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Association Between Late-Stage Schistosoma Infection and Colorectal Cancer: A Colorectal Cancer Screening among Elderly People in the Qingpu District of Shanghai Municipal

Xi Yu[1*], Sen Wang[1], Li Guifu[1], Xu Ruifang[1], Kun Xue[2] and Ji Zhu[3]

[1]*Shanghai Municipal Qingpu District Center for Disease Control & Prevention, China*

[2]*Department of Nutrition and Health, School of Public Health, Fudan University, China*

[3]*Department of Cancer, Fudan University Shanghai Cancer Center, China*

Correspondence should be addressed to Xi Yu, Shanghai Municipal Qingpu District Center for Disease Control & Prevention, China

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ABSTRACT

OBJECTIVE

To analyze the results of community colorectal cancer screening in Qingpu District, Shanghai Municipal, and explore the relevant risk factors.

METHODS

A questionnaire survey and fecal occult blood tests were carried out among community residents aged between 50 years and 74 years old in 11 communities in Qingpu District. Enteroscopy was then performed for individuals with positive results to identify cases of colorectal cancer.

RESULTS

A total of 378 residents claimed to have *Schistosoma japonicum* infection. The prevalence of colorectal cancer was 3439.15/100,000, which was significantly higher than in the non-schistosomiasis infection group (180.32/100,000). In addition, the M-H chi square test indicated that there was a significant difference in the rate of occult blood in stool between the schistosomiasis infected group and non-schistosomiasis infected group.

CONCLUSION

In the suburbs of Shanghai Municipal, previous infection with *Schistosoma japonicum* was an important risk factor for the prevalence of colorectal cancer. In addition, intake of more vegetables was an important protective factor for colorectal cancer.

KEYWORDS

Colorectal cancer; Enteroscopy; *Schistosoma japonicum* infection

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INTRODUCTION

Colorectal cancer has a high incidence rate in China, and its morbidity and mortality rate have maintained an upward trend. According to statistics, the incidence and mortality rate of colorectal cancer exceeds 20/100,000 and 11/100,000, respectively [1]. Colorectal cancer ranks 2nd in male cancers and 4th in female cancers [2]. Currently, it has a high mortality among malignant tumors because it is usually diagnosed in the late stage [3]. According to statistics reported by the Shanghai Municipal Center for Disease Control and Prevention, the incidence of colorectal cancer in Shanghai was 61.05/100,000 in men and 49.28/100,000 in women, respectively, accounting for the second and third highest cancer incidence rates in males and females, respectively. In addition, the mortality rate was 35.28/100,000 and 28.33/ 100,000, respectively, accounting for the third and second highest mortality rates of malignant tumors in men and women, respectively.

A previous study found that the incidence of colorectal cancer gradually increases with age, reaching its peak around 75 years of age [4]. In China, the median age of colorectal cancer incidence is 58 years [5]. Notably, the incidence rate is higher in urban areas than in rural areas, and in males compared to females. Specifically, the incidence and mortality rates of colorectal cancer in urban areas is more than twice that of rural areas, with a male-to-female morbidity ratio of about 1.3:1 [6].

The Shanghai Municipal Cancer Monitoring Report suggests that the prevalence of colorectal cancer increases significantly from the age of 50 to the highest point around the age of 70 [7], where it hovers at a higher level and then gradually decreases after the age of 74.

From an epidemiological point of view, there are many factors affecting the incidence of colorectal cancer, including the environment, lifestyle, and especially diet [8]. High-fat diets and insufficient cellulose are generally considered to be the main causes of colorectal cancer. It was also found that colorectal cancer incidence has a family history, which may be associated with common lifestyles and genetics [9]. In addition, colorectal cancer may be associated with parasitic infections in Southeast Asia countries. A study conducted in China's Yangtze River area found that Japanese schistosomiasis infection may induce intestinal lesions [10], thereby resulting in intestinal inflammation changes or tumor mutations.

It is worth noting that colorectal cancer can be diagnosed through early stool blood testing and questionnaires, and full colorectal examination through fiber colorectaloscopy can help improve the survival and quality of life of patients through early detection and early treatment [11]. Since 2011, the Shanghai Municipal launched free colorectal cancer screening for people over 50 years of age in the community. Moreover, early treatment and intervention were conducted through stool blood testing and questionnaire surveys for community residents.

