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Barriers to upper gastrointestinal screening among the general population in high-prevalence areas: a cross-sectional study

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ABSTRACT

Background: In China, there are large differences between regions in the use of gastroscopies and public awareness of upper gastrointestinal (UGI) screening.

Objective: This study investigated the current context and analyzed the barriers that influence UGI screening behavior among the general population in UGI cancer high-prevalence areas.

Methods: A total of 320 participants anonymously answered an online questionnaire. The rank sum test was used to analyze the difference in the scores of the UGI screening awareness questionnaire among participants with different socio-demographic characteristics. Using the awareness level of UGI screening and gastroscopy as the dependent variable, and the socio-demographic characteristics as the independent variable, simple linear regression and binary logistic regression analysis were used to determine the factors influencing attitudes toward gastroscopy screening. We used Spearman's correlation analysis to examine the correlation between UGI screening awareness level and willingness to undergo a gastroscopy.

Results: There was a correlation between the willingness to undergo gastroscopy and the awareness level of UGI screening ($r = 0.243$, $p < 0.001$). Linear regression analysis found that age, type of residence, education level, employment status, monthly income, history of gastroscopy, dietary habits, physical exercise, and convenience in obtaining information were significantly correlated with the awareness level of UGI screening ($p < 0.05$). Binary logistic regression analysis found that factors significantly associated with gastric cancer screening behavior include residence, monthly income, and self-perceived health status ($p < 0.05$).

Conclusion: It is necessary to improve education about UGI cancer and screening knowledge, with a focus on populations with lower education and income.

Keywords: cross-sectional study; gastroscopy; tumor screening; upper gastrointestinal

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INTRODUCTION

In recent years, despite a decline in gastric cancer incidence and mortality, this disease remains a prevalent upper gastrointestinal (UGI) malignancy globally.[1] In 2020, there were over 1 million new cases and approximately 770,000 deaths worldwide, ranking fifth in cancer incidence and fourth in mortality.[2] China reported 479,000 new cases and 374,000 deaths in 2020, contributing to 43.9% and 48.6% of global cases and deaths, posing a significant public health concern.[2] Factors such as rapid economic development, aging population, and unhealthy lifestyles have exacerbated the cancer burden in China, making gastric cancer the third most burdensome cancer.[3]

As a screening strategy, primary screening is used to identify high-risk populations, followed by diagnostic screening of high-risk populations using

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gastroscopy. This is the most effective way of reducing the cancer disease burden.[4] Since 2005, China has implemented UGI cancer screening in over 110 high-risk areas as part of a national public health program.[5] In 2011, the Ministry of Health and the Expert Committee of Early Diagnosis and Treatment of Cancer Project introduced the "Technical Programme of the Early Diagnosis and Treatment of Cancer Project (2011 Edition)."[6] Subsequent publications, such as the "Upper Gastrointestinal Tract Cancer Screening and Early Diagnosis and Treatment Technical Programme (2014, Trial)" and the "Upper Gastrointestinal Tract Cancer Population Screening and Early Diagnosis and Treatment Technical Programme (2020)," have further refined UGI cancer screening in China.[7] These efforts have had a positive impact on society, with the 5-year relative survival rate for gastric cancer increasing from 27.4% in 2003 to 35.1% in 2015, although it still lags behind Japan (80.1%) and South Korea (77.5%).[1,5,8,9]

The reasons for the low 5-year relative survival rate for gastric cancer in China may include (i) low public awareness of cancer prevention; (ii) insufficient endoscopic examination equipment and personnel; and (iii) misconceptions about gastroscopy and a low prevalence of related knowledge. The outcomes and survival time for gastric cancer are closely related to how early the disease is detected.[10] Based on data from cancer screening programs, the average participation rate in UGI gastroscopy screening in China is 26.07%,[11,12] with Kunming, Yunnan Province, having a relatively high participation rate of 24.34%[13] and Urumqi, Xinjiang Uygur Autonomous Region, having a lower participation rate of only 15.5%.[14] Multiple studies[4,15,16] have identified low awareness of UGI screening as a major obstacle to the low screening rate in China. This can be attributed to several reasons: (i) lack of publicity and education; (ii) fear and misconceptions; and (iii) inadequate health care resources.

