Human Papillomavirus awareness, knowledge and vaccine acceptance: A survey among 18-25 year old male and female vocational school students in Berlin, Germany

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Background: Human Papillomavirus (HPV) is a common sexually transmitted infection and is aetiologically linked with a number of health problems. In Germany, HPV vaccination for cervical cancer prevention is recommended for girls aged 12–17 years since 2007; however, a coordinated national immunization programme does not exist. We assessed whether socio-demographic factors and sexual history are associated with awareness of HPV and the HPV vaccine, vaccine uptake and HPV-related knowledge among young women and men.

Methods: In 2010, a survey was conducted with 18- to 25-year-old students from six vocational schools in Berlin. A total of 259 women and 245 men completed the questionnaire that included socio-demographic and sexual behaviour characteristics, questions about HPV awareness, vaccine status, reasons for not wanting to get vaccinated and HPV-related knowledge. Results: Among women aged 18–20 years (those eligible for reimbursed vaccination), 67% were vaccinated. At trend level, women with low education and those without past sexual intercourse were less likely to be vaccinated. Ninety-five per cent of the women and 80% of the men were aware of the ‘vaccine against cervical cancer’, but only half of the women and 25% of the men had heard of HPV. Knowledge was poor (M = 2.8; SD = 2.10 for women and M = 2.8; SD = 2.10 for men; possible range 0–11). Fifty-one per cent of the women and 42% of the men thought that only women can be infected with HPV and the majority did not know that HPV is sexually transmitted. Conclusion: Results indicate a need for better education about HPV that should extend beyond its link with cervical cancer.

Introduction

Human Papillomavirus (HPV) is one of the most common sexually transmitted infections. About 80–90% of the HPV infections are transient and are resolved by the body’s immune response, but persistent replication of viral DNA may lead to genital warts, abnormal Papanicolaou (Pap) tests, cervical dysplasia, cervical, vulvar, oropharyngeal and penile cancer.2–3 Of the sexually active women, 70–80% will acquire infection with HPV at some point during their life.2,4 The peak prevalence of HPV infections is found in young women in their 20s, whereas men have a constant risk to contract new infections throughout their lifetime.5

In 2006, the European Medicines Agency (EMEA) approved a quadrivalent vaccine containing antigens against four HPV types 6, 11, 16, 18 and 1 year later, they approved a second bivalent vaccine against HPV-types 16 and 18. HPV vaccines are now licensed in over 100 countries.6 In Europe, vaccine uptake rates vary greatly, ranging between 17% in Luxembourg and 81% in Portugal.8

Despite its high prevalence, awareness of HPV (‘have you heard about HPV?’) is generally poor in most countries, even in young adults.9 In 2000, a population-based survey in the city of Bielefeld in Germany observed that only 3.4% of women knew that HPV is a risk factor for cervical cancer.10 Studies conducted shortly before or after the introduction of HPV vaccines in other European countries have shown that HPV awareness ranged between 14% and 30%.11–13

While knowledge about HPV (e.g. who it affects, how it is transmitted) may be an important determinant for vaccine acceptance12,14–16 and vaccine uptake,17 only a few European and US-American studies have assessed HPV-related knowledge in young male and female adults.12,13,18–20 Knowledge was poor across studies. Women were consistently more knowledgeable than men, and higher education was a predictor of increased knowledge.9

HPV knowledge was a correlate of HPV vaccine acceptance in some studies12,16 but not in all.13 Predictors of vaccine uptake were higher HPV knowledge,21,22 physician/health-care provider and parent recommendation,22 as well as a history of sexual intercourse.23

In Germany, which has no nationwide immunization programme but where HPV vaccination is officially recommended and reimbursed for young girls aged 12–17 years, since 2007,24 HPV awareness and knowledge have not been assessed since. According to estimates, HPV vaccine uptake has been comparatively low in Germany and has decreased from 38% in July 2008 to 33% in July 200925 and to 27% in December 2010. Another estimate using data from several health insurance companies showed that in 2009, <20% of all 17-year-old girls were vaccinated.26

The aim of the current study was to assess HPV and HPV vaccine awareness, HPV-related knowledge, and attitudes towards HPV vaccination in four groups of young German adults: (i) women who were eligible for reimbursed vaccination since the official 2007 HPV
vaccination recommendation was issued in Germany (aged 18–20 years at the time of our survey); (ii) women aged 21–25 years; (iii) men aged 18–20 years; and (iv) men aged 21–25 years.

