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CLINICAL ARTICLE

Factors associated with regular cervical cancer screening

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Received 23 October 2007; received in revised form 29 January 2008; accepted 30 January 2008

KEYWORDS

Cervical cancer;
Cervical screening;
Human papillomavirus
infection;
Information;
Prevention;
Women's education

Abstract

Objective: To identify the factors associated with regular cervical screening (CS) in the French female population. **Methods:** Face-to-face interviews with 5354 randomly selected French women were carried out in this population-based, observational, cross-sectional study. The variables found significant by univariate analysis were entered in a stepwise analysis. A multivariate logistic model constructed with these variables permitted to identify which were significantly related to women undergoing regular CS. **Results:** A significant relationship was found between regular CS and previous screening for HIV infection, being professionally active, fear of cervical cancer, level of education, and having had a gynecologic check-up in the past 5 years. **Conclusion:** Since the study sample was known to be representative of the female adult population, most of our observations may have important public health implications in France, where information on HPV infection and its possible consequences need to be improved.

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1. Introduction

Cervical cancer is the second most common malignancy among women worldwide. It is diagnosed in almost half a million women each year and half as many die from it annually [1]. In France its incidence is estimated at 3400

cases per year [2,3]. Substantial data point to persistent human papillomavirus (HPV) infection as its cause [4–8]. The mean time between HPV infection and invasive cancer is about 15 years, and within 2 to 4 years of detection 15% to 25% of low-grade epithelial lesions become high-grade lesions. The most frequently sexually transmitted disease (STD) worldwide is HPV infection [9,10].

Still, the incidence of cervical cancer has decreased in some countries [1–3,11–13]. Mortality from this disease is related to multiple factors such as ethnicity, place of residence, income, and socio-economic status [1,14–19]. In

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most developed countries, as in France, the decline in the occurrence of cervical cancer is associated with the implementation of cervical screening (CS) programs [1,11–14,20]. In France, these essentially have consisted of cervical smear testing. Although the guidelines from the French Gynecologic Society recommend that each woman be tested every 3 years [13], CS remains irregular for too many women.

The relationship between noncompliance with screening guidelines and estimates of cervical cancer incidence has been established [21–23]. First, many studies demonstrated a relationship between the reduced incidence of cervical cancer and the implementation of CS programs [1,11–14,20–23]. In one of these studies, 35% of the 148 women with invasive cervical cancer had undergone CS only occasionally and 37% had never undergone CS. Only 17% of these women had had regular CS [22].

It is therefore reasonable to assume that regular screening would largely prevent the occurrence of cervical cancer and greatly reduce the mortality associated with it. Yet mortality rates remain high, reaching 1000 deaths per year in France [2,3]. The reasons, which seem varied, include disparity among countries in prevalent HPV types (all types not causing invasive cervical cancer) [24], health policies, and screening organization. In France, undergoing CS is not mandatory but voluntary, which explains why many women with cervical cancer have never been screened (only about 40% of the French female population undergoes regular CS according to an estimate by French insurance companies). Whether the women who die from cervical cancer in France share a particular profile should be determined if national compliance with the CS guidelines is to be improved.

The present study was conducted to identify what French women know about CS screening, HPV infection, and cervical cancer, and the relation between their level of knowledge and attitude toward CS.

2. Methods

This national, population-based, observational, cross-sectional survey was carried out between September and November 2005. Professional female interviewers from a poll agency (Institut de Sondages Lavalie, Issy-les-Moulineaux, France) interviewed a representative random sample of 5354 women aged 18 to 70 years living throughout France.

The source population was the entire French female population. A representative pool of possible interviewees was available from the permanent database IsoScope (IsoScope, Toulouse, France), a Microsoft Access panel (Microsoft, Redmond, WA, USA) that includes 20000 households distributed over the entire French territory. The sampling was performed following a stratified random method commonly used for nationwide epidemiological surveys in France [25]. The stratification criteria were the area of residence, age, and socio-economic level of the interviewee. The quotas were the number of interviewees per stratification. They were established according to the size of the area of residence (<2000; 2000 to 20000; 20000 to 100000; >100000; and the Paris area) and age group of the possible interviewee (18–25, 26–30, 31–35, 36–40, 41–45, 46–50, 51–55, 56–60, 61–65, and 66–70 years), plus her occupation and the occupation of the head of the family.

