Seroprevalence and awareness of human papillomavirus infection and cervical cancer screening results among reproductive-aged Georgian women

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ABSTRACT

Introduction As is the case in many developing countries, more than half of the new cervical cancer cases in Georgia are late-stage diagnoses, thus reducing the opportunity for effective treatment. A state cancer screening programme was launched in Tbilisi in 2006; 5 years later the programme had expanded to other regions in Georgia.

Methods This study was designed to estimate awareness about human papillomavirus (HPV), cervical cancer screening, the HPV vaccine, and the seroprevalence of HPV infection among reproductive-aged Georgian women. Study participants were recruited from four women's consultation centres in different regions of Georgia. Data were collected through interviewer-administered questionnaires and HPV seroprevalence was assessed for HPV types 6/11/16/18.

Results Of the 500 study participants, 52.0% were aware of HPV and 36.4% stated that the main cause of cervical cancer is HPV. Of those aware of HPV, 78% reported attending for cervical cancer screening at least once during their lifetime. Half (50.8%) of all respondents were unaware of the HPV vaccine. Of the women who agreed to be tested for anti-HPV antibodies (n=317), 21.1% were positive. Women reporting no condom use were more likely to have HPV antibodies (prevalence ratio 2.77; 95% confidence interval 1.79–4.27). Awareness of cervical cancer screening was significantly associated with HPV seropositivity. With multivariate analysis, both absence of condom use and lack of knowledge about cervical cancer screening were independently associated with HPV seropositivity.

Conclusion More comprehensive public awareness campaigns should be developed to raise awareness about HPV screening and prevention.

Key message points

- There is a lack of awareness about human papillomavirus (HPV), cervical cancer screening and HPV vaccine among reproductive-aged Georgian women.
- The seroprevalence of HPV types 6, 11, 16 and 18 was 21.1%.
- Condom use was an independent predictor of HPV antibody status.

INTRODUCTION

Cervical cancer is the second largest cause of cancer mortality among women in developing countries.[1] In 2008, the reported number of cervical cancer cases was approximately 530 000 and the number of deaths 275 000 worldwide.[2] Screening programmes have reduced mortality by detecting precancerous changes that can be treated, preventing development of invasive cancer. Consequently, worldwide more than 85% of cervical cancer cases occur in developing countries where there is limited access to screening.[3] The incidence of cervical cancer in Georgia was 13.5 per 100 000 females in 2008–2009;[4 5] more than half of all new cervical cancer cases in Georgia are late-stage diagnoses, making treatment more challenging.[6 7]

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Genital human papillomavirus (HPV) infection is one of the most common sexually transmitted infections (STIs) in the world. The majority of sexually active individuals become infected with at least one variant of HPV during their lifetime.[8 9] However, the HPV vaccine can protect women against some of the most common HPV types, including those implicated in approximately 70% of all cervical cancer cases.[10 11] Despite the availability of an effective vaccine, studies describing attitudes and knowledge about HPV vaccination often highlight a lack of awareness related to HPV infection and its association with cervical cancer.[12–14]

While there are few national data specific to Georgia, the burden of disease in developing countries underscores the need for a more proactive approach. To this end, the State Program on Cancer Screening started in 2006 in Tbilisi, Georgia's capital,[4 15] with the aim of reaching women aged 22–60 years. In 2011, the programme was expanded to other regions of the country. Additionally, as an extra component of the efforts to control cervical cancer in Georgia, free HPV vaccination (covered by a municipal programme) was implemented in Tbilisi in 2010 among 11–13-year-old girls. In 2011, the upper age limit was increased to 17 years and the vaccination programme was expanded to other regions in Georgia. To date, the vaccine uptake levels resulting from this programme are not known.

Given these preliminary efforts to increase awareness as well as offering screening and prevention, we were interested in estimating the awareness among the target population about HPV, cervical cancer screening, and the HPV vaccine. We were also interested in determining the seroprevalence of HPV infection among Georgian women.