MATERIALS AND METHOD

Target Population

The inclusion criteria included: Shanghai Municipal residents who lived in the area for more than six months and had access to Shanghai's social security benefits, female subjects aged between 50 years and 74 years old, and male subjects aged between 60 years and 74 years old. All subjects participated in the community colorectal cancer screening project on a voluntary basis and provided signed informed consent prior to the study. The study was approved by (Shanghai public health three-year action plan).

Assessments

Screening involved a questionnaire-based risk assessment and fecal occult blood test (FOBT). The risk assessment questionnaire was designed by the Shanghai Municipal Center for Disease Control and Prevention, and collected basic information and information associated with the main known risk factors for colorectal cancer. The following data was recorded: Personal cancer history, family cancer history, stool habits, trauma, smoking history, drinking history, vegetable and fruit intake, milk intake, and schistosomiasis infection history. The results of risk assessment were automatically determined by a computer system. At the same time, all subjects underwent two rounds of FOBTs, with results determined using an immunological method. If positive results were obtained from any one of the above procedures, the overall results were deemed "positive", and the patient was required to undergo a fibro-colorectaloscopy examination.

Quality Control

Quality control of questionnaire-based risk assessment and FOBTs was carried out by the Center for Disease Control and Prevention at the district and municipal level. The District Center for Disease Control and Prevention carried out a 10% quality control procedure in writing for the questionnaire-based risk assessment, while 3% of the results were entered into a computer system for a secondary quality control procedure. To interpret FOBT results, parallel samples were used in conjunction with a quality control procedure based on the chemical method. In addition, oncology experts conducted secondary interpretation and quality control for pathological specimens.

Data Entry

The risk assessment and FOBT results were entered into the community colorectal cancer screening system of the Shanghai municipal center for disease control and prevention by staff at the community health service centers. Quality control for 20% of data entry was carried out by Qingpu district center for disease control and prevention so as to ensure a data conformance higher than 95%. The screening data were then exported to Access 2013 for analysis.

Statistical Analysis

All statistical analyses were performed using SPSS 19.0 software. The incidence of colorectal cancer was calculated. In addition, logistic regression analysis was performed to determine the risk factors associated with colorectal cancer.

Age	No. of Screened Subjects	No. with Colorectal Cancer	Incidence per 100,000	No. of Patients with Tumor *in situ*	Incidence per 100,000	Aden-omas	Incidence per 100,000
50-54	6058	6	99.04	1	16.51	40	660.28
55-59	12419	12	96.63	5	40.26	93	748.85
60-64	23022	24	104.25	16	69.50	257	1116.32
65-69	20311	32	157.55	17	83.70	287	1413.03
70-74	15488	78	503.62	17	109.76	210	1355.89
75-	7927	14	176.61	9	113.54	80	1009.21
Male	33120	90	271.74	31	93.59	582	1757.24
Female	52105	76	145.86	34	65.25	385	738.88
Total	85225	166	194.78	65	76.27	967	1134.64

Table 1: Results of early screening for colorectal cancer among community residents of the Qingpu District.

RESULTS

During 2017-2019, over the course of three years, a total of 85,525 people in Qingpu district (aged 50 years - 74 years old) were screened for colorectal cancer, include 33120 males and 52105 females. Among them, 166 people presented with colorectal cancer, with an incidence rate of 194.78/100,000. In addition, 65 people showed tumor in situ with an associated incidence rate of 76.27/100,000,

whereas the incidence of adenoid tumors was 1,134.64/100,000 (Table 1).

Next, subjects were divided into groups according to whether they had ever been infected with *Schistosoma japonicum*. Among the subjects, 378 reported having a history of *Schistosoma japonicum* infection, including 227 males and 151 females. 84,847 respondents stated that they had never been infected with Schistosoma japonicum in the past, including 31,474 males and 53,373 females.

According to the M-H chi square test, the chi-square value was 672.4297, the corrected chi square value was 668.934, and the OR value was 3.9408 at 95% CI (3.6686 ~ 4.2332). Nine of the male colorectal cancer patients had a history of schistosomiasis infection, with a prevalence rate of 3964.76/100,000. Four of the patients had tumor *in situ*, with a prevalence rate of 1762.11/100,000. On the other hand, four women with colorectal cancer had a history of schistosomiasis infection, with a prevalence rate of 2649.01/100,000. Six patients had carcinoma *in situ*, with a prevalence rate of 3973.51/100,000. In addition, 13 patients had summarized colorectal carcinoma, with a prevalence rate of 3439.15/100,000. Furthermore, the number of colorectal cancer patients uninfected with *Schistosoma japonicum* was 153, with a prevalence rate of 180.32/100,000. Among them, 57 were males with a prevalence rate of 181.10/100,000 and 96 females with a prevalence rate of 179.82/100,000. The number of patients with colorectal carcinoma in situ was 55, and the prevalence rate was 64.82/100000. According to the M-H chi square test, chi square was 45.9157, corrected chi square was 980.6197, and the OR value was 94.1213 at 95%CI (53.0569 ~ 166.9684).