Data were collected on-site and face-to-face according to a computer-assisted personal interview method. The interviews

were focused on the women's own assessment of their health condition, behaviors regarding their health, health concerns, ability to express these concerns, alcohol and drug use, tobacco use, contraception methods, STD status, HIV infection status, cancer status, vaccination status, frequency of gynecologic check-ups, frequency of CS, previous histologic evaluations of cervical tissue, and knowledge regarding HPV infection.

In addition to these interviews, the participating women received printed self-administered questionnaires to be completed in private and returned to the interviewer in an unmarked envelope. These questionnaires investigated their behavior regarding tobacco, alcohol, and cannabis consumption; sexual activity; age at first intercourse; contraception; history of STD or uterine cancer; and screening experience for HIV and/or hepatitis C virus.

A comparison with national data on the female population obtained from the 1999 census was conducted to test representativeness of the study sample [26].

Only age (18–70 years) was a criterion of eligibility, and since age was verified by the interviewers, the analysis was done using the data obtained from all 5354 recruited women.

The data presented are those obtained from the study sample, but some tables and figures focus on women aged 25 to 65 years because most CS guidelines target women between these ages [2]. Moreover, sexuality was analyzed using data from the women who reported being sexually active; therefore, those who reported having no sexual activity were excluded from the analysis. SAS version 8.2 (SAS Institute, Cary, NC, USA) was used for the analysis.

A descriptive analysis was carried out first, and then a univariate analysis to identify significant variables at the 0.1 level ($P < 0.1$ by the χ^2 test). The great number of subjects in the study sample provided sufficient statistical power for this level of significance. Finally, a stepwise analysis was performed with the significant variables to construct a logistic regression model (at the 0.05 level). The variable "CS at least every 3 years" was a composite variable in both the univariate and multivariate analysis. It included a CS or a biopsy and a gynecologic check-up at least once a year or every 2 years with the last check-up during the year 2005.

3. Results

The study sample of 5354 women was known to be similar to the national population of women between the ages of 18 and 70 years in terms of sexual activity (vs no sexual activity), professional occupation, level of education, and marital status.

Of the 5354 women, 34% of those aged 18 to 25 years were living with their parents; most of the 26-year-olds were partners to the head of a family of their own; and as they aged the women tended to become head of the family themselves. The epidemiological characteristics of the population sample are presented in Tables 1 and 2. Tobacco consumption was predominant among women younger than 50 years and then declined with age. Alcohol consumption, however, increased with age (33% of the women aged between 66 and 70 years drank alcoholic beverages several times per week or every day). Cannabis consumption was predominant among the younger women (40% of those between 18 and 25 years used cannabis). The mean age at first intercourse varied with age groups. It seemed to have been

Table 1 Demographic and health characteristics of the study population distributed by age class; data collected by face-to-face interviews

Characteristic	Age group, years									
	18–25 (n=773)	26–30 (n=523)	31–35 (n=539)	36–40 (n=532)	41–45 (n=600)	46–50 (n=458)	51–55 (n=458)	56–60 (n=515)	61–65 (n=480)	66–70 (n=476)
Married or living with a male partner	37	79	80	78	77	73	69	65	63	55
Divorced, separated from the partner	2	3	7	11	14	16	18	19	15	10
Widow	0	0	0	1	2	4	6	10	19	31
Single, never married	61	18	13	11	8	8	7	6	4	4
No diploma	9	9	11	15	12	14	12	12	17	18
Education										
High school or less	30	28	32	45	46	47	57	60	60	70
Undergraduate	49	43	37	27	30	28	21	18	16	10
Graduate	13	21	20	13	12	12	10	10	8	3
Holds a professional occupation	50	81	81	81	80	80	73	46	11	1
History of CST	71	88	89	92	94	97	91	83	78	72
History of cervical precancerous lesion or cancer	1	2	4	4	4	3	4	4	3	7
Familial history of cervical precancerous lesions or cancer	15	14	17	16	18	15	14	13	11	12

Values are given as percentages.

