Short Communication

The Impact of Human Papillomavirus Information on Perceived Risk of Cervical Cancer

Laura A.V. Marlow, Jo Waller, and Jane Wardle

Health Behaviour Research Centre, Department of Epidemiology and Public Health, University College London

Abstract

There is a need to develop public education about the link between human papillomavirus (HPV) and cervical cancer. Explaining that a sexually transmitted virus causes cervical cancer may affect perceived risk of cervical cancer. We hypothesized that presenting HPV information would have differential effects depending on age and screening attendance. Data were collected during face-to-face interviews with a sample of British women age 16 to 75 years who had not heard of HPV before (n = 965). A repeated measures design was used, assessing perceived risk of cervical cancer before and after providing information about HPV. Perceived risk was assessed using a comparative risk measure with a five-point response scale. Preinformation, the mean perceived risk score was 2.64 (SE, 0.03). Overall, presentation of HPV information did not have an effect on perceived risk of cervical cancer [$\chi^2(1)$ =.72; P = 0.396], but as expected, there was a significant time by age interaction for the change in perceived risk [$\chi^2(5)$ = 33.56; P < 0.001], which increased in the youngest age group (16-25 years) and decreased in the oldest age group (65-75 years). In a separate analysis with women in the screening age range (25-64 years; n = 709), there was a significant time by screening attendance interaction [$\chi^2(1)$ = 5.25; P = 0.022], with an increase in perceived risk among women who did not regularly attend screening. This is the first study to examine the effect of HPV information on perceived risk across different population groups. Interventions to increase awareness of HPV could benefit from tailoring information to prescreening age, screening age, and postscreening age women. (Cancer Epidemiol Biomarkers Prev 2009;18(2):373–6)

Introduction

High-risk human papillomavirus (HPV) is sexually transmitted, very common, and a necessary cause of cervical cancer (1, 2). In the United States, HPV testing may be offered alongside primary screening for women ages >30 years (3). In England, cervical screening is offered to all women age 25 to 64 years, and HPV testing is being implemented as triage for mild dyskaryosis (4). Vaccination against the two most common high-risk types of HPV is already—or will shortly be—offered to girls and young women between 9 and 26 years (country dependent; ref. 5). With the introduction of these technologies, public education about HPV and cervical cancer is inevitable. The knowledge that cervical cancer is associated with a sexually transmitted infection may affect women's attitudes toward the disease including perceptions of cervical cancer risk.

Perceived risk (PR; or perceived susceptibility) is an individual's belief about the likelihood of harm (6). PR is central to many theoretical models of health behavior such as the Health Belief Model (7) and predicts participation in preventive behaviors such as screening (8) and vaccination (9). Increased PR is therefore one goal of health behavior–targeted interventions (10).

For an individual to make an accurate assessment of disease risk, they first need to be aware of relevant risk factors for the disease. In the case of cancer, perceived susceptibility is associated with awareness of personal behaviors and family history (11) and an accurate perception of susceptibility to cervical cancer would therefore require awareness that it is caused by a sexually transmitted infection. In a cross-sectional study of students who had high levels of HPV awareness (78%), HPV risk perceptions were positively related to behavioral risk factors such as multiple sexual partners (12). In another cross-sectional study, giving participants a list of risk factors for illnesses such as heart disease did not affect PR, but the authors concluded that simple interventions could be more successful in the case of less-familiar illnesses (6). Among the general public, few women are aware that a sexually transmitted infection causes cervical cancer (13), and therefore, we reasoned that conveying this information may affect women's PR of developing cervical cancer.

