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KNOWLEDGE OF CERVICAL CANCER RISK FACTORS AMONG CHINESE IMMIGRANTS IN SEATTLE

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Abstract

Chinese American immigrants are a growing part of the United States population. Cervical cancer is a significant cause of morbidity and mortality among Chinese Americans. Pap smear testing is less common in Chinese American immigrants than in the general population. During 1999, we conducted a community-based survey of Chinese American women living in Seattle. We assessed knowledge of cervical cancer risk factors and history of Pap smear testing along with socioeconomic and acculturation characteristics. The overall estimated response rate was 64%, and the cooperation rate was 72%. Our study sample included 472 women. Most cervical cancer risk factors were recognized by less than half of our participants. Factors independently associated with knowledge of cervical cancer risk factors included marital status, employment, and education. Respondents with the highest knowledge had greater odds of ever receiving a Pap smear, compared to those respondents with the lowest knowledge (OR 2.5; 95% CI: 1.1,5.8). Our findings suggest a need for increased recognition of cervical cancer risk factors among Chinese American immigrants. Culturally and linguistically appropriate educational interventions for cervical cancer risk factors should be developed, implemented and evaluated.

Keywords

cervix neoplasms; Chinese Americans; risk factors

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INTRODUCTION

Two and a half million ethnic Chinese live in the United States (U.S.), according to the 2000 census.¹ Approximately 83% of this population consists of recent immigrants who have come to the U.S. in response to changes in immigration law and circumstances in southeast and east Asia.² The recent increase in Chinese immigration started with the Immigration Act of 1965, which increased the annual quota for Chinese immigrants from 2,000 to 20,000. The act also allowed immediate family members of ethnic Chinese already living in the U.S. to immigrate outside of the quota.³ Several waves of immigration followed. In 1975, ethnic Chinese living in Laos, Cambodia and Vietnam fled to the U.S. following the fall of Saigon. Immigration from Mainland China rose in 1979 due to normalization of U.S.-China relations. Another rise in immigration occurred in 1981 when the U.S. set up separate immigration quotas for Hong Kong and Mainland China. More recent waves of immigration have been associated with the events of Tianamen Square in 1989 and the return of Hong Kong to Mainland China in 1997.⁴⁻⁶ Chinese Americans are currently the largest Asian subgroup in the U.S. and significant immigration from China is expected to continue. The Census department estimates that the Asian American population will more than triple by 2050.^{7,8}

Cervical cancer is an important cause of morbidity and mortality for Chinese American women. Although data specific to the Chinese immigrant population is lacking, a few studies have found that Chinese American women have a higher incidence and mortality from cervical cancer compared to the general population. A Los Angeles study estimated a cervical cancer incidence of 12.3/100,000 for Chinese vs. 7.2/100,000 for non-Latina whites.⁹ In a British Columbia study, the cervical cancer rate in the Chinese population was found to be two times that of the Caucasian population.¹⁰ Chinese American women also present with more advanced stages of cervical cancer compared to Caucasians. In one study, 21% of Chinese Americans presented with regional or distant metastases compared with 8% of the Caucasian population.¹¹

We are currently unaware of studies directly addressing Chinese American immigrants' knowledge of cervical cancer risk factors. In a recent study, we reported that 60% of our Chinese immigrant respondents had undergone Pap smear testing in the previous two years.¹² This rate is below that of the general population (79%) and well below the goals of Healthy People 2010 (90%).¹³ We now report the knowledge of cervical cancer risk factors in this immigrant population of Chinese American women.

METHODS

Study Sample

The Chinese American population in Seattle is concentrated in the south and central regions of the city.¹⁴ We aimed to recruit a representative sample of Chinese American women from these areas. To identify Chinese households within these target areas, we used two complementary sampling methods. First, we used multiple data sources (e.g., published articles and cancer registries) to compile a comprehensive list of Chinese surnames. We then used this surname list to identify potential Chinese households from the 1998 Seattle phone book. This sampling method is described in detail elsewhere.¹⁵⁻¹⁷ Second, we bought a commercially available listing of Chinese households from a marketing company, The American List Council of New Jersey. This company uses a combination of sources, including driver's licenses, voter registrations, warranty cards, market research data, and telephone directories to compile listings for subgroups of the population, such as racial or ethnic groups. All of the company's databases are updated monthly using the National Change of Address System.¹⁸ We then merged the listings from the two sampling methods by street address to eliminate duplicates.