17, 18, and 19, respectively, in the 18 to 35 years, 36 to 50 years, and 51 to 60 years age groups, and 20 years for women older than 60 years. The median number of sexual partners within the preceding year was 1 in all age groups, but the most frequent partner change occurred among the women aged 18 to 30 years. The contraceptive pill was the main means of pregnancy prevention for women aged between 18 and 40 years. Condoms were used mostly by the younger women (by 39% of those in the 18–25 age group) and intrauterine contraceptive devices by those aged between 31 and 50 years.

Previous serologic screening was reported more frequently for HIV infection than for hepatitis C, especially by women aged between 26 and 40 years, but screening for both in-

fections peaked between 26 and 30 years, followed by a steady decrease until the women reach 70 years. Overall, self-estimations showed an increasingly negative perception of one's general health with age, with general health becoming a matter of concern at the age of 45 years. When the women were asked to rank different diseases or health problems, fear of being infected with HIV decreased with age (Fig. 1). Traffic accidents were the first concern irrespective of age.

Older women had their first gynecologic consultation at an older age than the younger women: 22 years for the 61 to 65 years group, 24 years for the 66 to 70 years group, and 17 years for the 18 to 35 years group. The gynecologist was the most frequently visited health practitioner, especially

Table 2 Health condition of the study population distributed by age group

Behavior	Age group, years									
	18–25 (n=750)	26–30 (n=508)	31–35 (n=521)	36–40 (n=502)	41–45 (n=574)	46–50 (n=437)	51–55 (n=438)	56–60 (n=483)	61–65 (n=445)	66–70 (n=435)
Tobacco consumption (smokers and former smokers)	79	74	80	79	80	76	64	45	39	28
Cannabis consumption	39	31	23	15	14	8	6	3	2	1
Alcohol consumption	9	7	8	12	16	19	18	29	25	32
More than 1 sexual partner in the preceding year	19	10	8	9	7	7	7	3	3	2
History of STD	6	8	9	10	8	8	8	4	3	2
Mean age at 1st occurrence of STD, years	19	23	23	24	26	24	33	34	36	25
History of HIV screening	47	66	63	53	48	41	30	25	22	14
History of hepatitis C screening	28	37	33	30	29	27	18	18	14	9

Abbreviations: CS, cervical screening; HIV, human immunodeficiency virus; STD, sexually transmitted disease. Values are given as percentages; data collected from self-administered questionnaires.

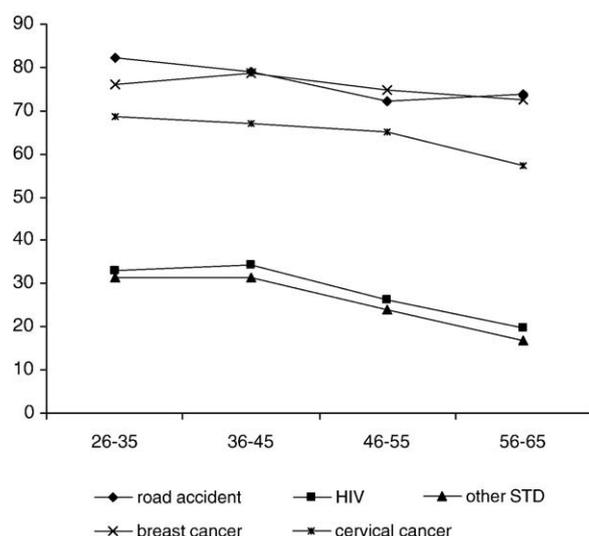


Figure 1 Concerns regarding health and diseases among the study population.

until the age of 60 years; a higher frequency of visits was observed among the younger women (Fig. 2).

The most frequently reported gynecologic investigation was CS, with a peak reaching 97% for women aged between 46 and 50 years. Although 75% to 80% of those aged 26 to 50 years reported undergoing CS at least every 2 years, those aged 18 to 25 years reported less frequent CS (70%) and 19% had never had CS. After 50 years, the frequency of CS decreases.