Infected with *Schistosoma japonicum* = 0 Sex = Male	**Age Group**	**Positive Result**	**Total**	**Number of Colorectal Carcinoma**	**Prevalence**	**Number of Adenoma**	**Prevalence**	**Number of Carcinoma *in situ***	**Prevalence**
	50-	365	1244	3	241.16	19	1527.33	0	0
	55-	717	2757	4	145.09	41	1487.12	0	0
	60-	1793	7527	9	119.57	106	1408.26	7	93
	65-	2192	9200	15	163.04	159	1728.26	7	76.09
	70-	1769	7103	17	239.34	110	1548.64	10	140.79
	74-	873	3643	9	247.05	33	905.85	5	137.25
	合计	7709	31474	57	181.1	468	1486.94	29	92.14
Sex = Female	50-	880	4809	3	62.38	17	353.5	0	0
	55-	2086	9642	8	82.97	42	435.59	5	51.86
	60-	3652	15407	14	90.87	120	778.87	7	45.43
	65-	2726	10944	14	127.92	63	575.66	8	73.1
	70-	2202	8278	54	652.33	12	144.96	2	24.16
	74-	1106	4293	3	69.88	38	885.16	4	93.17
	合计	12652	53373	96	179.87	292	547.09	26	48.71
	总计	20361	84847	153	180.32	760	895.73	55	64.82
Infected with *Schistosoma japonicum* = 1 Sex = Male	50-	1	0	0		1		0	
	55-	7	7	0	0	7	100000	0	0
	60-	29	39	0	0	12	30769.23	1	2564.1
	65-	60	93	3	3225.81	45	48387.1	0	0
	70-	44	61	5	8196.72	40	65573.77	2	3278.69
	74-	23	27	1	3703.7	20	74074.07	1	3703.7
	合计	164	227	9	3964.76	125	55066.08	4	1762.11
Sex = Female	50-	4	4	0	0	3	75000	1	25000
	55-	7	13	0	0	3	23076.92	0	0
	60-	26	39	1	2564.1	19	48717.95	1	2564.1
	65-	25	31	0	0	20	64516.13	2	6451.61
	70-	35	46	2	4347.83	26	56521.74	2	4347.83
	74-	14	18	1	5555.56	9	50000	0	0
	Total	111	151	4	2649.01	80	52980.13	6	3973.51
	Total	275	378	13	3439.15	205	54232.8	10	2645.5

Table 2: Analysis of *Schistosoma japonicum* infection and colorectal lesions in community residents with carcinoma *in situ*.

Comparison of Tumor Prevalence of Schistosomiasis Infection: M-H chi square = 45.9157
Corrected chi square = 980.6197 or = 94.1213 95%CI (53.0569 ~ 166.9684)
Comparison of Stool Positive Rate of Schistosomiasis Infection: M-H chi square = 672.4297
Corrected chi square = 668.934, OR = 3.9408, 95%CI (3.6686 ~ 4.2332)

Effect	Model Fitting Standard	Likelihood Ratio Test		
	Log Likelihood	Chi square	Df	Significant Level
Intercept	121155.714	121092.797	1	0.000
Smoking	63.209	.292	1	.589
Second-Hand Smoking	63.566	.649	1	.420
Milk Consumption	62.920	.003	1	.956
Vegetable Intake	84.494	21.577	1	.000
Fruit Intake	63.000	.083	1	.773
Schistosoma Infection	73.906	10.989	1	.001

Table 3: Univariate regression analysis of behavioral risk factors for colorectal cancer.