We used three different versions of our survey to assess different preventive behaviors, including Pap smear testing, mammography, and hepatitis B serologic testing. Study households were, therefore, randomly assigned one of three different versions of the survey instrument. Two thirds of the study households were assigned to a survey version that included questions pertaining to knowledge of cervical cancer.

Survey Recruitment

The human subjects committee of the Fred Hutchison Cancer Research Center approved our study. We publicized the project through posters in community settings, such as Chinese grocery stores and restaurants. We then mailed introductory letters in both Chinese and English that were signed by two physicians from the International Medical Clinic in Seattle. Interviews were conducted either in English, Cantonese or Mandarin. Bicultural Chinese American women conducted all interviews. We offered ten dollars to each participant in order to acknowledge their time and commitment to the survey.

Participants were eligible if they were Chinese women equal to or over the age of 20 years old. Due to cost restraints, we conducted interviews only with those respondents who spoke Cantonese, Mandarin or English. If there was more than one woman in the household, the eldest was chosen. If the eldest woman was not available or refused to participate, we asked if we could interview a younger woman. We chose this method of participant selection within a household, rather than random selection, due to previous reports showing a decrease in response rate associated with attempts to enumerate the number of individuals within an Asian American household.¹⁹ The survey workers made at least five attempts to contact each household, including at least one attempt during the day, one during the evening and one on the weekend.

Survey Content

We developed all survey questions in English, translated them to Chinese and then back translated them to English, in order to assure lexical equivalence, reconciled, and pre-tested.²⁰ We asked our participants standard demographic questions including age, marital status, educational level, income, religion, housing type (owned, rented, subsidized), employment outside the home, and country of birth. We also asked participants about their age at immigration, the number of years they had lived in North America and which of the following languages they were fluent in: Mandarin, Cantonese and English. In order to ascertain whether cervical cancer knowledge was associated with exposure to western health services, we also included questions about receipt of prenatal care or family planning services in North America.

We developed our knowledge questions based on previously established risk factors for cervical cancer. These included the following: age over 50; onset of sexual intercourse at an early age; history of multiple sexual partners; history of sexual activity with a man who has had multiple partners; history of a sexually transmitted disease; multiparity; smoking; and absence of Pap testing.²¹⁻²⁴ We also included two questions, which were not associated with cervical cancer, in order to assess alternative beliefs and deter patterned responses. One of these questions asked about a potential association of frequent sexual activity with the same partner and cervical cancer risk, and the other asked about a potential association of multiple miscarriages with cervical cancer.

Pap testing items were taken from the Pathways to Early Detection questionnaire, which has previously been successfully used in several Asian American populations.^{5,25,26} Current guidelines recommend Pap testing every one to three years.^{27,28} Most physicians in the Seattle area, however, perform annual Pap smear testing. Therefore, in our survey we asked

participants whether they had ever received a Pap test, and if so, whether they had received Pap testing in the previous two years.

Data Analysis

We calculated knowledge scores by summing the total number of correct responses for each participant. Incorrect responses included those respondents who answered a question incorrectly or did not know the answer. Using analysis of variance, we assessed the association of the knowledge scores for cervical cancer risk factors with the sociodemographic and acculturation characteristics of women. Age at immigration was calculated from women's answers to questions concerning their age and years since immigration. We limited the bivariate analysis to those participants who answered all of the knowledge questions ($n = 413$). A linear regression model was used to summarize the independent effects of sociodemographic and acculturation factors on knowledge of cervical cancer risk factors. The linear regression analysis was limited to those respondents who had complete information for all knowledge questions and all sociodemographic variables, except income ($n = 388$). As a tool to build a summary model, we used a stepwise variable-selection method.^{29,30} Variables entered the model at a level of $p < 0.15$ and were removed from the model at a level of $p > 0.05$. We excluded income data from our multiple regression, due to 44% non-response rate for this variable.