The analyses for the determination of the factors associated with regular CS were carried with the subset of patients aged 25 to 65 years because this is the age group targeted in most guidelines. Table 3 presents the results of the univariate analysis that identified the variables to be entered in the logistic model. The final model shows a significant relationship between regular screening and a history of voluntary testing for HIV infection (odds ratio [OR], 1.35; 95% confidence interval [CI], 1.18–1.55; $P < 0.001$); having a professional activity (OR, 1.37; 95% CI, 1.18–1.60; $P < 0.001$); having an undergraduate degree (OR, 1.32; 95% CI, 1.11–1.55; $P < 0.001$); concern about cervical cancer (OR, 1.24; 95% CI, 1.07–1.43; $P < 0.003$); and a gynecologic check-up, whether regularly scheduled or for a gynecologic disorder within the past 5 years (OR, 6.10; 95% CI, 5.04–7.39; $P < 0.001$).

4. Discussion

The face-to-face interviews permitted to collect significant information regarding women's attitudes toward the prevention of cervical cancer. Since 4 of the 5 factors shown to determine an adequate screening frequency were related to information and education, these findings point to the importance of information and patient education for a better compliance with the guidelines. The present study's limitations are the same as those of all studies based on self-reporting. However, all interviewers were professionally trained women and the self-administered questionnaires were confidential.

Although the incidence of cervical cancer has been decreasing in the past years, and is lower than that of other types of cancer such as colon and breast cancer, it remains all too frequent. Mortality rates remain important even in countries where screening programs have been implemented nationally, and show a disparity seemingly related to factors such as place of residence, ethnicity, income, and socioeconomic status [1,14–19]. In the United States, over the past several decades, cervical cancer mortality has been consistently higher among women living in rural than in urban areas [16,17]. Invasive cervical cancer still occurs in a country such as Canada, among women born in Canada as well as immigrant women [1]. And studies from different countries have shown that minority and low-income women are screened less frequently, and have a higher mortality from cervical cancer, than more affluent women [14,15,18,19].

The present study was conducted to identify, if not which parts of the French female population was more likely not to comply with the recommended screening schedule, at least some factors that would be associated with noncompliance with the recommendations. The necessity of information and patient education on the importance of good compliance came out clearly in the study. The factors that are related to information and education are a relatively high level of formal education (the equivalent of an undergraduate degree in the United States); previous voluntary screening for HIV; regular gynecologic check-ups, which may reflect compliance with the recommendations; and fear of cervical cancer, which reflects some knowledge regarding this risk. Efforts should therefore be made to improve patient education, which would lead to improved compliance with the recommendations.

Two unexpected observations further support the finding of insufficient information received by most women. First, we noticed that the awareness of STD differs from that of cancers, even cervical cancer, which reflects the lack of any association in women's minds between HPV infection as an STD and cervical cancer. This observation corroborates a previous study conducted in the United States [27].

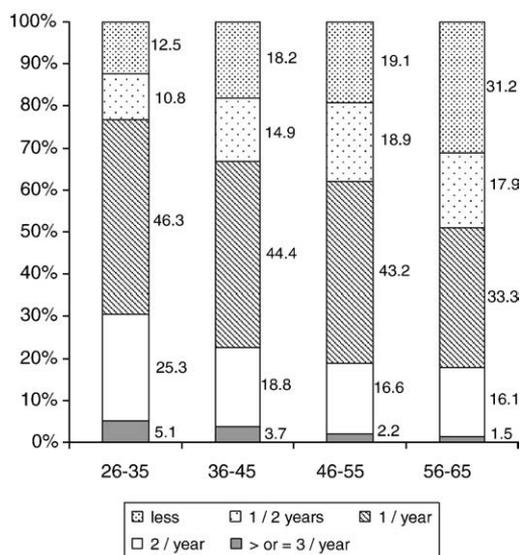


Figure 2 Frequency of routine gynecologic check-ups (pregnancy check-ups excluded).