Understanding risk also requires consideration of participation in risk-relevant behaviors. In the case of cervical cancer, a woman would have to take into account (among other things) her own and her partner's sexual history and her screening behavior. Sexual behavior varies by age. In a study of adults ages 16 to

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Requests for reprints: Laura Marlow, Cancer Research UK Health Behaviour Research Centre, Department of Epidemiology and Public Health, University College London, Gower Street, London WC1E 6BT, United Kingdom. Phone: 44-20-7679-1798; Fax: 44-20-7679-8354. E-mail: l.marlow@ucl.ac.uk

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44 years, younger women (16-24 years) had more sexual partners and concurrent sexual relationships than older women, partly explained by marital status (14). In another study of older women (57-85 years), sexual activity declined with age, and those who reported being sexually active were more likely to be in a relationship (15). We therefore expected that learning about HPV would change women's PR of cervical cancer and this would have a differential effect by age and screening attendance. To date no work has considered the differential effects of HPV information on PR. We made two *a priori* hypotheses:

1. PR of cervical cancer would increase for younger women and decrease for older women, in response to information about HPV.
2. Screening attendance would have a moderating effect, with a greater increase in PR of cervical cancer among women who are not attending regular screening.

Materials and Methods

Participants were a population-representative sample of British women recruited using the National Centre for Social Research Omnibus survey. Data were collected during face-to-face, computer-assisted interviews between November 2006 and January 2007 (see ref. 13 for more details on recruitment). National Centre for Social Research abide by the Social Research Association Ethical guidelines.

As part of the survey, women were asked whether they had heard of HPV; only those who responded "no" were included in this study. An experimental, repeated measures design was embedded in the survey, assessing perceptions of cervical cancer risk before and after reading information about HPV. PR was assessed by asking women to make a comparative judgment using a verbal response scale; *"Compared to other women my age, I think that my chance of getting cervical cancer is..."* ... *much below average, below average, average, above average, much above average*. This format has been used in previous studies (e.g., ref. 16).

Participants were then asked to read a card with the HPV information printed on it. The information was initially designed for a UK-based internet study of 300 women 18 to 55 years.[1] It was developed by the product marketing team at GSK biologicals and approved by their panel of medical experts. The information included the following: the association of HPV with cervical cancer, incidence and mortality figures for cervical cancer, the asymptomatic nature of HPV infection, the possibility (albeit rare) of persistent infection, the high prevalence of HPV, the role of screening in detecting precancerous changes in the cervix, the sexually transmitted nature of HPV infection, and the limited protection afforded by condoms. Women were given time to read the card and indicated to the interviewer when they had finished. There was no opportunity to ask additional questions. After this, PR for cervical cancer was reassessed.

[1] Unpublished work commissioned by GSK biologicals and carried out by TNS Global.

Women were categorized into six age groups: 16 to 24, 25 to 34, 35 to 44, 45 to 54, 55 to 64, and 65 to 74. Women reported their marital status as: married, cohabiting, single, widowed, separated, divorced; this was recoded as a binary variable: "married/cohabiting" versus "non-married/noncohabiting."

Women selected one of four categories that most closely represented their cervical screening attendance. Women who selected; *"I regularly have cervical cancer screening and do not need reminding"* or *"I regularly have cervical cancer screening but do need reminding"* were categorized as "regular attenders." Those who selected *"I do not have regular cervical cancer screening in spite of reminders to do so"* or *"I have never had cervical cancer screening"* were categorized as "nonregular attenders."

Data were weighted to ensure the distributions matched population totals. Frequencies and cross-sectional means were produced using the complex samples option in SPSS 15.0 (SPSS, Inc.). Generalized estimating equations were run in STATA 9.2 (Statacorp) to examine the interaction between time (before or after HPV information) and age group. The interaction between time (before or after HPV information) and screening attendance was explored in a separate analysis using data only from women in the screening age range (25-64 years).

Results

The overall response rate was 53.4%, with a female sample of 1,620. Data from women who were ages 16 to 75 years, had not heard of HPV before, and who responded to the PR questions before and after the HPV information, were included in these analyses ($n = 965$). The characteristics of these women are shown in Table 1. Women were mainly White (93%), married/cohabiting (60%), and had at least basic educational qualifications (61%). Age was normally distributed (mean, 42.72; SE, 0.62). This subsample were more likely to be married, outside the screening age range, and had lower education than women who had heard of HPV. Characteristics of the overall sample and a comparison between those aware and unaware of HPV are presented elsewhere (13).