		B	se	Wald	Df	P	Exp(B)	Exp(B) 95%CI	
								Lower Limit	Upper Limit
1	**Intercept**	-7.856	.172	2097.638	1	0.000			
	Smoking	-0.261	0.488	0.286	1	0.593	0.771	0.296	2.004
	Second-Hand Smoking	-0.365	0.456	0.642	1	0.423	0.694	0.284	1.696
	Milk Consumption	-0.030	0.550	0.003	1	0.957	0.970	0.330	2.852
	Vegetable Intake	3.505	0.600	34.090	1	0.000	33.278	10.261	107.924
	Fruit Intake	-0.135	0.469	0.083	1	0.773	0.873	0.348	2.191
	Schistosoma Infection	1.585	0.523	9.185	1	0.002	4.880	1.751	13.604

Table 4: Multivariate regression analysis of risk factors for colorectal cancer.

After analyzing the behavioral risk factors into the single-factor regression model, it was found that regular consumption of vegetables was an important protective factor for colon lesions, whereas schistosomiasis infection was a risk factor for the occurrence of colon lesions.

Furthermore, the variables in the questionnaire were included in the univariate regression analysis. The following variables were included in the univariate regression analysis: Smoking, second-hand smoking schistosomiasis infection history, milk-drinking and eating habits. Next, the stepwise regression method was used for analysis. Results showed that the history of *Schistosoma japonicum* infection was an important risk factor for the high incidence of colorectal cancer in elderly residents in Qingpu District, Shanghai Municipal. Moreover, intake of more vegetables was an important protective factor for colorectal cancer. Notably, there were significant differences between the groups with regard to both factors (Table 2 - Table 4).

DISCUSSION

The findings of this study suggest that conducting free community colorectal cancer screening for older people aged 50 years - 74 years in the communities and focusing on changes in bowel blood and lifestyle habits can help identify colorectal polyps, adenomas, and early tumor patients. Results showed that community living habits such as eating more fruits and vegetables, drinking milk in moderation, no smoking, and drinking less alcohol can help to reduce the occurrence of colorectal lesions. In addition, red meat intake, excessive fat intake, trauma, and family history are risk factors for colorectal cancer.

A local survey among the elderly in Qingpu District community showed that the colorectal lesions were more significant after schistosomiasis infection, the prevalence of colorectal cancer was higher than those non-schistosomiasis infection, and the prevalence of colorectal cancer in schistosomiasis infected people was more than 10 times higher than that of non-schistosomiasis infected

people. Qingpu District is in the terrain of Jiangnan, which was one of the areas hardest hit by schistosomiasis infection. However, although the Shanghai Municipal officially announced the elimination of schistosomiasis in 1987, there are currently more than 1,000 patients with advanced schistosomiasis infection in the Qingpu District. Colorectal cancer screening found that intestinal calcification of schistosoma eggs, polyps, and tumor condition were more serious in individuals who had a history of schistosomiasis infection. Herein, multivariate regression analysis revealed that schistosomiasis infection was an important risk factor for colorectal cancer. This is consistent with previous studies that reported that Japanese schistosomiasis infection can induce changes in intestinal inflammation, ultimately resulting in colorectal cancer in the long-term.

It should be noted that Japan schistosomiasis infection has had a great impact in Southeast Asia countries such as Vietnam, Malaysia and others [12], and the Yangtze River area in China. Currently, some areas in China, including Jiangxi, Hunan, Hubei, and GuangDong areas, have new schistosomiasis infection. This study found that early detection of schistosomiasis intestinal lesions can lead to early diagnosis of colorectal cancer, which can aid in early treatment and timely follow-up. Therefore, it is of great public health significance to carry out early targeted screening for colorectal cancer.

Schistosoma japonicum infections are common in China and Southeast Asia countries. Previous studies reported that the schistosoma parasite lives in the liver and can easily cause liver lesions [13,14]. In addition, schistosoma eggs calcify in colorectal regions. However, although schistosoma infections can cause splenomegaly and dwarfish pathological manifestations [15], its involvement in colorectal cancer has not yet been shown. In this study, calcified schistosoma eggs were detected in some patients with colorectal lesions, usually accompanied by a history of schistosoma infection. The findings of this study suggest that the deposition and calcification of schistosoma eggs in the colorectal region may induce colorectal inflammation, ultimately leading to the occurrence of colorectal cancer. However, further studies should be conducted to verify this hypothesis. It has also been reported that colorectal cancer may result from changes in the gene expression of colorectal cells upon mechanical and biological stimulation generated by schistosoma eggs in the intestine [16].