Next to gender and age, we analysed socio-demographic (education and migration background) and sexual–behavioural (sexual history and history of HPV infection/abnormal Pap smear) variables as potential correlates of HPV vaccine uptake, HPV awareness and HPV-related knowledge.

We included both men and women in our survey since both sexes are part of the infection chain, and both are potentially at risk for HPV-related adverse health consequences. Furthermore, quadrivalent HPV vaccine is already approved (though not officially recommended) for boys and men in Germany.

Methods

Participants, design and procedure
A survey was conducted among 18- to 25-year-old vocational school students in Berlin, Germany, in July 2010. The study was approved by the local ethics committee.

Vocational schools are part of the secondary dual education system (job training + education) in Germany. Part-time vocational schools are attended by all apprentices who simultaneously obtain training for an occupation in a company. Full-time schools prepare students for specialized jobs, coupled with several weeks of traineeships in companies and provide the opportunity for all secondary graduation levels. In 2008, 64.7% of all German students who graduated from the general school system (graduation is possible after 9, 10 or 13 years of school education) enrolled in a dual-system apprenticeship.27 Other students completed military or civil service, enrolled in a university programme, were unemployed or enrolled in a pre-vocational programme for students without any school degree.

From the vocational school list of the Berlin Chamber of Commerce, 24 schools were randomly selected. Representatives of these schools were contacted by phone and asked about their consent to have their students participate in the survey. After their oral consent, an e-mail was sent containing additional information about data protection and content of the survey. Students from all classes of each participating school were approached once during a scheduled appointment in class, and after a brief introduction into the purpose of the study were asked to complete the self-administered questionnaire.

Measures
A self-administered questionnaire was distributed to the students in the classroom.

Socio-demographic characteristics
This included age, gender, migration background and years of school education. Participants were grouped into two age groups: 18–20 years (in this age group, women were eligible for reimbursed HPV vaccination since 2007) and 21–25 years.

School education was categorized according to students’ self-reported school degree. In Germany, three types of degrees can be obtained: after 9th grade, after 10th grade or after 13th grade. Of note, any such degree qualifies for vocational school entry. We distinguished between low vs. high education (<11 years vs. ≥11 years of school education).

Migration background was determined by assessing primary language, place of birth and place of mother’s and father’s birth.28

Sexual history and history of HPV infection and cervical cell changes in women
Participants were asked to indicate whether they had ever had sexual intercourse, and how many lifetime sexual partners they had. Participating women were asked whether they had ever been diagnosed with a HPV infection and have had an abnormal Pap smear in the past.

Awareness about HPV and HPV vaccine
Participants were asked whether they have ever heard about HPV, and whether they have heard about ‘a vaccine that protects against cervical cancer’. If they indicated ‘yes’, they were then asked to indicate the source(s) of that information (the Internet, friends, family member, physician, media or other sources).

Knowledge about HPV
Items were selected from previous studies.29,30 Eight items related to the mode of transmission of HPV, whether or not it was a common disease, whether or not affected people experience symptoms, who could be infected by it, and what health consequences HPV may have. Three additional questions were included about PAP smears (whether they can detect cell change at the cervix, whether they can detect the HPV and whether a normal PAP result means that a woman is not infected with HPV). Answer options were ‘yes’, ‘no’ and ‘do not know’, except for the item asking about who could be infected by HPV, where answer options were ‘women’, ‘men’ and ‘both women and men’.

A total knowledge score was computed by summing all correct answers (range 0–11).

Vaccine status and attitudes towards HPV vaccination
Participants were asked whether or not they were vaccinated against HPV and whether they had ever been advised to get vaccinated against HPV. Students who were not vaccinated were asked whether they would like to get the HPV vaccine. If the answer was ‘No’, respondents were asked to indicate from a list of possible reasons to deny vaccination all that applied to them.