More women perceived their risk to be "below average" (36% preinformation, 35% postinformation) than "above average" (9% preinformation and 10% postinformation), demonstrating optimistic bias in the sample. Preinformation, the mean PR score was 2.64 (range, 1-5; SE = 0.03). Postinformation, the mean score was 2.67 (range, 1-5; SE, 0.03), so there was no overall effect of HPV information [$\chi^2(1) = 0.72$, $P = 0.396$].

Preinformation, PR of cervical cancer varied by age group [$F(5, 964) = 9.78$; $P < 0.001$], with the highest PR among 35 to 44 years old and the lowest in women over 65. In a generalized estimating equation model including age group and time, there was a significant time-by-age interaction [$\chi^2(5) = 33.56$; $P < 0.001$], with changes in PR for the youngest and oldest groups after information about HPV (see Fig. 1). In ages 16 to 24 years, PR of cervical cancer increased from 2.56 (SE, 0.07) to 2.87 (SE, 0.06). In the ages 65 to 74 years, PR decreased from 2.31 (SE, 0.09) to 2.11 (SE, 0.07) after HPV information. There was little difference in PR of cervical cancer before and after information in women ages 25 to 64 years. The time-by-age interaction remained significant after

Table 1. Sample characteristics (n = 965)

	%*
Respondent age (y)	
16-24	17.5
25-34	18.0
35-44	20.1
45-54	16.6
55-64	15.0
65-75	12.8
Marital status	
Married/cohabiting	60.7
Single/separated/divorced/widowed	39.3
Ethnicity	
White	93.4
Non-White	6.4
Refused to answer	0.2
Education	
No qualifications	26.8
At least minimum qualifications	61.3
University degree	11.9
Annual household income	
<£10,000	49.3
£10,000-£19,999	23.6
£20,000-£29,999	8.1
>£30,000	4.2
Missing	14.7

*Percentages are for the weighted data.

controlling for marital status and screening attendance [$\chi^2(5) = 35.94$; $P < 0.001$].

The majority of women within the cervical screening age range for England (25-64 years; n = 709) reported regular attendance (88%). Preinformation, those who did not attend cervical screening regularly had slightly lower PR of cervical cancer than regular screening attenders [2.48 (SE, 0.10) compared with 2.76 (SE, 0.04)]. There was a significant time-by-screening attendance interaction [$\chi^2(1) = 5.25$; $P = 0.022$], with a slight increase in PR for women who did not regularly attend cervical screening (from 2.48-2.68; see Fig. 2). There was little change in PR of cervical cancer for regular screening attenders (pre-information mean, 2.76; postinformation mean, 2.74). The time-by-screening attendance interaction remained significant after controlling for age and marital status [$\chi^2(1) = 4.66$; $P = 0.031$].

Discussion

The distribution of PR was similar to other studies that have used a verbal comparative measure, with the sample showing an optimistic bias both before and after reading the information (8, 17, 18).

As expected, HPV information affected womens' cervical cancer risk perceptions differently, depending on their age and screening history. PR of cervical cancer increased in the younger women after reading information about the sexually transmitted nature of HPV and the importance of cervical screening. This increase could suggest a shift toward more accurate PR in this age group because these women are not yet invited for screening and tend to have more sexual partners (14). They are also above the age for the national HPV vaccination program in the United Kingdom. Care must therefore be taken not to increase their PR without offering options for behavioral control, otherwise it could create anxiety (19). Information aimed at increasing awareness of HPV and cervical cancer within this age group should provide reassurance to limit any increase in anxiety (e.g., by explaining that only the minority of HPV infections persist) and ensure that women understand the reasons why they are not yet invited for screening.

In contrast, older women (age 65-75 years) showed a slight decrease in PR of cervical cancer after reading HPV information. Most sexually active women in this age group are in long-term relationships (15), and although they are no longer invited to cervical screening, they are likely to have been invited within the last 10 years. We therefore expected a decrease in PR of cervical cancer among this age group. It is important that older women continue to pay attention to early symptoms of cervical cancer especially if they did not attend for screening when they were younger. Information aimed at this age group should emphasise the importance of early presentation of symptoms.