Approximately 1% of patients with colorectal adenoma will undergo malignant transformation after several years or decades [17]. In this study, the incidence rate of colorectal adenoma was 1134.64/100,000, suggesting that the incidence of colorectal cancer could be reduced through early detection and treatment. Moreover, the mean time for occurrence of colorectal lesions after schistosoma infection was 38.60 ± 2.77 years and the shortest time prior to onset of colorectal lesion was 34 years, indicating that chronic schistosoma infection could lead to colorectal lesions.

The results of this screening further showed that patients with Schistosoma japonicum infection had significantly more positive FOBT compared to the general population, and this disparity was accompanied by a higher incidence of colorectal cancer. Collectively, these findings suggest that routine follow-up fibro-colorectaloscopy and FOBTs should be performed for patients with schistosoma infections to discover early lesions.

CONCLUSION

In conclusion, this study has shown that patients with early colorectal cancer can be effectively diagnosed through organized community events and proactive colorectal cancer screening, thereby resulting in significant social benefits and reduced treatment costs. In addition, proactive

colorectal cancer screening can effectively reduce the medical care, and follow-up costs incurred by families and the society at large.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

REFERENCES

1. Xu Z, Su DL (1984) *Schistosoma japonicum* and colorectal cancer: An epidemiological study in the People's Republic of China. International Journal of Cancer 34(3): 315-318.
2. Reddy BS (2002) Types and amount of dietary fat and colon cancer risk: Prevention by omega-3 fatty acid-rich diets. Environmental Health and Preventive Medicine 7(3): 95-102.
3. Chao A, Thun MJ, Jacobs EJ, et al. (2000) Cigarette smoking and colorectal cancer mortality in the cancer prevention study II. Journal of the National Cancer Institute 92(23): 1888-1896.
4. Fedirko V, Tramacere I, Bagnardi V, et al. (2011) Alcohol drinking and colorectal cancer risk: An overall and dose–response meta-analysis of published studies. Annals of Oncology 22(9): 1958-1972.
5. Jeon J, Du M, Schoen RE, et al. (2018) Determining risk of colorectal cancer and starting age of screening based on lifestyle, environmental, and genetic factors. Gastroenterology 154(8): 2152-2164.
6. Tao W, Konings P, Hull MA, et al. (2017) Colorectal cancer prognosis following obesity surgery in a population-based cohort study. Obesity Surgery 27(5): 1233-1239.
7. Zuo L, Zhang SM, Hu RL, et al. (2008) Correlation between expression and differentiation of endocan in colorectal cancer. World journal of gastroenterology: WJG 14(28): 4562.
8. Melton EC, Kehl KA (2015) Managing chronic diarrhea with colorectal cancer. Journal of Hospice & Palliative Nursing 17(5): 382-388.
9. Harnoy Y, Bouhnik Y, Gault N, et al. (2016) Effect of appendicectomy on colonic inflammation and neoplasia in experimental ulcerative colitis. Journal of British Surgery 103(11): 1530-1538.
10. Thomsen RW, Thomsen HF, Nørgaard M, et al. (2008) Risk of cholecystitis in patients with cancer: A population-based cohort study in Denmark. Cancer 113(12): 3410-3419.
11. Párraga Ros E, Correa-Martín L, Sánchez-Margallo FM, et al. (2018) Time-course evaluation of intestinal structural disorders in a porcine model of intra-abdominal hypertension by mechanical intestinal obstruction. Plos One 13(1): e0191420.
12. Bareket R, Schonberg MA, Comaneshter D, et al. (2017) Cancer screening of older adults in Israel according to life expectancy: Cross sectional study. Journal of the American Geriatrics Society 65(11): 2539-2544.
13. Van de Vijver KK, Hokke CH, van Remoortere A, et al. (2004) Glycans of Schistosoma mansoni and keyhole limpet haemocyanin induce hepatic granulomas in vivo. International Journal for Parasitology 34(8): 951-961.
14. Zhao E (1981) Cancer of the colorectal and schistosomiasis. Journal of the Royal Society of Medicine 74: 645.
15. Tamer E, Gamal E (2013) Hepatic and intestinal schistosomiasis: Review. Journal of Advanced Research 4(5): 445-452.
16. Zhai X, Xue Q, Liu Q, et al. (2017) Colon cancer recurrence-associated genes revealed by WGCNA co-expression network analysis. Molecular Medicine Reports 16(5): 6499-6505.
17. Conteduca V, Sansonno D, Lauletta G, et al. (2013) *H. pylori* infection and gastric cancer: State of the art. International Journal of Oncology 42(1): 5-18.