Statistical analyses
T-tests and chi-squared tests were used to assess bivariate relations between independent variables (socio-demographic characteristics, past sexual intercourse as well as history of HPV infection/abnormal Pap smear in women) and outcome variables (awareness about HPV and HPV vaccine, and HPV-related knowledge and acceptance). Tests were two sided and statistical significance was set to P < 0.05. Multivariable analyses were then conducted including all predictor variables (logistic regression for binary outcomes and linear regression for the continuous knowledge score).

Multiple imputation was used to generate values for the missing data on some predictor variables (past sexual intercourse experience and migration status). Results did not differ between the pooled results from the imputed data sets and the original data set; we thus report the results from the original data set only. All analyses were performed using SPSS, version 17 (SPSS Inc, Chicago, IL, USA).

Results
The school principals from six schools (25%) gave their consent to participate in the study. A total of 606 students were present in classes at the scheduled survey assessments. Sixty-four of these were excluded because they were under the age of 18 years. Of the remaining 542 students, 22 (4%) refused to participate, and 18 (3%) were excluded because of missing data on age, sex or knowledge items. The final study sample was comprised of 259 women and 245 men.

Table 1 displays the characteristics of the study sample (N = 504) by gender.

Vaccination uptake among female students
Of all the women, 40% (N = 103) were vaccinated against HPV. Two-thirds reported having received advice to get vaccinated against HPV, this rate was significantly higher in the younger age group of women (86.8%) compared to the older age group (50.4%; χ² = 39.53, P < 0.001).

Of the women in the age group eligible for reimbursed HPV vaccination (18–20 years; n = 129), 86 (67%) were vaccinated. Vaccination rates in that age group were lower in those with in comparison to those
without migration background (44% vs. 70%; \(\chi^2 = 4.44, P = 0.04\)) and in women who were less educated compared to those with higher education (58% vs. 77%; \(\chi^2 = 5.14, P = 0.02\)). Moreover, women who reported that they had no sexual intercourse in the past also had lower vaccination rates in comparison to those with reported past intercourse (48% vs. 74%; \(\chi^2 = 6.56, P = 0.01\)). In contrast, knowledge (indicated by the 11-item sum score ranging from 0 to 11) was unrelated to vaccine uptake (\(M_{\text{vaccinated}} = 2.8, \text{SD} = 1.94\) vs. \(M_{\text{unvaccinated}} = 2.31, \text{SD} = 1.96, P = 0.85\)). We further analysed whether vaccinated and unvaccinated women differed on any of the individual knowledge items, and found that they had not (\(t = 1.5, P = 0.10\)).

### Table 1 Characteristics of the study sample

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Women, (n = 259)</th>
<th>Men, (n = 245)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18–20</td>
<td>129 (49.8)</td>
<td>97 (39.6)</td>
</tr>
<tr>
<td>21–25</td>
<td>130 (50.2)</td>
<td>148 (60.4)</td>
</tr>
<tr>
<td>Years of school education (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;11</td>
<td>103 (39.8)</td>
<td>115 (46.9)</td>
</tr>
<tr>
<td>(\geq)11</td>
<td>156 (60.2)</td>
<td>130 (53.1)</td>
</tr>
<tr>
<td>Migration background</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>35 (13.8)</td>
<td>30 (12.4)</td>
</tr>
<tr>
<td>Past sexual intercourse</td>
<td>209 (83.9)</td>
<td>197 (86.4)</td>
</tr>
<tr>
<td>Number of lifetime sexual partners</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>32 (12.7)</td>
<td>22 (9.7)</td>
</tr>
<tr>
<td>1–3</td>
<td>119 (47.4)</td>
<td>91 (40.1)</td>
</tr>
<tr>
<td>4 and more</td>
<td>100 (39.8)</td>
<td>114 (50.2)</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>2.6 ± 1.5</td>
<td>2.8 ± 1.4</td>
</tr>
<tr>
<td>Reported a history of cell change</td>
<td>13 (5.0)</td>
<td>17 (7.0)</td>
</tr>
<tr>
<td>at the cervix</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reported a history of HPV infectionb</td>
<td>10 (3.9)</td>
<td>6 (2.5)</td>
</tr>
</tbody>
</table>

**a:** Due to missing values on single variables \(n\) varies between 465 and 504. The variables with the highest number of missing values was number of life-time partners (\(n = 26\) missing values).