For the women in the mid-age range (25-64 years), there seemed to be little difference in PR of cervical cancer as a result of reading information about HPV. However, in the small group of women who did not regularly attend screening, there was an increase in PR of cervical cancer postinformation. The possibility of raising PR among nonattenders by presenting information about HPV and cervical cancer may have valuable implications for increasing screening uptake. This is especially relevant for women ages 25 to 34 years in England, among whom cervical screening rates have been declining (20).

This study has several limitations. Although not surprising for a sample recruited by random address selection, the response rate was modest and there was some evidence for a health-related bias with higher-than-expected self-reported screening attendance (88% compared with 79% in the population; ref. 20), although part of this could be self-report bias (21). Moreover, it is not possible to pin-point the exact informational content that affected PR in this study because no control group was used. Women also rated their PR immediately after reading information about HPV and it is possible that the effects would be different in the longer term. Apart from screening attendance, data on risk behaviors (e.g., multiple partners) was not collected and therefore matching PR to actual risk was not possible. Future

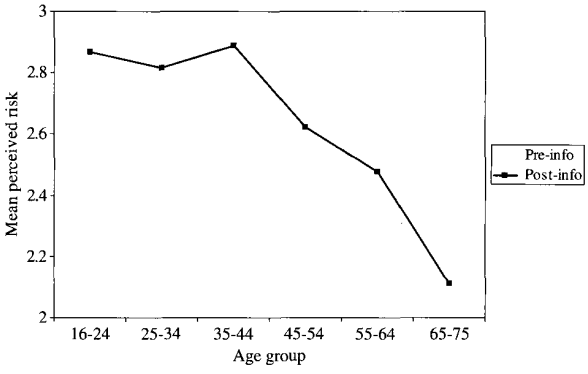

Figure 1. Perceived risk before and after HPV information in different age groups (n = 965).

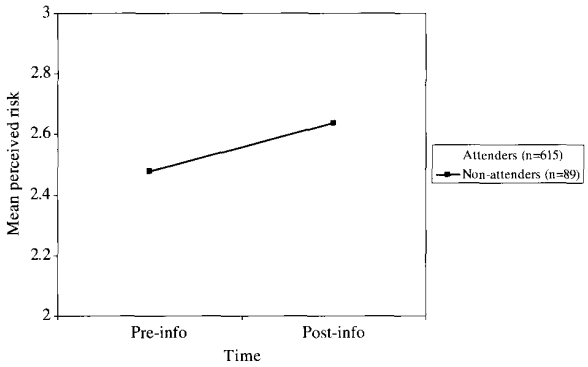

Figure 2. Perceived risk before and after information in relation to screening attendance (n = 709).

research should consider whether changes in PR of cervical cancer, after reading about HPV, increase the accuracy of risk perceptions. Similarly, the proxy measures used for sexual behavior (age and marital status) are not ideal. However, we aimed to identify groups who might benefit from tailored HPV information. Age and marital status are easily identifiable characteristics and would therefore be feasible targets for administering large-scale interventions.

The results suggest an increase in PR of cervical cancer among younger women and nonattenders at screening following HPV information, but more work is needed to explore the significance of these findings and the direct implications and clinical relevance of small changes in PR in terms of effects on either anxiety or behavior. Furthermore, it is not yet clear which measurement dimension of PR (cervical cancer, HPV, both) will be most relevant in terms of implications for participation in vaccination and testing. One recent study found that both were important predictors of HPV vaccine acceptability for a daughter (22). The focus of the present study was cervical cancer-related PR in relation to HPV information, but future work should consider different options for PR measurement.

Previous studies have shown that information about the sexually transmitted nature of HPV is associated with feelings of stigma and anxiety (23, 24). No studies have considered the effects of information on perceived risk of cervical cancer, nor looked at these effects in different population groups. The findings from the present study suggest that information about HPV and cervical cancer may well change perceptions of cervical cancer risk among women who are either outside the screening age range or do not attend screening. Tailoring information for these groups could be an effective way to avoid increasing anxiety and to encourage acceptance of relevant health behaviors when recommended. Further research on the emotional and behavioral consequences of information about HPV is needed, but this study points toward an important implication of increasing awareness about the cause of cervical cancer.

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