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Why hasn't this woman been screened for breast and cervical cancer? – Evidence from a Chinese population-based study

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ABSTRACT

Objective: Less than half of eligible Chinese rural women have been screened for breast and cervical cancer. The objective of this study was to describe individual-level reasons for attending or not attending 'two cancers' screening using Andersen's Behavioral Model of Health Services Use.

Study design: Cross-sectional study.

Methods: The study sample was from the Health Services Survey in 2013 in Jiangsu, China. A total of 6520 rural women aged 36–65 years answered the questions on 'two cancers' screening participation and were included in the final analysis, which consisted of univariate and multivariate logistic regression.

Results: In the results of multivariate logistic regression, factors significantly associated with having 'two cancers' screening included educational level (odds ratio [OR] = 0.78, 95% confidence interval [CI] = 0.65–0.92), per capita household income (OR = 0.65, 95% CI = 0.58–0.73), availability of female medical faculty in township facilities (OR = 0.35, 95% CI = 0.28–0.42), quality of life (OR = 0.72, 95% CI = 0.58–0.90), being nulliparous (OR = 3.21, 95% CI = 1.96–5.26), and multiparous (OR = 1.91, 95% CI = 1.68–2.16).

Conclusion: To reduce inadequate screening service utilization of breast and cervical cancer in rural areas, efforts should be made not only to target the vulnerable rural women with lower income, lower educational level, and lower health conditions but also to further

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improve access to female primary-care providers. Strategies are also urgently needed to focus on nulliparous and multiparous women.

Introduction

Both breast and cervical cancer are common cancers with high incidence in women worldwide.[1] In recent years, the incidence of 'two cancers' in China has continued to rise, becoming a serious threat to women's health. For breast cancer, the incidence increased at an annual rate of 3.9% from 2000 to 2011; likewise, the incidence of cervical cancer increased by 4.1% annually from 2007 to 2011.[2] According to the latest data from the World Health Organization,[3] new cases of breast cancer among Chinese women account for 17.6% of all new cases in the world, and new cases of cervical cancer account for 18.7% worldwide. In 2018, the estimated number of breast cancer deaths in China will account for 15.6% of global breast cancer deaths, while deaths from cervical cancer will be 15.3%.

Screening for breast and cervical cancer is conducted through effective, simple, and economical examinations, aiming to identify individuals with abnormalities suggestive of a specific cancer or precancer who have not developed any symptoms and to refer them promptly for diagnosis and treatment.[4] Cancer screening programs in general are a far more complex public health intervention compared with early diagnosis. They are well-implemented in high-income countries, especially for a few malignancies whose mortality can be reduced by screening, such as breast and cervical cancer in women.[5] The importance of organized cancer screening has been increasingly recognized in lowering mortality and morbidity in 'two cancers'. In the United States and United Kingdom, breast and cervical cancer mortality has been declining in recent years, and one of the main reasons for this has been extensive screening.[6,7] Beginning in 2009, the Chinese government launched a program of free screening for 'two cancers' among rural women aged 35 to 64 years.[8] In practice, the health administrative department in each city sets a schedule for the annual task of screening at community healthcare institutions, and the grass-roots medical staff conducts extensive social mobilization and regular health education about screening among the women in each community, so as to inform and encourage age-eligible women to participate. By 2014, 42.87 million women and more than 6 million women had attended a free screening for cervical cancer and breast cancer, respectively.[9] Nevertheless, the participation rate is still low. Previous studies have reported that women are reluctant to attend the programs.[10,11] As a result, the desired effect of the screening has been limited.

According to Andersen's Behavioral Model of Health Services Use,[12,13] the individual-based determinants of health-service utilization include predisposing characteristics, enabling resources, and the need for health services: (1) individuals' predisposing characteristics refers to social-demographic factors and/or individual belief systems regarding health; (2) enabling resources refers to the impacts of factors such as income, health insurance, and medical accessibility (including some factors from the service providers); and (3) the need for health services refers to medical needs that reflect the person's actual health status. All these factors also likely contribute to screening utilization, which is the hypothesis of this study. Although there have been some previous studies on influences upon women's participation in screening, there remains a paucity of research on this topic among Chinese women. Furthermore, few studies have applied the Andersen model to explain screening behaviors. The purpose of this study, therefore, was to assess the impact factors of screening attendance for breast and cervical cancer in rural China, adopting Andersen's model as a template.