In addition, we used unconditional logistic regression to evaluate the likelihood of having obtained a Pap smear in relation to knowledge score.³¹ Knowledge score was entered as a linear predictor in the model. The odds ratio was then scaled to represent the odds of obtaining a Pap smear in the group of women with the highest knowledge score compared to the women with the lowest knowledge score. Variables formerly established in our previous analysis of these data as independently associated with ever receiving a Pap smear and with receipt of a Pap smear in the previous two years were used as adjustment variables in assessing the association of knowledge with Pap smear testing behavior. These variables included age, marital status and housing type.¹²

RESULTS

Study Group

Seven hundred and ten women participated in the survey. We have previously reported the details our of response rates for the survey.¹² The estimated total response rate for recruitment was 64%. For those households that were both eligible and reachable, 72% cooperated. Four hundred and seventy two women completed the survey version that included questions on cervical cancer knowledge risk factors. Since our focus was on the Chinese immigrant population, we excluded 31 women who were born in North America (Canada and U.S.). We also excluded five women with a history of invasive cervical cancer. Therefore, 436 women were in our final study sample.

Table 1 provides details of the participants' demographics and acculturation characteristics. The mean age in the study group was 54 years with a range from 20 to 93 years. The mean number of years of education was 8.8. One hundred and ninety three of our participants (44%) did not offer income data. Among those who did offer income data, 28% had incomes under \$10,000 a year. Most participants came to North America in the last 10 years (72%), immigrated before the age of 40 (61%) and did not speak fluent English (90%).

Knowledge of Cervical Cancer Risk Factors

Correct responses for individual knowledge questions ranged from 12% to 72%. Table 2 lists the questions we used to evaluate knowledge of cervical cancer risk factors along with the correct proportion of responses. A minority of women (27%) knew that early age of first sexual intercourse was associated with cervical cancer. However, the majority (72%) of respondents knew that lack of Pap smear screening put them at higher risk for cervical cancer. The average summary score for knowledge of cervical cancer risk factors was 4.6 (95% CI: 4.3,4.8) out of a total possible score of 10.

Several sociodemographic and acculturation characteristics were associated with respondents' knowledge summary score for cervical cancer. These bivariate relationships are summarized in Table 3. Age, education, marital status, income, employment, place of birth, age at immigration, receipt of prenatal care in the U.S., and receipt of family planning services in the U.S. were all associated with knowledge of cervical cancer risk factors ($p < 0.05$). However, neither English fluency nor years in North America were associated with knowledge of cervical cancer.

The results of multiple linear regression modeling are shown in Table 4. The regression coefficients in Table 4 represent the difference in mean knowledge score between the comparison groups, adjusted for other variables in the model. Three variables including educational level, marital status, and employment status were identified as significant predictors of the knowledge score ($p < 0.05$). Controlling for all other variables in the model, respondents who were previously married had a mean score that was 1.4 (95% CI: 2.7,0.1) points lower than those who were never married. Those who had 12 or more years of education had a mean score 1.2 points higher than those with 0 to 5 years. The trend for increasing knowledge with increasing education was significant ($p < 0.01$). Respondents who were employed outside the home had a mean score that was 0.7 (95% CI: 0.2,1.2) points higher than those respondents who were not employed.

Risk Factor Knowledge in Relation to Pap Testing

Table 5 shows the relationship between knowledge and history of Pap smear testing. In unadjusted analysis using knowledge as a continuous variable, respondents with the highest knowledge score had a greater likelihood of ever receiving a Pap smear compared to those respondents with the lowest knowledge score (OR 2.5; 95% CI: 1.1,5.8). Controlling for age, marital status and housing type, this relationship persisted (OR 1.5; 95% CI: 0.6,3.8), but was not statistically significant. Results were similar for the relationship between knowledge score and receipt of a Pap smear in the previous two years.