Thus, improving UGI screening uptake is a key aspect of effective gastric cancer prevention and treatment in China. Due to the late start of cancer screening in China, few studies have systematically explored the factors influencing UGI screening behavior. The main objective of this study is to assess people's knowledge of the UGI cancer screening program and their overall attitude toward the gastroscopy procedure, as well as to investigate the barriers associated with gastroscopy knowledge and behavior. The aim is to improve gastroscopy screening uptake among people at high risk of upper gastrointestinal cancer (UGC), and thus, to reduce UGC incidence and improve UGC survival.

METHODS

Design

This cross-sectional study was conducted from June to September 2022 in a Chinese tertiary care hospital that runs a general cancer screening program. An online questionnaire was used; the participants were informed of confidentiality and only those who consented received the questionnaire. Ethical approval was obtained from the Institutional Review Board of Jiangnan University, China (approval number: JUN20220310IRB37) and the study was conducted in accordance with the revised Declaration of Helsinki.

Participants

The participant inclusion criteria were as follows: (i) patients or family members attending the hospital outpatient clinic; (ii) conscious patients with good verbal communication and comprehension skills; and (iii) voluntary participation with informed consent. Exclusion criteria were as follows: (i) inability to provide consent due to mental or cognitive reasons; and (ii) refusal or failure to complete the questionnaire.

Sample size

According to international standards for questionnaire design as well as recommendations from earlier studies, to improve the structural stability of a questionnaire, the sample size should be 5 to 10 times the number of scale entries.[17] Based on a 10% to 20% rejection rate, the final sample for this study was 320.

Outcome measures

Questionnaire part 1: general information

This part of the questionnaire was a self-designed general survey based on China's national conditions and the current situation regarding UGC screening. The questionnaire screened gender, age, and marital status, along with 16 other items (see Table 1).

Questionnaire part 2: UGI screening awareness

Given the lack of a validated scale in this study, this section of the questionnaire contained questions to

Table 1: Mean scores for socio-demographic characteristics of participants and UGI screening awareness questionnaire results (n = 304)

Characteristics	n (%)	Median of knowledge level questionnaire	H (*p*)
Gender			−1.678 (0.093)
Male	168 (55.3)	7 (5.00–13.00)	
Female	136 (44.7)	6 (4.00–11.75)	
Age (years)			18.327 (0.001)*
20–29	52 (17.1)	5 (3.25–7.00)	
30–39	121 (39.8)	6 (4.00–13.00)	
40–49	77 (25.3)	9 (5.00–13.00)	
50–59	42 (13.8)	10.5 (6.00–13.00)	
≥60	12 (3.9)	8 (3.25–11.75)	
Marital status			−3.167 (0.002)*
Married	258 (84.9)	8 (4.00–13.00)	
Unmarried/divorced/widowed	46 (15.1)	5 (4.00–6.25)	
Type of resident			−6.989 (<0.001)*
Urban	199 (65.5)	10 (5.00–13.00)	
Rural	105 (34.5)	5 (4.00–6.00)	
Residence status			14.934 (0.002)*
Living with children	125 (41.1)	9 (5.00–13.00)	
Living with spouse	111 (36.5)	7 (5.00–12.00)	
Living alone	48 (15.8)	5 (3.25–7.00)	
Other[a]	20 (6.6)	5.5 (3.25–10.25)	
Education level			23.388 (< 0.001)*
Primary or below	11 (3.6)	7 (3.00–12.00)	
Lower secondary or post-secondary	77 (25.3)	5 (3.00–11.00)	
High school or tertiary	95 (31.3)	6 (4.00–11.00)	
Bachelor or above	121 (39.8)	9 (5.00–13.00)	
Employment status			6.969 (0.031)*
Unemployed	16 (5.3)	12 (8.00–13.00)	
Employed	270 (88.8)	6 (4.00–12.00)	
Retired	18 (5.9)	10.5 (4.75–13.00)	
Monthly income (RMB/per capita)			35.314 (< 0.001)*
≤ 2000	14 (4.6)	5 (3.75–8.50)	
2001–4000	94 (30.9)	5 (4.00–7.25)	
4001–6000	97 (31.9)	7 (4.00–12.00)	
≥ 6001	99 (32.6)	12 (5.00–13.00)	
Medical insurance			30.672 (< 0.001)*
Resident health insurance	121 (39.8)	10 (5.00–13.00)	
Employee health insurance	103 (33.9)	9 (5.00–13.00)	
New Rural Cooperative Medical Care	63 (20.7)	5 (3.00–7.00)	
Other[b]	17 (5.6)	5 (5.00–7.00)	
Family members working in the medical field			−0.393 (0.694)
Yes	42 (13.8)	8 (4.00–13.00)	
No	262 (86.2)	7 (4.00–12.00)	