Methods

Data and sampling

The data for this article were drawn from the National Health Services Survey (NHSS) collected by the National Health and Family Planning Commission (NHFPC) of China in 2013. The data used were from Jiangsu province. Located on the east coastal area of China, Jiangsu has been an economic leader among all the provinces. In 2013, the per capita income of rural residents in the province was much higher than the national average level ($2216 vs $1458). In rural Jiangsu, 11 counties were covered in the NHSS in 2013. A multistage stratified random sampling technique was used to choose the sample, and a probability-proportional-to-size sampling design was adopted. First, the counties were chosen randomly. Then, townships were drawn from each county, and then villages were drawn from each township. Finally, the households were drawn from each village.

The local medical university and medical institutions were commissioned by the NHFPC to conduct the provincial survey. The investigators were local medical personnel and some recruited college students trained by researchers from the medical university. After giving their informed consent, all members of a household were interviewed at home, face-to-face by the investigators. When three attempts to survey the same household had failed, the investigators gave up this household and surveyed a replacement from among the candidates, in order. A total of 8400 rural households were investigated, and considering the research purpose, 6520 rural women aged 36–65 years were enrolled in this study (the screening program covered rural women aged 35–64 years, but the survey investigated use of the services during the last year.)

Dependent and independent variables

The dependent variable was screening utilization of 'two cancers'. In the first analysis, the responses were dichotomized to non-attendance or attendance in breast cancer screening and cervical cancer screening. Using Andersen's Model,[13] the following three dimensions were taken into account as the independent variables: predisposing characteristics, enabling resources, and the need for health services. First, demographics including age, marital status, education, and employment were used as indicators of predisposing characteristics. Second, the enabling resources indexes in this study included income, distance from the nearest hospital, and whether female medical staff was available as required in town facilities. Third, the need for health services was based on indicators that reflected actual health, thus a participant's chronic disease status (with or without chronic disease) was adopted, as well as quality of life. The European Quality of Life-5 Dimensions (EQ-5D) was used to estimate the quality of life. In addition, parity was taken into account in this dimension since it was closely related to these two female tumors.

Statistical analysis

Chi-squared tests and multinomial logistic regression analyses were performed in comparisons among the following three groups: those who did not attend any screening, those who attended one type of screening, and those who attended two types of screenings. Then, univariate and multivariate binary logistic regressions were conducted to explore the factors influencing breast cancer screening attendance. The same analysis methods were adopted for the dependent variable of cervical cancer screening utilization. According to the theoretical hypotheses, the independent variables in each regression model included age, marital status, education, employment, income, distance from the nearest hospital, availability of female medical staff when required, chronic disease status, quality of life, and parity. All data analyses were performed using SPSS, version 20.0 (IBM, New York, New York, USA), and the significance level in the analyses was set as 0.05.

Results

Characteristics of respondents

The average age of those 6520 respondents was 52.80 ± 7.60 years. Among them, the majority (95.2%) were married. Participants in this study who had reached high school and above in their education amounted to 791 (12.1%), the majority (87.9%) had an educational level below high school. Nearly half of the women (52.4%) had an annual per capita household income ≤16000 Yuan ($2622). Of the respondents, 28.3% had chronic diseases, and most were primiparous (56.5%; see Table 1).

Screening attendance status

In the most recent year, 41.76% (2713/6520) of the women had attended a breast cancer screening, and 35.57% (2319/6520) had participated in cervical cancer screening. Of the respondents, those who had received both screening services amount to 34.19%, while 8.96% received only one screening service, and more than half (56.86%) did not participate in any screening (Fig. 1).

Comparison among different attendance groups

Most study factors were significantly associated with screening attendance (Table 1). Results of Chi-squared tests showed women aged 45–55 years were more likely to have received screening than the rest ($P < 0.001$). Those whose educational level was below high school ($P < 0.001$) and those who were employed ($P = 0.04$), had a low income ($P < 0.001$), and had lower EQ-5D scores ($P < 0.001$) were more likely to be non-attendees. The availability of female medical faculty in township facilities had a positive association with screening participation ($P < 0.001$).

