38.1%, $P < 0.001$) and were higher among those aged 61 to 64 years (52.1%) than among other younger age groups (23.2%–50.0%). Also, participants with lower educational background (PR: 48.8%) and family history of cancer (PR: 57.9%) were more likely to undertake serum AFP and/or B-scan ultrasound ($P < 0.05$). Non-smokers (PR: 58.7%) and non-drinkers (PR: 50.0%) were also more likely to participate in LC screening ($P < 0.001$) [Supplementary Table 3, http://links.lww.com/CM9/A747].

In the univariate logistic regression model (Model 1), compared with the first tertile of higher cancer prevention knowledge scores, the second and third tertiles had higher odds of LC screening participation (the second tertile *vs*. the first tertile: OR = 1.290, 95% CI: 1.107–1.503, $P = 0.001$; the third tertile *vs*. the first tertile: OR = 1.237, 95% CI: 1.053–1.452, $P = 0.009$). After adjusting for sex, age, education, income, marriage, smoking habit, alcohol consumption, family history of cancer, digestive system disease, and hepatitis B virus (HBV) infection, higher knowledge levels were still significantly associated with higher screening PRs (the second tertile *vs*. the first tertile: adjusted odds ratio [aOR] = 1.307, 95% CI: 1.104–1.547, $P = 0.002$; the third tertile *vs*. the first tertile: aOR = 1.197, 95% CI: 1.004–1.428, $P = 0.045$) [Supplementary Table 4, http://links.lww.com/CM9/A747].

Stratified by sex, age, education, and HBV infection, significant associations between cancer prevention knowledge levels and PRs were found in women but not in men, in participants aged 50 years and older, rather than those in those aged <50 years, and only in illiterate participants. HBV infection may decrease PRs of LC screening [Supplementary Table 5, http://links.lww.com/CM9/A747].

LC screening programs for high-risk patients to detect LC as early as possible are particularly important.[3] However, how to increase PRs of LC screening remains unsolved. In our study, PRs for clinical screening in the high-risk population in our study was 45.2%, which is far <70% which was recommended by the Specialist Committee of Cancer Prevention and Control of Chinese Preventive Medicine Association.[7] As a result, patients with early LC cannot be detected through LC screening, and the yield from LC screening program is discounted.

We performed this study to explore the relationship between knowledge and screening rates. In this study, higher cancer prevention knowledge scores were significantly related to elevated PRs of LC screening, and the associations still existed even after adjusting multiple confounding factors, which is consistent with the previous literature.[4,5] A cross-sectional study reported that knowledge concerning all aspects of cervical cancer and achievement of knowledge scores about cervical cancer above the median were significantly associated with PRs of Pap test screening.[4] These results highlight the importance of knowledge training about cancer prevention when performing LC screening programs. Consistent with previous studies,[5,6] our study found that significant associations between cancer prevention knowledge scores and PRs were found in women but not in men, in participants aged 50 years and older, rather than those in those aged <50 years, and only in illiterate participants. These findings indicated that women, older adults, and illiterate individuals were key populations for health education.

Interestingly, our stratified analysis showed that higher levels of cancer prevention knowledge in individuals with HBV infection showed lower LC screening PRs, which were inconsistent with the results from the national cancer screening program in Korea.[6] The reasons for the differences were unknown. One possibility might be that higher knowledge levels make individuals with HBV infection more likely to go to comprehensive hospitals for further examination. It is also possible that individuals with HBV infection routinely visit hospitals or clinics for health check-ups instead of utilizing the screening program.

Several limitations should be taken into consideration when interpreting our findings, such as relatively modest sample size, differences in PRs, and several characteristics between the high-risk individuals included and those excluded from the final analysis. Further improvements will be made to make the samples more representative in future work.

Our results indicated that cancer prevention awareness will increase PRs of LC screening. More importantly, these associations were more pronounced in some subgroup populations including women, older adults, illiterate individuals, and individuals without HBV. These findings suggested that priority for health education concerning knowledge of cancer prevention should be given to these special populations to increase PRs of LC screening.

### Funding

This work was supported by grants from the National Key Research and Development Program (Nos. 2017YFC0908103 and 2016YFC1302605).

### Conflicts of interest

None.

### References

1. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, *et al*. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin 2021;71:209–249. doi: 10.3322/caac.21660.
2. Zeng H, Chen W, Zheng R, Zhang S, Ji JS, Zou X, *et al*. Changing cancer survival in China during 2003-15: a pooled analysis of 17 population-based cancer registries. Lancet Glob Health 2018;6:e555–e567. doi: 10.1016/S2214-109X(18)30127-X.
3. Zhang BH, Yang BH, Tang ZY. Randomized controlled trial of screening for hepatocellular carcinoma. J Cancer Res Clin Oncol 2004;130:417–422. doi: 10.1007/s00432-004-0552-0.
4. Ahmed NU, Rojas P, Degarege A. Knowledge of cervical cancer and adherence to pap smear screening test among female university students in a Multiethnic Institution, USA. J Natl Med Assoc 2020;112:300–307. doi: 10.1016/j.jnma.2020.03.007.
5. Shaw J, Patidar KR, Reuter B, Hajezifar N, Dharel N, Wade JB, *et al*. Focused Education increases hepatocellular cancer screening in patients with cirrhosis regardless of functional health literacy. Dig Dis Sci 2020;66:2603–2609. doi: 10.1007/s10620-020-06583-x.
6. Noh DK, Choi KS, Jun JK, Lee HY, Park EC. Factors associated with attending the National Cancer Screening Program for liver cancer in Korea. Asian Pac J Cancer Prev 2012;13:731–736. doi: 10.7314/apjcp.2012.13.2.731.
7. Professional Committee for Prevention and Control of Hepatobiliary, Pancreatic Diseases of Chinese Preventive Medicine Association, Committee of Hepatology of Chinese Research Hospital Association, Society of Hepatology of Chinese Medical Association, Prevention of Infection Related Cancer Group, Specialist Committee of Cancer Prevention and Control of Chinese Preventive Medicine Association. Guideline for stratified screening and surveillance of primary liver cancer (2020 Edition) (in Chinese). Chin J Oncol 2021;43:60–77. doi: 10.3760/cma.j.cn112152-20201109-00970.

**How to cite this article:** Zha Z, Lyu Y, Liu L, Dong T, Cheng B, Yang L, Liu Z. Association of cancer prevention awareness with liver cancer screening participation rates among a high-risk population: results from rural Anhui Province. Chin Med J 2022;135:499–501. doi: 10.1097/CM9.0000000000001735