DISCUSSION

The specific health beliefs and practices of immigrant populations in the U.S. pose challenges to the development of effective and culturally appropriate cancer prevention programs. In the present study we sought to understand Chinese immigrants' recognition of cervical cancer risk factors. We found that most risk factors were recognized by less than half of our participants. Studies looking at other minority populations and the general U.S. population have shown a similar overall level of knowledge for cervical cancer risk factors. The pattern of recognition between populations, however, is somewhat varied. For certain risk factors associated with sexual activity, our Chinese immigrant respondents had very similar knowledge to studies of the general U.S. population. Recognition of multiple sexual partners as a risk factor was comparable in our study (49%) to that of the North American general population (35–60%).^{32–34} Recognition of a sexually transmitted disease history as a risk factor was also similar

among our Chinese immigrant participants (47%), compared to the U.S. (52%).³³ However, our Chinese immigrant respondents had poor recognition of the early onset of first intercourse as a risk factor (27%), compared to the North American population (39%) as a whole.³³ Seventy-two percent of our participants recognized the importance of obtaining a Pap smear in preventing cervical cancer. This is particularly notable, since in a previous analysis of this population, only 60% had obtained a Pap smear in the previous two years.¹²

Marital status was associated with recognition of cervical cancer risk factors. Women who were never married had higher knowledge compared to those who had been previously married. Women who were never married also tended to have higher knowledge than those currently married. In a former study of Chinese immigrants from the same study population, we saw the opposite association between marital status and Pap smear history. In that analysis, immigrants who were married had 6.9 times the odds of ever having received a Pap smear compared to those who were never married. Similarly, those who were previously married had 4.3 times the odds of ever having received a Pap smear.¹² The positive association of marriage and receipt of Pap smears has been documented in other minority populations, as well the general U.S. population.^{33,35–38} We are unaware of other studies that have examined the relationship between marital status and knowledge of cervical cancer risk factors. Since we did not hypothesize an a priori relationship between knowledge of cervical cancer risk factors and marital status, our results may be due to multiple comparisons. This relationship between marital status and knowledge of cervical cancer risk factors needs to be independently confirmed.

The relationships in our study between other sociodemographic characteristics and knowledge of cervical cancer risk factors are consistent with findings from a study of the general US population. In an analysis using the National Health Interview Survey (NHIS), investigators evaluated factors that predicted recognition of multiple sexual partners as a risk factor for cervical cancer.³² In both our study of Chinese immigrants and the NHIS study of the general US population, increasing years of education was associated with knowledge of cervical cancer risk factors. Income was also associated with knowledge of cervical cancer risk factors in the NHIS study as well as in our unadjusted analysis of Chinese immigrants. Our analysis of income is limited, however, due to a 44% non-response rate for income in our participants.

The association between knowledge of cervical cancer risk factors and Pap smear testing in our study is similar to other studies of the general U.S. population. In a study of inner city Baltimore women, those participants with higher knowledge of cervical cancer were more likely to have received adequate Pap smear testing compared to those women with lower knowledge of cervical cancer risk factors ($p < 0.001$).³⁹ A study using the National Health Interview Survey also showed that women with either knowledge of cervical or breast cancer risk factors had greater likelihood of cervical and breast cancer screening (OR 1.7; 95% CI: 1.1,2.7).⁴⁰ Our results from unadjusted analysis showed similarly that women with the highest knowledge scores were more likely to have ever received a Pap smear in comparison to those women with the lowest knowledge scores (OR 2.3; 95% CI: 1.1,4.8). In our adjusted analysis, this relationship persisted, but was not statistically significant. The unadjusted analysis, however, may be more representative of the relationship between cervical cancer knowledge and Pap testing, since the variables used in the adjusted analysis including age, housing type and marital status, are potentially determinates of cervical cancer knowledge, rather than confounders in the relationship between cervical cancer knowledge and Pap testing.

Our study has potential limitations. First, we focused our study on a high-density population of Chinese Americans in the Seattle area. The generalizability of our data to less densely populated areas of Chinese American immigrants is not clear. Second, we do not know how

the individuals who refused to participate or were unreachable may have affected our data. Third, since we excluded those individuals who did not speak Mandarin Cantonese or English, other more linguistically isolated dialects are not represented. Fourth, we selected the oldest woman in our survey households as participants. Younger women may have a different understanding of cervical cancer. Fifth, our study does not directly assess knowledge of human papilloma virus (HPV) as a probable cause of most cervical cancer. We chose instead to look at behaviors that affect HPV infection, such as a history of multiple sexual partners.