Multinomial logistic regression analyses showed that compared with women attending two types of screenings, the non-attendance group were less likely to be those who with a higher educational level (odds ratio [OR] = 0.78, 95% confidence interval [CI] = 0.65–0.92), with higher per capita household income (OR = 0.65, 95% CI = 0.58–0.73), having access to female medical faculty in township facilities (OR = 0.35, 95% CI = 0.28–0.42), with a higher quality of life (OR = 0.72, 95% CI = 0.58–0.90), nulliparous (OR = 3.21, 95% CI = 1.96–5.26), and multiparous (OR = 1.91, 95% CI = 1.68–2.16). Meanwhile, the group attending only one type of screening were less likely to be those who were 55–65 years (OR = 0.71, 95% CI = 0.57–0.88) and more likely to be those who were employed (OR = 1.39, 95% CI = 1.01–1.91).

Multivariate analysis of factors influencing breast cancer screening attendance

As seen in Table 2, the results of univariate analysis indicated that those variables significantly associated with breast cancer screening utilization included age (36–45 vs 45–55: OR = 0.86, 95% CI = 0.75–0.98; 55–65 vs 45–55: OR = 0.83, 95% CI = 0.74–0.93), educational level (OR = 1.53, 95% CI = 1.32–1.77), per capita household income (OR = 1.74, 95% CI = 1.58–1.92), availability of female medical faculty in towns (OR = 3.49, 95% CI = 2.93–4.15), EQ-5D (OR = 1.55, 95% CI = 1.30–1.86), and parity (nulliparous vs primiparous: OR = 0.26, 95% CI = 0.17–0.41; multiparous vs primiparous: OR = 0.44, 95% CI = 0.39–0.49).

The results of multivariate analysis indicated that in predisposing characteristics, women with a higher educational level were more likely to use screening services (OR = 1.30, 95% CI = 1.11–1.53). Age was no longer significant in this model. Higher income (OR = 1.49, 95% CI = 1.33–1.66) and having access to female medical faculty (OR = 2.98, 95% CI = 2.48–3.58) were significant enabling factors. In terms of need for health services, a higher quality of life (OR = 1.31, 95% CI = 1.08–1.60) was significantly associated with screening utilization. In addition, nulliparous (OR = 0.30, 95% CI = 0.19–0.48) and multiparous (OR = 0.53, 95% CI = 0.47–0.60) women were less likely to attend a screening.

Table 1 – Characteristics of respondents and comparison among different attendance groups.