Table 1: (*Continued*)

Characteristics	n (%)	Median of knowledge level questionnaire	H (*p*)
Gastroscopy history			−5.250 (<0.001)*
Yes	85 (28.0)	11 (6.00–13.00)	
No	219 (72.0)	6 (4.00–11.00)	
Family history of tumors			−2.920 (0.004)*
Yes	53 (17.4)	10 (5.50–13.00)	
No	251 (82.6)	6 (4.00–12.00)	
Family history of UGI			−1.360 (0.174)
Yes	49 (16.1)	6 (4.00–11.00)	
No	255 (83.9)	7 (4.00–12.00)	
History of UGI-related diseases			−1.013 (0.311)
Yes	63 (20.7)	7 (5.00–13.00)	
No	241 (79.3)	7 (4.00–12.00)	
Healthy eating habits			−7.321 (< 0.001)*
Yes	186 (61.2)	10 (5.00–13.00)	
No	118 (38.8)	5 (3.75–7.00)	
Physical exercise (Individual exercise time ≥ 30 minutes) (times/week)			0.578 (0.749)
< 1	110 (36.2)	8 (4.00–12.25)	
1–3	132 (43.4)	7 (4.00–12.75)	
≥ 3	62 (20.4)	6 (4.75–12.00)	

[a]dormitory, shared rental, or other residence status.
[b]commercial medical insurance.
*$p < 0.05$; UGI, upper gastrointestinal; H, Kruskal–Wallis H statistic

measure the participants' knowledge of UGC screening (see Appendix I, http://links.lww.com/IJEBH/A144). We reviewed the literature and based our questionnaire on the guidelines of the European Society of Oncology and the American Society of Clinical Oncology; the screening implementation policies of China, South Korea, and Japan; and various sources describing UGI tumor risk factors.[18–22] The questionnaire focused on (i) identification of risk factors for gastric cancer; (ii) identification of warning symptoms of gastric cancer; and (iii) views on gastric cancer and screening. Overall, the questionnaire contained 13 items, with 1 point accorded for "Correct/Yes" answers and 0 points for "Incorrect/No" and "Unsure/Don't know" answers, with the total score ranging from 0 to 13 points. Higher scores indicated greater knowledge of UGI screening.

Questionnaire part 3: gastroscopy acceptance

This section of the questionnaire examined participants' attitudes toward gastroscopy, concerns about gastroscopy, opinion about gastroscopy, understanding of gastroscopy, the ease of obtaining information about gastroscopy, understanding the specific process of undergoing a gastroscopy, and the importance of gastroscopy (see Appendix II, http://links.lww.com/IJEBH/A145).

Quality control

Before starting the survey, we first sent the questionnaire to a group of UGI screening teams, including the head of the early tumor screening project, 2 gastroenterologists, 2 oncology nurses, and 5 gastroenteroscopy examination nurses. This was to ensure that the questionnaire content was clear and easily understandable. Based on the feedback, the questionnaire was modified and improved. For the final version of the questionnaire, the Cronbach's α coefficient was 0.871 and the Kaiser–Meyer–Olkin value was 0.776. This indicates that the questionnaire had good reliability and validity.

Data collection

The questionnaire was administered electronically, at the hospital. The researcher explained the purpose of

the study to participants, obtained consent, and provided instructions for questionnaire completion. Any doubts were addressed on the spot, and the questionnaire took approximately 6–8 minutes to complete. To enhance participation, participants were provided with a free brochure about UGI screening and gastroscopy.

Data analysis

Data were analyzed using SPSS version 25.0 (IBM, Armonk District, New York City, USA). Descriptive analyses were conducted using frequency counts and percentages. Rank sum tests were used to analyze differences between the UGI screening awareness questionnaire scores. Simple linear regression analyses and binary logistic regression analyses were conducted to determine the factors influencing high UGI screening awareness and the attitudes toward gastroscopy screening. Spearman's correlation analysis was used to test the correlation between the level of awareness of UGI screening and the acceptance of gastroscopy. For all 2-tailed statistical tests, a value of $p < 0.05$ was considered statistically significant.