Table 3 Univariate analysis^a

Variable	No CS in the past 3 years (n=2049)	CS at least every 3 years (n=2170)	P value ^b	OR (95% CI)	Total (N=4219)
Being professionally active ^c	1240 (60.52)	1602 (73.82)	≤0.001	1.37 (1.27–1.47)	67.36
Education					
High school or less	320 (15.62)	203 (09.35)	≤0.001	0.73 (0.65–0.82)	12.40
Undergraduate ^{c, d}	1403 (68.47)	1754 (80.83)	≤0.001	1.42 (1.31–1.54)	74.83
Graduate	254 (12.40)	320 (14.75)	0.03	1.10 (1.01–1.19)	13.61
Age, mean±SD, years	45.8±12.2	43.2±11.2	≤0.001		44.5±11.8
Apprehension regarding					
Road accidents	1560 (76.17)	1741 (80.23)	0.001	1.13 (1.04–1.22)	78.26
Alcohol-related diseases	446 (21.80)	464 (21.39)	0.75	0.99 (0.92–1.06)	21.59
Tobacco-related diseases	827 (40.36)	885 (40.78)	0.78	1.01 (0.95–1.07)	40.58
HIV infection	597 (29.14)	615 (28.38)	0.59	0.98 (0.92–1.05)	28.75
STD	535 (26.16)	582 (26.87)	0.60	1.02(0.95–1.09)	26.53
Lung cancer	1043 (50.93)	1078 (49.77)	0.45	0.98 (0.92–1.04)	50.33
Breast cancer	1485 (72.55)	1708 (78.78)	≤0.001	1.19 (1.10–1.28)	75.75
Cervical cancer ^c	1236 (60.44)	1486 (68.61)	≤0.001	1.20 (1.12–1.28)	64.64
Hepatitis B	674 (33.42)	733 (33.97)	0.71	1.01 (0.95–1.08)	33.70
Hepatitis C	680 (33.88)	756 (35.28)	0.35	1.03 (0.97–1.10)	34.60
≥1 sexual partners in the past 12 months	761 (43.09)	1022 (53.87)	≤0.001	1.23 (1.16–1.31)	48.68
Family history of precancerous lesions or uterine cancer	277 (13.52)	340 (15.67)	0.05	1.08 (1.00–1.17)	14.62
History of screening for					
HIV-infection ^c	721 (37.83)	1056 (52.02)	≤0.001	1.32 (1.24–1.40)	45.15
Hepatitis C	424 (22.46)	612 (30.55)	≤0.001	1.21 (1.14–1.29)	26.63
Gynecologic check-up or consultation in the past 5 years ^c	1281 (62.52)	2006 (92.44)	≤0.001	3.47 (3.01–4.00)	77.91

Abbreviations: CI, confidence interval; CS, cervical screening; HIV, human immunodeficiency virus; OR, odds ratio; STD, sexually transmitted disease.

^a A χ^2 test was performed to compare women with a CS frequency of less than 3 years with those with a CS frequency of 3 years or greater in the subset of women aged 25 to 65 years; values are given as number (percentage) or percentage unless otherwise indicated.

^b By the χ^2 test.

^c The variable displayed a significant relationship and was selected for the multivariate logistic model.

^d This variable encompasses the preceding one; consequently, the total value of distribution exceeds 100%.

Second, the fear of being infected with HPV was not associated with regular CS even though HIV testing was. This suggests that the relationship between HPV screening and CS reflects compliance with known recommendations and adequate information whereas the fear of HPV infection is not a sufficient motivation for a better compliance with recommendations.

The high rate of HIV screening reported in this study (Table 2) may be the result of free access to HIV screening and a high level of prevention against HIV in France since the 1990s. Information on HIV is also probably more effective than information on STD, HPV infection, and the risk of cancer associated with them.

Despite official guidelines recommending regular screening every 3 years [2], screening was found to be voluntary rather than organized. Thus, in addition to information campaigns, screening programs should be organized and efficiently promoted. Improved screening should decrease the occurrence of—and mortality from—cervical cancer.

The present population-based study identified factors significantly associated with compliance with regular screening for cervical cancer. In addition to regular gynecologic check-ups, several factors related to women's adequate in-

formation and awareness of the recommendations showed a strong relationship with regular voluntary CS. Since the study sample was shown to be representative of the national female adult population, most of our observations may have important implications in terms of public health.

Acknowledgement

Sample collection and statistical analyses were funded by GlaxoSmithkline Laboratories.

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