Characteristics	*n* (%)	Attendance status, n (%)			χ^2	OR (95%CI) for non-attendance (ref: attendance in two types of screening)	OR (95%CI) for attendance in one screening (ref: attendance in two types of screening)
		None	One screening	Two types of screenings			
Predisposing characteristics							
Age group in years (*n* = 6520)							
>45, ≤55	2383 (36.5)	1283 (53.8)	254 (10.7)	846 (35.5)	22.23***	1	1
≥35, ≤45	1323 (20.3)	764 (57.7)	118 (8.9)	441 (33.3)		0.90 (0.77–1.06)	0.92 (0.72–1.19)
>55, ≤65	2814 (43.2)	1660 (59.0)	212 (7.5)	942 (33.5)		1.04 (0.91–1.19)	0.71 (0.57–0.88)**
Marital status (*n* = 6520)							
Unmarried	313 (4.8)	172 (55.0)	31 (9.9)	110 (35.1)	0.63	1	1
Married	6207 (95.2)	3535 (57.0)	553 (8.9)	2119 (34.1)		1.17 (0.90–1.52)	0.91 (0.60–1.38)
Educational level (*n* = 6520)							
Below high school	5729 (87.9)	3326 (58.1)	505 (8.8)	1898 (33.1)	28.47***	1	1
High school and above	791 (12.1)	381 (48.2)	79 (10.0)	331 (41.8)		0.78 (0.65–0.92)**	0.90 (0.68–1.18)
Employment (*n* = 6520)							
Unemployed	767 (11.8)	432 (56.3)	52 (6.8)	283 (36.9)	6.51*	1	1
Employed	5753 (88.2)	3275 (56.9)	532 (9.2)	1946 (33.8)		1.11 (0.93–1.32)	1.39 (1.01–1.91)*
Enabling resources							
Annual per capita household income[a] (*n* = 6520)							
≤16000(Yuan)	3415 (52.4)	2157 (63.2)	287 (8.4)	971 (28.4)	124.41***	1	1
>16000(Yuan)	3093 (47.4)	1540 (49.8)	295 (9.5)	1258 (40.7)		0.65 (0.58–0.73)***	0.83 (0.69–1.01)
Distance from the nearest hospital (*n* = 6520)							
<1 km	3125 (47.9)	1810 (57.9)	275 (8.8)	1040 (33.3)	2.805	1	1
≥1 km	3395 (52.1)	1897 (55.9)	309 (9.1)	1189 (35.0)		1.08 (0.96–1.21)	1.00 (0.83–1.21)
Availability of female medical faculty when requested in township facilities (*n* = 6520)							
No	895 (13.7)	709 (79.2)	43 (4.8)	143 (16.0)	211.83***	1	1
Yes	5625 (86.3)	2998 (53.3)	541 (9.6)	2086 (37.1)		0.35 (0.28–0.42)***	0.94 (0.65–1.36)
Need for health services							
Chronic disease[b] (*n* = 6520)							
Without	4677 (71.7)	2678 (57.3)	403 (8.6)	1596 (34.1)	2.63	1	1
With	1843 (28.3)	1029 (55.8)	181 (9.8)	633 (34.3)		0.97 (0.85–1.10)	1.11 (0.90–1.38)
Quality of life[c] (*n* = 6511)							
Low	601 (9.2)	397 (66.1)	54 (9.0)	150 (25.0)	26.35***	1	1
High	5910 (90.6)	3305 (55.9)	529 (9.0)	2076 (35.1)		0.72 (0.58–0.90)**	0.75 (0.53–1.06)
Parity (*n* = 5979)[d]							
Primiparous	3685 (56.5)	1696 (46.0)	396 (10.7)	1593 (43.2)	237.16***	1	1
Nulliparous	111 (1.7)	84 (75.7)	6 (5.4)	21 (18.9)		3.21 (1.96–5.26)***	1.10 (0.44–2.75)
Multiparous	2183 (33.5)	1434 (65.7)	169 (7.7)	580 (26.6)		1.91 (1.68–2.16)***	1.20 (0.97–1.49)

OR, odds ratio; CI, confidence interval; EQ-5D, European Quality of Life-5 Dimensions.
*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.
[a] Income: 16000 Yuan was a median of annual per capita household income.
[b] Chronic disease: hypertension, diabetes, or any other chronic diseases diagnosed by a doctor.
[c] Quality of life: groups were divided according to the mean of EQ-5D index score.
[d] *n* = 5959 (91.4%) after exclusion of missing data for all covariates in multinomial logistic regression model.

The Hosmer–Lemeshow (H–L) test showed a good model degree of fit ($P = 0.99$).

Multivariate analysis of influencing factors of cervical cancer screening attendance

As is shown in Table 3, the results of univariate analysis indicated that educational level (OR = 1.41, 95% CI = 1.21–1.64), annual per capita household income (OR = 1.71, 95% CI = 1.54–1.89), distance from the nearest hospital (OR = 1.11, 95% CI = 1.00–1.23), availability of female medical faculty in towns (OR = 2.94, 95% CI = 2.45–3.52), EQ-5D (OR = 1.60, 95% CI = 1.32–1.93), and parity (nulliparous vs primiparous: OR = 0.32, 95% CI = 0.20–0.52; multiparous vs primiparous: OR = 0.49, 95% CI = 0.44–0.55) were significantly associated with attendance at a cervical cancer screening.

The results of multivariate analysis indicated, among predisposing characteristics, that women who had a higher educational level were more likely to attend a screening (OR = 1.21, 95% CI = 1.03–1.43). Higher income (OR = 1.47, 95% CI = 1.32–1.65) as well as having female medical faculty when required (OR = 2.45, 95% CI = 2.03–2.95) were enabling resources that could improve participation. In terms of need for health services, the proportion of cervical cancer screening was higher among the women with higher EQ-5D scores (OR = 1.35, 95% CI = 1.10–1.66) but lower among nulliparous (OR = 0.32, 95% CI = 0.20–0.52) and multiparous (OR = 0.49,