RESULTS

Socio-demographic characteristics and UGI screening awareness scores

A total of 320 participants took part in the survey, with 304 valid responses, resulting in a valid response rate of 95%. Among the participants, 252 (82.9%) were aged 30 years or above, 168 (55.3%) were male, 199 (65.5%) lived in towns or cities, 236 (77.6%) lived with their children or spouses, 270 (88.8%) were employed, 196 (64.5%) had a monthly household income of RMB 4,000 or more, and 184 (60.5%) had urban residents' medical insurance or New Farmers' Cooperative Medical Insurance. The majority of the participants (n = 262, 86.2%) did not have family members working in the medical field. A total of 85 (28.0%) participants had a history of gastroscopy, 186 (61.2%) participants considered their diet as healthy and normal, and 194 (63.8%) engaged in physical activity at least once a week (see Table 1).

Table 1 also shows the differences in UGI screening awareness scores among participants with different socio-demographic characteristics. Participants who were aged 50–59 years, lived with their children, had a bachelor's degree or higher education level, had a per capita household income of over RMB 6,000 per month, were unemployed, and had urban health insurance exhibited the highest level of UGI screening awareness compared with those with the same socio-demographic characteristics (all $p < 0.05$). The level of UGI screening awareness was higher among married individuals compared with unmarried individuals, and higher among participants living in urban areas compared with those in rural areas (all $p < 0.05$). Those with a history of gastroscopy, family history of tumors, and a balanced diet had a higher level of UGI screening awareness compared with those without such a history or a balanced diet (all $p < 0.05$). Differences in the other socio-demographic characteristics were not significant (all $p > 0.05$).

UGI screening awareness level

Table 2 presents the respondents' answers to the UGI cancer screening knowledge survey. The top 3 risk factors for UGI cancer in terms of awareness were "Regular consumption of pickled, smoked, hot, fried, spicy, high-salt, or moldy foods increases the risk of upper gastrointestinal cancer"(n = 221, 72.70%), "Regular smoking and drinking increases the risk of upper gastrointestinal cancer" (n = 178, 58.55%), and "First-degree relatives (parents, siblings, children) with a history of esophageal or stomach cancer are at greater risk of developing upper gastrointestinal cancer" (n = 162. 53.29%). Regarding the recognition of UGI cancer warning symptoms, 192 (63.16%) participants agreed with the statement, "Chronic acid reflux, difficulty swallowing, nausea and vomiting, bloating and abdominal pain, loss of appetite, weight loss, and black stools are warning signs of upper gastrointestinal cancer."

Regarding perceptions of stomach cancer and screening, the top 3 ratings were "Cancer can be prevented" (n = 221, 72.7%), "Early detection, early diagnosis, and early treatment can eradicate approximately one-third of cancers" (n = 211, 69.41%), and "The most effective method of early screening for upper gastrointestinal cancer is gastroscopy" (n = 189, 62.17%).

Analysis of factors influencing the level of awareness of UGI screening

Linear regression analysis revealed that age, place of residence, education, employment status, per capita monthly household income, history of gastroscopy, dietary habits, physical activity, and ease of access to information were significantly associated with the