**b:** Eight women reported both HPV infection and cell change, two reported only HPV infection and five reported only cell changes.

### Attitudes towards the HPV vaccine

Among those who were not vaccinated against HPV, four times more men than women stated that they would like to receive the HPV vaccine (table 3). Almost half of the unvaccinated participants were undecided whether they would like to receive the vaccine or not. None of the demographic variables or past sexual intercourse experience were significant predictors of the willingness to get vaccinated (data not shown).

### Discussion

The majority of our survey participants were aware of the vaccine for protection against cervical cancer, but similar to studies from other European countries,12,13 only half of the women and one-fourth of the men had heard about HPV.

We found higher rates of vaccination in our female participants in comparison to previous estimates of vaccine uptake in Germany,25,26 which may be due to local differences in HPV education and/or attitudes. Also, young adults with <11 years of school education were underrepresented in our study.31 Women with a migration background and less educated women had lower vaccine uptake rates, which is in accordance to observations from a study conducted in the UK.32 Since in Germany, women from a lower social class are also less likely to be screened for cervical cancer,33 it is important to intensify educational efforts for those women in order to achieve a high rate of vaccination coverage among them, or else a significant future decline in cervical cancer rates is unlikely.34 Of note, one-third of the unvaccinated women and more than half of the men in our study were not against, but yet undecided about receiving vaccination, indicating a need for better education and counselling.

Knowledge about HPV was poor and essential gaps and misconceptions in understanding HPV infection were identified in all subgroups. Most women and men were lacking basic knowledge such that HPV...
infection is sexually transmitted, that the virus is common, asymptomatic and causally linked to genital warts.

Unlike previous studies, women who were vaccinated against HPV in our study did not have more knowledge about HPV in comparison to the unvaccinated. This is surprising because one would expect that vaccinated women would have received at least basic information about the virus and the vaccine. Although the German guidelines for HPV prevention, diagnostic and therapy recommend to educate adolescents about HPV and to counsel them about sexually transmitted infections and protective behaviour, the current counselling practice of physicians is not known. Our findings suggest that adolescents are not counselled in a satisfying manner. Moreover, various studies have reported that women are interested in receiving comprehensive information about HPV.

An alternative way to improve HPV knowledge may be to include HPV in Sexually Transmitted Infection (STI) education at schools. An
Table 2 Multivariable analyses: parameter estimates from linear regression models predicting HPV knowledge

<table>
<thead>
<tr>
<th></th>
<th>Women, β</th>
<th>Men, β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (0 = 18–20 years; 1 = 21–25 years)</td>
<td>0.015</td>
<td>0.083</td>
</tr>
<tr>
<td>Education (0 = ≤11 years; 1 = &gt;11 years)</td>
<td>0.091</td>
<td>–0.029</td>
</tr>
<tr>
<td>Migration background (0 = no; 1 = yes)</td>
<td>0.040</td>
<td>0.039</td>
</tr>
<tr>
<td>Past sexual intercourse (0 = no; 1 = yes)</td>
<td>0.155*</td>
<td>0.013</td>
</tr>
<tr>
<td>Aware about HPV (0 = no; 1 = yes)</td>
<td>0.328***</td>
<td>0.361***</td>
</tr>
<tr>
<td>Vaccinated against HPV (0 = no; 1 = yes)</td>
<td>0.046</td>
<td>0.210***</td>
</tr>
<tr>
<td>History of abnormal Pap smear or HPV infection (0 = no, 1 = yes)</td>
<td>0.029</td>
<td>0.029</td>
</tr>
</tbody>
</table>

a: HPV vaccine awareness was omitted as a predictor from multivariable analyses because of its high correlation with HPV awareness. The last two predictors were only entered in the model for women

*P < 0.05; **P < 0.01; ***P < 0.001

Table 3 Attitudes towards HPV vaccine among respondents who were not vaccinated against HPV