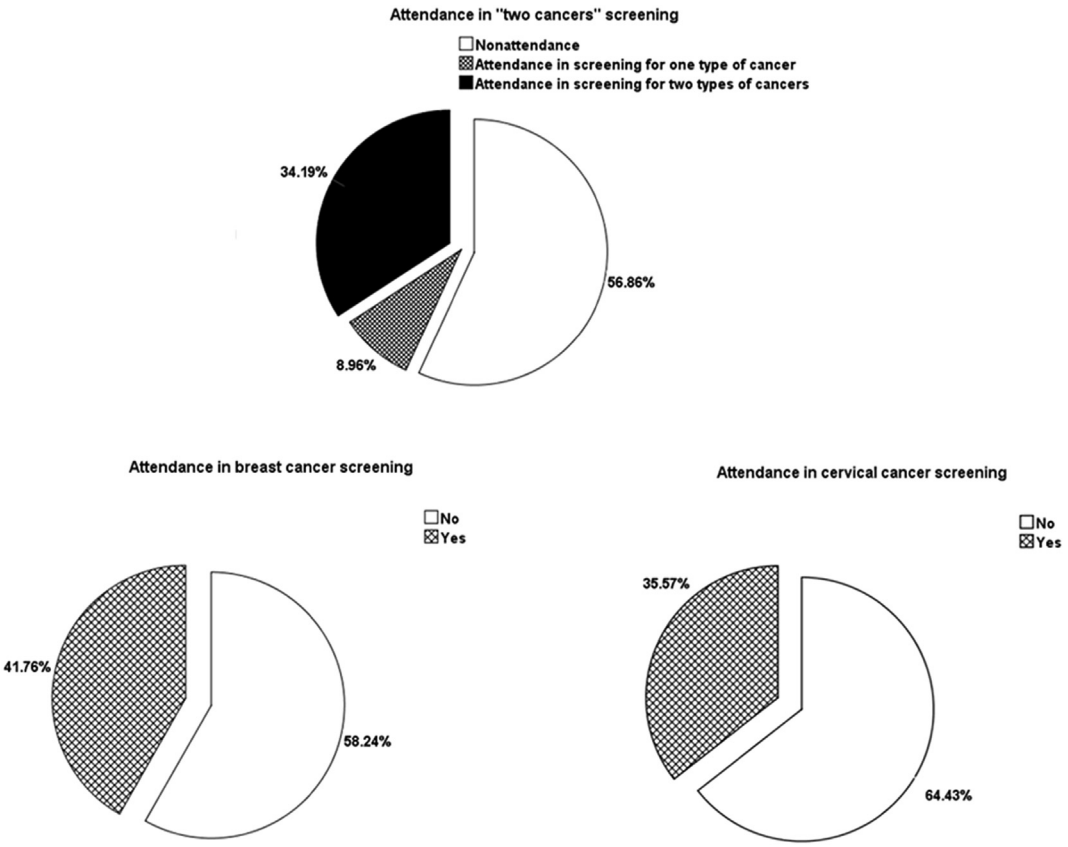

Fig. 1 – Distribution of breast and cervical cancer screening.

95% CI = 0.44–0.55) women. The H–L test showed a good model degree of fit (P = 0.33).

Discussion

Although the government has been carrying out free screening programs for rural women since 2009, studies have revealed that the screening rates in rural areas were still far lower than in urban areas.[14,15] The effect of the screening program for rural women needs to be improved; thus, there is a need to identify and target context-specific influence factors that are contributing to the limits in screening attendance. This is the first study using Andersen's model to explore the women's predisposing, enabling, and reinforcing features as they bear upon non-attendance.

Among the predisposing factors, a higher educational level was positively associated with screening attendance, whether for breast cancer or cervical cancer. The same was reported in the previous study of the United States,[16] and a separate meta-analysis also confirmed evidence of inequalities in 'two cancers' screening adherence according to women's educational level.[17] There is a possible explanation in previous studies, which suggest that better-educated women have greater awareness about their risk, more interest in health issues and behaviors, and better access to information and resources for health improvement.[18] Additionally, health literacy may play an important role in the relationship between educational level and adherence to cancer screening. As reported in some studies, health literacy was the only factor independently associated with knowledge related to cervical cancer screening.[19]