Table 2: Screening awareness questionnaire

Question number	Question	Correct n (%)	Don't know n (%)	Incorrect n (%)
1	Cancer can be prevented.	221 (72.70)	45 (14.80)	38 (12.50)
8	Regular consumption of pickled, smoked, hot, fried, spicy, high-salt, or moldy foods increases the risk of UGI cancer.	221 (72.70)	41 (13.49)	42 (13.82)
3	Early detection, early diagnosis, and early treatment can eradicate approximately one-third of cancers.	211 (69.41)	54 (17.76)	39 (12.83)
9	Chronic acid reflux, difficulty swallowing, nausea and vomiting, bloating and abdominal pain, loss of appetite, weight loss, and black stools are warning signs of UGI cancer.	192 (63.16)	73 (24.01)	39 (12.83)
10	The most effective method of early screening for UGI cancer is gastroscopy.	189 (62.17)	90 (29.61)	25 (8.22)
7	Regular smoking and drinking increases the risk of UGI cancer.	178 (58.55)	91 (29.93)	35 (11.51)
12	Compared with ordinary gastroscopy, painless gastroscopy is a similar procedure and although it is more expensive, it is comfortable and painless.	177 (58.22)	89 (29.28)	38 (12.50)
11	Physical examinations for UGI cancer should be regularly performed.	173 (56.91)	86 (28.29)	45 (14.80)
13	Gastroscopy requires an appointment.	166 (54.61)	96 (31.58)	42 (13.82)
4	First-degree relatives (parents, siblings, children) with a history of esophageal or stomach cancer are at greater risk of developing UGI cancer.	162 (53.29)	103 (33.88)	39 (12.83)
2	Cancer can have no symptoms in its early stages.	157 (51.64)	103 (33.88)	44 (14.47)
6	People over 40 years of age are more likely to develop UGI cancer.	155 (50.99)	106 (34.87)	43 (14.14)
5	People who are positive for *H. pylori* infection are at greater risk of developing UGI cancer.	142 (46.71)	112 (36.84)	50 (16.45)

UGI, upper gastrointestinal.

level of awareness of UGI screening (all $p < 0.05$). Those who lived in urban areas, were older, more educated, had higher per capita monthly household income, history of gastroscopy, healthy diet, and ease of access to information had better knowledge of UGI cancers. In addition, participants with a low frequency of weekly physical activity had a higher level of knowledge about UGI cancers (see Table 3).

Gastroscopy acceptance

In this survey, 83.8% of participants were aware of the gastroscopy program, but only 56.2% stated that they would schedule a gastroscopy if they had symptoms. In total, 77.91% of participants who would not undergo a gastroscopy claimed that they would do so if recommended by an outpatient doctor. The top 3 concerns about gastroscopy among respondents were "Pain and other discomfort associated with gastroscopy" ($n = 114$, 37.5%), "Risk of anesthesia for painless gastroscopy" ($n = 87$, 28.62%), and "Painless gastroscopy is expensive" ($n = 81$, 26.64%).

Analysis of factors influencing attitudes toward gastroscopy

Spearman's correlation analysis of UGI screening cognition level and gastroscopy acceptance showed a correlation coefficient of $r = 0.243$, $p < 0.001$, indicating that there was a correlation between the acceptance of gastroscopy and UGI screening cognition level.

The binary logistic regression model developed was tested for goodness of fit using the Hosmer–Lemeshow goodness-of-fit test, with a p-value of 0.294, indicating a good model fit. Binary logistic regression analysis revealed that the factors significantly associated with gastric cancer screening behavior were place of residence, per capita monthly household income, and self-perceived health status (all $p < 0.05$). Participants living in towns, with a high per capita monthly income, and with good self-perceived health status were more likely to undergo gastroscopy. (See Table 3).

DISCUSSION

The results of the study showed that the majority of participants agreed with the statements "Cancer is preventable" (72.7%) and "Early detection, diagnosis, and treatment can cure about one-third of cancers" (69.41%), indicating some knowledge about early cancer diagnosis and treatment. However, there was variation in knowledge regarding UGI cancer risk

Table 3: Factors associated with UGI awareness and gastroscopy acceptance

	Linear regression analysis			Two-category logistic regression analysis		
	B	β	*p*	B	*p*	Exp (B)
Gender	0.653	0.056	0.265	0.151	0.585	1.163
Age (years)	0.729	0.132	0.025*	0.269	0.079	1.308
Marital status	−1.089	−0.067	0.199	−0.263	0.503	0.769
Type of resident	−2.386	−0.195	<0.001*	−0.777	0.009*	0.460
Residence status	0.273	0.042	0.431	0.169	0.297	1.184
Education level	0.970	0.148	0.005*	−0.082	0.610	0.921
Employment status	−2.349	−0.135	0.008*	−0.729	0.106	0.483
Monthly income	1.085	0.168	0.001*	0.496	0.002*	1.642
Medical insurance	−0.506	−0.079	0.128	0.036	0.819	1.036
Gastroscopy history	2.057	0.159	0.003*	0.471	0.152	1.602
Family members working in the medical field	−0.924	−0.057	0.232	−0.307	0.397	0.735
Family history of tumors	0.854	0.056	0.286	0.491	0.214	1.633
Family history of UGI	−0.355	−0.022	0.653	0.274	0.474	1.315
History of UGI-related diseases	−0.193	−0.013	0.788	0.139	0.689	1.149
Healthy eating habits	3.065	0.257	<0.001*	0.484	0.080	1.623
Physical exercise	−0.903	−0.114	0.019*	−0.011	0.949	0.989
Self-perceived health status	0.110	0.019	0.686	−0.330	0.011*	0.719
Easy access to information	1.319	0.233	<0.001*	−0.045	0.905	0.956