Our assessment of knowledge is based on a biomedical model, which may not capture culturally specific interpretations of our questions. Several of our questions about cervical cancer risk factors resonate with behaviors that are traditionally associated with gynecologic problems in Chinese culture.⁴¹ Although our Chinese participants may have correctly identified these risk factors, the reasons behind their answers may be very different from those of the general North American population. Divergent reasons for similar beliefs or knowledge can have a profound impact on preventive health behaviors, as exemplified by the Latin American community. A Los Angeles study found that Latina immigrants had far higher knowledge of several cervical cancer risk factors than either the non-immigrant Latina population or the general population. Those same Latinas who recognized these cervical cancer risk factors, however, were less likely to have had a Pap smear in the previous three years.³³ Prior qualitative work helped sort out this apparent paradox. Many Latinas attributed cervical cancer risk to lifestyle choices, which were morally charged, such as having multiple sexual partners.^{33,42} Latinas consequently tended to avoid Pap smears, since they were associated with an admission of immoral behavior in their culture. Many Latina immigrants also attributed a diagnosis of cervical cancer to fate or punishment by God, which may further impede cancer prevention behaviors in this less acculturated population.^{33,43}

Chinese culture has specific gender roles and perceptions of sexuality that may impact immigrants' perceptions of cervical cancer and affect Pap smear rates.^{6,44} However, our results suggest that these cultural differences may not impact Pap testing in Chinese immigrants to the same degree as the Latina immigrant population. First, as previously noted, higher knowledge in our participants was associated with greater odds of ever having received a Pap test (OR 2.5; 95% CI: 1.1,5.8). Second, Chinese Americans are less likely to perceive cancer as a form of punishment or a death sentence compared to the Latina population.⁴⁵ Third, we found in a recent study that a belief in fate or karma as a cause of cancer did not play a significant role in whether Chinese American women obtained Pap smears.⁴⁶

There is a need for culturally and linguistically appropriate interventions to reduce cervical cancer incidence and mortality among immigrant Chinese Americans. The development of these interventions should be based on an understanding of the health beliefs and attitudes of Chinese immigrants. Our findings suggest a need for increased recognition of cervical cancer risk factors among Chinese American immigrants, especially among the less educated. Future studies should clarify the roles of sexuality and sexual mores in Chinese American immigrants' understanding of cervical cancer. Studies could also further explore the potential impact of specific beliefs about cervical cancer on preventive behaviors, such as Pap smear testing. By continuing to improve our understanding of Chinese immigrants' perceptions of cervical cancer we can develop more effective and appropriate primary and secondary prevention programs.

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TABLE 1
Sociodemographic and Acculturation Characteristics of Chinese Respondents ($n = 436$)^a

<i>Characteristic</i>	<i>n</i>	<i>%</i>
Age (years)		
20–39	77	18
40–59	194	45
60+	157	37
Marital Status		
Currently married	339	78
Previously married	71	16
Never married	23	5
Educational Level (years)		
0–5	83	19
6–11	201	47
12+	147	34
Income (\$) ^b		
<10,000	69	28
10,000–19,999	45	19
20,000–29,999	49	20
30,000+	80	33
Housing Type		
Owned	343	80
Rented/Subsidized	84	20
Employment		
Yes	251	58
No	184	42
Place of Birth		
Mainland China	322	74
Hong Kong	40	9
Southeast Asia ^c	58	13
Other	16	4
Years in North America		
<10	311	72
10+	121	28
Age at Immigration (years)		
0–39	261	61
40+	165	39
Speaks Fluent English		
Yes	44	10
No	390	90

^aPercentages for some items do not add up to 100% due to rounding.

^b193 women either did not know their household income or chose not to answer the income question.

^cBurma (Myanmar), Cambodia, Laos, Thailand and Vietnam.