Previous studies have indicated that lower economic status was associated with non-participation in two screenings,[5,20] which is consistent with results from our study. The situation in China is similar to that of most European national health systems, where financial barriers to screening are generally reduced and free tests are available through organized programs.[21] Nevertheless, population coverage of the program in China is currently still limited because of the restrictions on program funds and the gap between the quota set for free screening and the huge eligible female population. As a result, some rural women still have to pay out-of-pocket fees to go to an outpatient clinic for breast or cervical cancer screening.[15] Low-income women may be fragile, and some of them would be afraid to face positive screening outcomes once they took into account the high cost of cancer treatment and the possible cost for time missed from work. The vulnerability perceived by low-income women concerning their capacity to trust the health services and to cope with diseases, and how this affects their perceptions of risk and their behaviors have not been studied yet.[22] Even so, varying degrees of vulnerability can always affect the motivation for screening among poor rural women.

Primary-care physicians may have a key role in promoting 'two cancers' screening, and they should be explicitly involved in the implementation of organized population programs. However, the gender of primary-care providers may

Table 2 – Factors associated with breast cancer screening attendance in the recent one year.

Variables	Attendance, n (%)		ORu (95%CI)	ORm (95%CI)
	No	Yes		
Predisposing characteristics				
Age group in years ($n = 6520$)				
>45, ≤55	1323 (55.5)	1060 (44.5)	1	1
≥36, ≤45	784 (59.3)	539 (40.7)	0.86 (0.75–0.98)*	1.09 (0.93–1.27)
>55, ≤65	1690 (60.1)	1124 (39.9)	0.83 (0.74–0.93)***	0.93 (0.82–1.05)
Marital status ($n = 6520$)				
Unmarried	175 (55.9)	138 (44.1)	1	1
Married	3622 (58.4)	2585 (41.6)	0.91 (0.72–1.14)	0.82 (0.64–1.05)
Educational level ($n = 6520$)				
Below high school	3409 (59.5)	2320 (40.5)	1	1
High school and above	388 (49.1)	403 (50.9)	1.53 (1.32–1.77)***	1.30 (1.11–1.53)***
Employment ($n = 6520$)				
Unemployed	440 (57.4)	327 (42.6)	1	1
Employed	3357 (58.4)	2396 (41.6)	0.96 (0.83–1.12)	0.95 (0.81–1.13)
Enabling resources				
Annual per capita household income[a] ($n = 6508$)				
≤16000(Yuan)	2205 (64.6)	1210 (35.4)	1	1
>16000(Yuan)	1582 (51.1)	1511 (48.9)	1.74 (1.58–1.92)***	1.49 (1.33–1.66)***
Distance from the nearest hospital ($n = 6520$)				
<1 km	1842 (58.9)	1283 (41.4)	1	1
≥1 km	1955 (57.6)	1440 (42.4)	1.06 (0.96–1.17)	1.04 (0.94–1.16)
Availability of female medical faculty when requested in township facilities ($n = 6520$)				
No	723 (80.8)	172 (19.2)	1	1
Yes	3074 (54.6)	2551 (45.4)	3.49 (2.93–4.15)***	2.98 (2.48–3.58)***
Need for health services				
Chronic disease[b] ($n = 6520$)				
Without	2743 (58.6)	1934 (41.4)	1	1
With	1054 (57.2)	789 (42.8)	1.06 (0.95–1.18)	1.06 (0.94–1.20)
Quality of life[c] ($n = 6511$)				
Low	406 (67.6)	195 (32.4)	1	1
High	3386 (58.2)	2524 (42.7)	1.55 (1.30–1.86)***	1.31 (1.08–1.60)**
Parity ($n = 5979$)[d]				
Primiparous	1747 (47.4)	1938 (52.6)	1	1
Nulliparous	86 (77.5)	25 (22.5)	0.26 (0.17–0.41)***	0.30 (0.19–0.48)***
Multiparous	1470 (67.3)	713 (32.7)	0.44 (0.39–0.49)***	0.53 (0.47–0.60)***

CI, confidence interval; ORu, the odds ratio of univariate logistic regression analysis; ORm, the odds ratio of Multivariate logistic regression analysis.

*P < 0.05, **P < 0.01, ***P < 0.001.

[a] Income: 16000 Yuan was a median of annual per capita household income.

[b] Chronic disease: hypertension, diabetes, or any other chronic diseases diagnosed by a doctor.