$R^2 = 0.415$, D–W = 2.160, $p = 0.294$.
*$p < 0.05$; UGI: upper gastrointestinal; B, non-standardized coefficient; β, standardization coefficient; exp (B), odds ratio; R2, coefficient of determination; D–W, Durbin–Watson; *p*, *p*-value

factors. For example, 72.7% of participants recognized unhealthy dietary habits as a risk factor, but only 46.71% believed that *H. pylori* infection increased the risk. A Chinese case-cohort study clearly showed that more than 60% of gastric cancers are caused by *H. pylori* infection, and the *H. pylori* positivity rate was 44.2% in mainland China.[23] This rate is lower compared with a study in Korea where 58.3% of the general population recognized the association. The authors suggested that this difference may be attributed to better educational interventions by health care professionals in Korea.[24]

This study analyzed factors influencing the awareness of UGI screening and found that participants who were 40 years old, actively employed, rural residents, and had a monthly income of RMB 4,000 had lower levels of awareness. Factors influencing attitudes toward gastroscopy included living in towns or cities, high household income, and good self-perceived health. There was a correlation between the acceptance of gastroscopy and UGI screening cognition. The partial overlap observed between factors influencing the level of awareness of UGI screening and those influencing attitudes toward gastroscopy was consistent with the study of He et al.[25]

Acceptance and understanding of information related to cancer prevention and gastroscopy screening varies depending on literacy level. Thus, more literate populations were more aware of the benefits of early cancer screening and looked for more ways to gain information about UGC screening,[26] thereby directly influencing screening behavioral outcomes. Sanguinetti et al.[27] also concluded that low educational level is closely related to poor knowledge about cancer prevention. Moreover, literacy levels were responsible for the lower level of knowledge about UGI screening among rural residents than urban residents, and participants from rural populations were generally less educated. More educated people were likely to have higher per capita monthly household income; therefore, those with higher per capita monthly household income had higher levels of awareness

of UGI screening and were also more likely to undergo gastroscopy.

Awareness of UGI screening was higher among participants who engaged in physical activity at least once a week, which may be explained by the fact that people who are physically active on a regular basis have higher health literacy and are more aware of their own health status. Moreover, engaging in regular exercise reduces the negative effects of neurotic personality traits on an individual's mental health,[28] resulting in a more positive attitude toward disease prevention. The lower level of awareness of UGI screening in the working population may be due to the busy lifestyle and high demands placed on people in employment, who do not have enough time to learn about and access information about cancer.

In November 2017, the hospital initiated an early gastric cancer screening project in asymptomatic residents of Wuxi City. This project was conducted in collaboration with the China Gastrointestinal Tumour Centre, the Chinese Centre for Disease Control and Prevention, and the China Gastric Cancer Tumour Screening Project. The key elements of the screening program were community publicity through various channels to attract participants, including dissemination of information about gastric cancer and details of the screening program. Participants who provided informed consent underwent serological tests, such as serum HP antibody and pepsinogen tests. Those with abnormal results or requiring further examination underwent gastroscopy and pathological diagnosis. Follow-up and treatment plans were recommended based on the results. The implementation of the project has achieved good results, with the proportion of biopsy cases accounting for 94.56% of the actual screening population.[29] Among the detected cases of tumor lesions, the early diagnosis rate of UGC is 29.67%.[29]

However, the study found deficiencies in the population's knowledge of UGI screening even after the implementation of a large-scale screening program. This may be due to the late initiation of the early diagnosis and treatment of cancer program in China, which started in 2017. The organization and management of community outreach for screening is still in the early stages and requires continuous improvement. There is also a lack of widespread knowledge about screening, leading to low awareness among the population, especially among young, low-income, and rural residents with irregular diets. Therefore, rural doctors should be included in future cancer screening and early diagnosis and treatment.[30] This is because rural doctors play a central role in China's rural health care system, and rural residents have a high degree of trust in them, which is conducive to increasing rural residents' participation in, and awareness of, screening. At the same time, however, we should continue to strengthen health education on UGC screening for high-risk individuals and obtain the support and cooperation of grass-roots organizations. This will allow the public to have a correct understanding of what the examination will involve before going to the hospital for screening.