<table>
<thead>
<tr>
<th></th>
<th>Women, n=160</th>
<th>Men, n=232</th>
<th>P-value</th>
</tr>
</thead>
</table>
| If you are not vaccinated
would you be willing to get vaccinated against HPV? | | |
| Yes                  | 57 (37.8)    | 19 (8.2)    |         |
| No                   | 40 (28.8)    | 85 (36.6)   |         |
| I do not know        | 50 (33.3)    | 128 (55.2)  | <0.001  |

<table>
<thead>
<tr>
<th>Reasons for unwillingness to get vaccinated</th>
<th>n=40</th>
<th>n=85</th>
</tr>
</thead>
<tbody>
<tr>
<td>I perceive myself not at risk to contract HPV</td>
<td>6 (15.0)</td>
<td>39 (45.9)</td>
</tr>
<tr>
<td>HPV is not a serious infection</td>
<td>1 (2.5)</td>
<td>4 (4.7)</td>
</tr>
<tr>
<td>The risk that HPV can cause diseases like cancer is too little</td>
<td>3 (2.4)</td>
<td>6 (7.1)</td>
</tr>
<tr>
<td>I doubt that the vaccine protects against HPV</td>
<td>14 (35)</td>
<td>9 (10.6)</td>
</tr>
<tr>
<td>I believe the vaccine has too many side-effects</td>
<td>20 (50)</td>
<td>12 (14.1)</td>
</tr>
<tr>
<td>I’m in general against vaccination</td>
<td>4 (10)</td>
<td>14 (16.5)</td>
</tr>
<tr>
<td>I do not have any special reason</td>
<td>5 (12.5)</td>
<td>32 (37.6)</td>
</tr>
</tbody>
</table>

a: Five unvaccinated women and 11 unvaccinated men did not answer the question ‘If you are not vaccinated would you be willing to get vaccinated against HPV’

b: More than one answer possible

intervention study with Swedish high school students consisting of a class room lesson, a website and a folder containing information about HPV and its prevention significantly increased knowledge among the female and male students.38

The main limitation of the current survey is that the sample is not representative of the general population of 18–25 year olds in Germany. We did not find an association between education and HPV awareness and HPV knowledge, which may be the case in a representative sample that includes adults without any school degree, and the relation between education and vaccination uptake may be even stronger. Further, we did not assess beliefs about the effectiveness of the HPV vaccine (e.g. for how long the immunization lasts and how effectively it prevents HPV infection and its adverse health consequences), which are also important determinants of vaccine acceptability.

To conclude, our results indicate that HPV prevention policy in Germany is currently focused on the prevention of cervical cancer (‘protectionism’), as opposed to complete education about the nature of the STI (‘right to know’).38 Women with lower education and migrant status should be especially targeted by educational campaigns. Education about HPV should be broadened so that teenagers and young adults are able to make informed decisions about their health behaviour, including the ways in which they are sexually active and whether or not they choose to receive immunization.

Conflicts of interest: None declared.

Key points

• In Germany, HPV vaccination is officially recommended and reimbursed for young girls aged 12–17 years, since 2007; however, a nationwide immunization programme is not in place and HPV vaccine up-take has been low in comparison to other countries. This survey of 18- to 25-year-old female and male vocational school students in Berlin found high awareness of the ‘vaccine against cervical cancer’, but low awareness of HPV.

• Women had higher HPV awareness rates and better HPV-related knowledge than men. However, knowledge was poor among both sexes, even among vaccinated women. For example, the majority of men and women did not know that HPV is sexually transmitted.

• Poor education and not having had sexual intercourse in the past were associated with a lower likelihood of being vaccinated among women.

• One-third of the unvaccinated women and more than half of the men were undecided about receiving HPV vaccination. The most common reasons for not wanting to get vaccinated were no perceived risk among men, and concerns about side-effects among women.

• There is need for better education about HPV and extended counselling about HPV vaccination. This education should be tailored for groups with lowest vaccination rates, it should extend beyond the link between HPV and cervical cancer, and emphasize that HPV is not a ‘women’s issue’, that it is common, and that it is sexually transmitted.

References