[c] Quality of life: groups were divided according to the mean of EQ-5D index score.

[d] $n = 5959$ (91.4%) after exclusion of missing data for all covariates in multivariate analysis.

lead to differences in effectiveness of mobilization for the screenings. This study revealed that a lack of female health workers is a significant negative factor in women's unwillingness to be screened. Hope et al.'s[23] study pointed out any emotional discomfort in the situation, itself, might be exacerbated by facing a male healthcare worker during screening. Women felt embarrassed about the awkward positions they had to assume and the manipulation and exposure of private parts of the body to male physicians during the screening process.[24] In some countries, patients have the option to request a female nurse to conduct the screening test.[23] However, in the primary-care facilities responsible for the screening program in rural China, female health workers are often unavailable when needed. Many grass-roots clinics have only one general practitioner, and under such conditions of health manpower, the demand for female faculty at every grass-roots facility is not yet widely met. In addition, owing to insufficient human resources in primary healthcare facilities, the service quality cannot be adequately guaranteed. Thus, the two screenings campaigns in China are not going well in areas where female rural doctors are absent, especially among relatively conservative rural women.

The association between quality of life and screening attendance was proven to be significant: the group with higher EQ-5D scores was found to have a higher screening rate. A study using national data from Korea[25] is consistent with our results and deduces the possible explanation that mobility impairment is a main component of EQ-5D and can be a main reason for lower use of healthcare services, including screenings of breast and cervical cancers at the community level. On the other hand, mental conditions may also contribute to the correlation between quality of life and screening utilization. Recent systematic reviews have found suboptimal cancer screening rates in people with mental disorders.[26] A study

Table 3 – Factors associated with cervical cancer screening attendance in the recent one year.

Variables	Attendance, n (%)		ORu (95%CI)	ORm (95%CI)
	No	Yes		
Predisposing characteristics				
Age group in years ($n = 6520$)				
>45, ≤55	1497 (62.8)	886 (37.2)	1	1
≥36, ≤45	862 (65.2)	461 (34.8)	0.90 (0.79–1.04)	1.11 (0.95–1.29)
>55, ≤65	1842 (65.5)	972 (34.5)	0.89 (0.80–1.00)	0.99 (0.87–1.12)
Marital status ($n = 6520$)				
Unmarried	200 (63.9)	113 (36.1)	1	1
Married	4001 (64.5)	2206 (35.5)	0.98 (0.77–1.23)	0.91 (0.71–1.17)
Educational level ($n = 6520$)				
Below high school	3748 (65.4)	1981 (34.6)	1	1
High school and above	453 (57.3)	338 (42.7)	1.41 (1.21–1.64)***	1.21 (1.03–1.43)
Employment ($n = 6520$)				
Unemployed	476 (62.1)	291 (37.9)	1	1
Employed	3725 (64.7)	2028 (35.3)	0.89 (0.76–1.04)	0.88 (0.74–1.04)
Enabling resources				
Annual per capita household income[a] ($n = 6508$)				
≤16000(Yuan)	2396 (70.2)	1019 (29.8)	1	1
>16000(Yuan)	1793 (58.0)	1300 (42.0)	1.71 (1.54–1.89)***	1.47 (1.32–1.65)***
Distance from the nearest hospital ($n = 6520$)				
<1 km	2053 (65.7)	1072 (34.3)	1	1
≥1 km	2148 (63.3)	1247 (36.7)	1.11 (1.00–1.23)*	1.10 (0.99–1.23)
Availability of female medical faculty when requested in township facilities ($n = 6520$)				
No	738 (82.5)	157 (17.5)	1	1
Yes	3463 (61.6)	2162 (38.4)	2.94 (2.45–3.52)***	2.45 (2.03–2.95)***
Need for health services				
Chronic disease[b] ($n = 6520$)				
Without	3016 (64.5)	1661 (35.5)	1	1
With	1185 (64.3)	658 (35.7)	1.01 (0.90–1.13)	1.01 (0.89–1.14)
Quality of life[c] ($n = 6511$)				
Low	442 (73.5)	159 (26.5)	1	1
High	3753 (63.5)	2157 (36.5)	1.60 (1.32–1.93)***	1.35 (1.10–1.66)**
Parity ($n = 5979$)[d]				
Primiparous	2041 (55.4)	1644 (44.6)	1	1
Nulliparous	88 (79.3)	23 (20.7)	0.32 (0.20–0.52)***	0.38 (0.24–0.60)***
Multiparous	1567 (71.8)	616 (28.2)	0.49 (0.44–0.55)***	0.58 (0.52–0.66)***

CI, confidence interval; ORu, the odds ratio of univariate logistic regression analysis; ORm, the odds ratio of multivariate logistic regression analysis.