TABLE 2
Chinese Women's Knowledge of Cervical Cancer Risk Factors ($n = 436$)

<i>Question</i>	<i>Correct Answer</i>	<i>n</i>	<i>%</i>
Being over 50 years	Yes	235	55
Having intercourse at an early age	Yes	114	27
Having multiple sexual partners	Yes	207	49
Having sexual activity with a man who has had multiple sexual partners	Yes	193	45
Having frequent sexual activity with the same man	No	231	54
Having a history of a sexually transmitted disease	Yes	199	47
Having several miscarriages	No	129	30
Giving birth to many children	Yes	50	12
Lack of pap smear screening	Yes	312	72
Smoking	Yes	286	67

TABLE 3
Cervical Cancer Knowledge Scores in Relation to Sociodemographic and Acculturation Characteristics ($n = 413$)

Characteristic	Knowledge Score ^a	
	Mean	95% CI
Age (years)		
20–39	4.8**	4.2, 5.3
40–59	5.2	4.9, 5.6
60+	3.7	3.3, 4.1
Marital Status		
Currently married	4.8**	4.6, 5.1
Previously married	3.1	2.5, 3.7
Never married	5.0	4.0, 6.1
Educational Level (years)		
0–5	3.3**	2.8, 3.9
6–11	4.6	4.3, 5.0
12+	5.2	4.8, 5.6
Income (\$) ^b		
<\$10,000	3.5**	2.9, 4.1
\$10,000–19,999	4.9	4.2, 5.6
\$20,000–29,999	5.7	5.0, 6.4
\$30,000+	5.4	4.9, 5.9
Housing Type		
Owned	4.8**	4.5, 5.0
Rented/Subsidized	3.6	3.0, 4.3
Employment		
Yes	5.0**	4.7, 5.4
No	3.9	3.5, 4.3
Place of Birth		
Mainland China	4.5*	4.2, 4.8
Hong Kong	5.7	4.9, 6.5
Southeast Asia	4.3	3.6, 5.0
Other	4.7	3.4, 6.0
Years in North America		
<10	4.8	4.4, 5.3
10+	4.5	4.2, 4.8
Age at Immigration (years)		
0–39	5.2**	4.9, 5.6
40+	4.5	4.0, 4.9
Speaks Fluent English		
Yes	5.1	4.3, 5.9
No	4.5	4.3, 4.8
Prenatal Care in U.S.		
Yes	4.9*	4.5, 5.3
No	4.4	4.1, 4.7
Family Planning in U.S.		
Yes	5.2*	4.7, 5.6
No	4.4	4.1, 4.7

^aTotal number of correct responses to the 11 questions concerning cervical cancer risk factors.

^b193 women either did not know their household income or chose not to answer the income question.

**
 $p < 0.01$.

*
 $0.01 < p < 0.05$.

TABLE 4
Multiple Linear Regression Results ($n = 388$)^a

Characteristic	Regression Coefficient ^b		
	β	95% CI	P value
Intercept	3.9	2.7, 5.2	<0.01
Educational Level (years) **			
0-5	Reference		
6-11	0.7	0.0, 1.4	0.07
12+	1.2	0.4, 1.9	<0.01
Marital Status *			
Never	Reference		
Currently	-0.3	-1.4, 0.8	0.63
Previously	-1.4	-2.7, -0.1	0.03
Employment			
No	Reference		
Yes	0.7	0.2, 1.2	0.01

^a A total of 19 missing participants with one or more missing values were excluded from this multiple regression analysis.

^b β , regression coefficient; CI, confidence interval.

** $p < 0.01$.

* $0.01 < p < 0.05$.

TABLE 5
 Knowledge of Cervical Cancer Risk Factors and Odds of Having Obtained a Pap Smear^a

<i>High vs .Low Knowledge^b</i>	<i>Pap Smear Test</i>			
	<i>Ever (n=412)</i>		<i>In Prior 2 Years (n=409)</i>	
	<i>OR</i>	<i>95% CI</i>	<i>OR</i>	<i>95% CI</i>
Crude	2.5*	1.1, 5.8	2.0	1.0, 4.0
Adjusted ^c	1.5	0.6, 3.8	1.6	0.7, 3.5

^aUnconditional logistic regression.

^bOdds Ratio corresponds to a comparison of the likelihood of Pap testing among those with the highest knowledge score (9/10) to those with the lowest knowledge score (0/10).

^cAdjusting for covariates formerly established as independently associated with obtaining a Pap smear, including age, marital status and housing type.

* 0.01 < *p* < 0.05.