This study found that only 56.20% of participants indicated that they would be willing to undergo a gastroscopy if they experienced uncomfortable symptoms. The top 3 barriers to participation in gastroscopy were "pain and other discomfort associated with gastroscopy," "anesthetic risk of painless gastroscopy" and "painless gastroscopy is expensive." Li Huiling et al.[31] showed that gastroscopy can result in nervousness and anxiety in patients, which, as an important stressor, often leads to reactions such as nausea, vomiting, elevated blood pressure, and increased respiration and heart rate. Considering these negative reactions, high-risk groups may decide not to go ahead with gastroscopy screening because of fear. Pontone et al.[32] also found that the level of anxiety prior to an examination was negatively associated with tolerance of the examination.

In clinical practice, nurses play a crucial role in identifying individuals at high risk of gastric cancer and guiding patients and their families to adhere to screening recommendations.[33] Before undergoing gastroscopy, nurses provide health education to patients. Patients with higher literacy levels generally have better comprehension than those with lower literacy levels. Through the nurses' explanation, patients can better understand the purpose and process of gastroscopy. However, rural patients tend to have lower literacy levels compared with urban patients. Additionally, due to a lack of publicity and education about medical insurance, some rural patients may not be aware of reimbursement policies, leading to their reluctance to undergo gastroscopy.

Therefore, to promote participation in upper gastrointestinal tract screening, health management personnel can raise awareness by sharing current information on the incidence of upper gastrointestinal tract cancer in China during community-based

early diagnosis and treatment programs. Various media platforms such as TV, radio, newspapers, internet, and WeChat should be utilized to enhance the dissemination of knowledge regarding gastric cancer screening and early diagnosis and treatment. This can help address concerns and improve the willingness of individuals to undergo screening. Nurses are encouraged to optimize health promotion efforts for patients with low education levels and those residing in rural areas. For example, depending on their literacy level, illustration or roleplay can be used[34] to convey relevant information to facilitate patients' understanding.

There are some limitations to this study. Firstly, our study was conducted in Wuxi, an economically developed city, and was conducted in a single hospital. Therefore, our findings may be affected by sample selection and sampling bias. Secondly, questionnaire studies rely on participants' subjective statements and recollections, which may be subject to self-report bias. Participants may have been influenced by factors such as memory bias, social expectations, or self-modelling, resulting in inaccurate or incomplete information. Thirdly, although the expert panel confirmed the content validity of the questionnaire, further validation of its validity and reliability is needed in the future.

CONCLUSION

This study shows that the majority of the Chinese population has some knowledge about early cancer diagnosis and treatment, but not enough knowledge about the perception of UGI cancer risk factors. Fear of gastroscopy, fear of risk, and economic factors were the 3 main reasons for patients' lack of motivation to undergo gastroscopy screening. Therefore, in future interventions on gastroscopy screening behaviors for UGI cancer risk groups, it is necessary to strengthen education about UGI cancer and screening, focusing on people with lower income and literacy levels. Moreover, the education should be specifically designed to foster a more accurate understanding of perceived risk associated with early cancer screening.

AUTHOR CONTRIBUTIONS

Conceptualization, methodology, validation, investigation, formal analysis, writing–original draft: CX. Validation, investigation: YWY and ZY. Formal analysis, writing–review, and editing: THM, SRJ, and YYL. All authors have read and approved the final version of the manuscript.

INSTITUTIONAL REVIEW BOARD STATEMENT

The study was conducted in accordance with the Declaration of Helsinki. Ethical approval for this study was obtained from the Institutional Review Board of Jiangnan University, China (approval number: JUN20220310IRB37).

INFORMED CONSENT STATEMENT

Informed consent was obtained from all subjects involved in the study.

DATA AVAILABILITY STATEMENT

Data supporting the study results can be obtained upon request sent to the corresponding author's e-mail.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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