$P < 0.05$, **$P < 0.01$, ***$P < 0.001$.

[a] Income: 16000 Yuan was a median of annual per capita household income

[b] Chronic disease: hypertension, diabetes, or any other chronic diseases diagnosed by a doctor.

[c] Quality of life: groups were divided according to the mean of EQ-5D index score.

[d] $n = 5959$ (91.4%) after exclusion of missing data for all covariates in multivariate analysis.

among Swedish women displaying higher odds of non-attendance at mammography screening found that they had a low sense of control and experienced greater stress.[27]

The results of our study showed that nulliparous or multiparous women were less likely to attend the two screenings than primiparous women. A study in Jordan was consistent with these results about nulliparous women.[28] Women who have experienced childbirth are supposed to have received some related health education, particularly on sexual and reproductive health, and are also more likely to have the motivation to participate in screening. But the reason for less screening utilization among multiparous women than among primiparous women still needs to be studied. This result is the opposite of a previous study in Italy, which revealed having had two or more pregnancies was associated with more frequent screening.[29] In past decades, in particular, China's strict implementation of its 'one child policy' might have led to lower utilization of certain health services for some multiparous women who violated the family planning policy.[30] Thus, the comparison with other countries may not be valid because of this major policy difference. In any event, this phenomenon should be noted, especially for the coming possible 'second baby boom' and a gradually increasing number of multiparous women. In 2017, the second year of the implementation of the 'comprehensive two-child' policy in China, second babies rose to 8.83 million, accounting for 51% of the newborn.[31]

Policy implications

There are many possible strategies that could be implemented to improve 'two cancers' screening adherence. First, attention should be paid to vulnerable rural women with a low educational level, a low economic level, and poor health conditions.

Providing education about the early diagnosis of 'two cancers' leads to positive changes in the health beliefs of women regarding screening tests,[32] thus it is very necessary to implement relevant health education among all eligible people, especially those who are disadvantaged. Second, the introduction of projects to improve screening rates should be considered in communities with women having a poor quality of life. The government should continue to expand the program to increase the quota for free screening. Third, it is clear that primary-care providers play a critical role in screening uptake, and adherence to cancer screening often hinges on effective doctor-patient communication about screening. Primary-care personnel allocation should be aptly adjusted to ensure the availability of female faculty, since they have a natural superiority when interacting with female patients. On the other hand, improving communication and social mobilization skills among male healthcare providers is also one of the remediable measures. Fourth, nulliparous women should be focused on more seriously than primiparous women in mobilizing screening. Given that the number of women with multiple births is likely to increase as the effect of the birth policy continues, the attitudes and behaviors of multiparous women toward screening require further attention and research.

Limitations

There are some limitations in this study. First, there is a question about the representativeness of the sample. This study only included respondents from Jiangsu province, so conclusions cannot be generalized to the entire population in China. Second, the authors did not consider intrapersonal factors that can affect cancer screening, such as anxiety or fear of cancer, one's sense of self-efficacy, and the receipt of appropriate health education about cancer screening.

Conclusions

The findings of this study provide encouraging evidence that the crucial roles individual-based characteristics play in deciding whether or not to attend screenings for breast and cervical cancer must be considered. Strategies to improve screening participation should include education about the rationale for screening, developing policies favoring the interests of vulnerable women, addressing ways to optimize primary-care providers' communication strategies, and paying more attention to nulliparous or multiparous women.

Author statements

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Ethical approval

Ethics approval was obtained from Nanjing Medical University.

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Competing interests

None declared.

Contributors

All authors participated in concept and design of this study. Y.H., G.H., Z.N., K.Y., and C.N. participated in data collection and analysis. Y.H., G.H., F.H., and L.X.Y. participated in data interpretation and writing the manuscript and approved the final version. L.X.L. and G.J. participated in correcting the grammatical errors and editing the manuscript.

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