METHODS

Study participants were recruited from four women's consultation centres (WCCs) in Georgia. The WCCs were selected from different regions of the country: Tbilisi (the capital, where almost one-third of the country's total population resides – two centres), Batumi (large city in Western Georgia) and Rustavi (large city in Eastern Georgia). During defined study periods in 2009–2010, consecutive women seen by obstetricians for their routine postnatal visit (usually occurring around 6–8 weeks after delivery) were recruited to the study. The postnatal visit was used to enroll our target population because Georgian women do not have access to routine gynaecological care. Eligibility criteria for study enrollment were: having a postnatal visit at one of the four WCCs during the study period, women aged 18+ years, and Georgian- or Russian-speaking and competent to provide informed consent to volunteer for the study. As this was an independent research study not affiliated with the State Program on Cancer Screening, the lower age limit for cervical cancer screening was reduced from 22 to 18 years. Data collection included an interviewer-administered survey and clinical examination. Nurses were selected at each participating clinic and trained as interviewers. The questionnaire was developed and piloted on 15 reproductive-aged women prior to administration. Additionally, for a subset of women, blood was tested for antibodies to the HPV serotypes covered by the vaccine.

The study was reviewed and approved by the Research Ethics Committee of the Maternal and Child Care Union, Tbilisi, Georgia. Each woman was enrolled in the study after signing an informed consent form. The informed consent contained separate permissions for cervical cancer screening, and for a subset of women (only women in Tbilisi and Rustavi, for logistical reasons), a blood sample taken for HPV antibody testing.

Data collection and measures

Survey data were collected by an interviewer-administered questionnaire. The brief survey included demographic characteristics, clinical information (e.g. history of STIs) and knowledge of cervical cancer-related prevention. Demographic characteristics collected included age, education and family income. Marital status was not queried as it is exceptionally rare for an unmarried woman to deliver a baby in Georgia. Clinical history questions included having ever had an STI and previous use of preventive services such as cervical cancer screening. Awareness of HPV was assessed by means of the question: "Have you ever heard about human papillomavirus (HPV)?" Exposure to education about cervical cancer risk factors and prevention was ascertained by asking: "Have you ever heard about cervical cancer screening?" In the Soviet Union, routine cervical cancer screening was not conducted and was only rarely employed for diagnostic purposes in asymptomatic women. At the time of our survey the HPV vaccine was being considered for use in Georgia.

The clinical examination in the study procedure mentioned above was part of routine postnatal care, and included a gynaecological examination, which provided an opportunity to obtain cervical swabs for cervical cancer screening using standard collection and cytology methods. Cervical cancer screening was offered to all women, and samples were analysed using standard technique and reported using the Bethesda System.

After the interview and clinical examination, 3 ml venous blood was drawn from consenting women seen in the Tbilisi centres. Seroprevalence of HPV was determined by detection of the anti-virus-like particle (anti-VLP derived from HPV types 6/11/16/18) antibodies in the blood serum using an ELISA (HPV IgG ELISA, Dia.Pro Diagnostic Bioprobes s.r.l., Milan, Italy).

Statistical analysis

SPSS V.20™ (StataCorp, College Station, TX, USA) was used for data management and statistical analyses.

The two main outcome variables were knowledge about cervical cancer screening and HPV seroprevalence. The predictor variables were: age, education level, employment status, family income, age at first intercourse, condom use, history of STIs (for a woman and her partner) and STI knowledge. Bivariate and adjusted multivariate prevalence ratios (PRs) with 95% confidence intervals (CIs) were computed. Poisson regression with robust variance estimates was used to define independent predictors for the outcomes of interest.[16]

RESULTS

Of the 515 women approached, 500 agreed to participate in the study (a 97% response rate). Half the women (n=249) were selected from two different WCCs in Tbilisi and the other half were recruited from two WCCs in Rustavi (n=71) and Batumi (n=180).

The median age of respondents was 32 (range 18–48) years. The proportion of employed women was 49.6% (248). Some 64.0% (320) of women reported ever having had an abortion. The median number of self-reported abortions was 2 (range 1–34) and 64.0% (319) of the study participants reported ever using any type of contraception. Among those women who had ever used condoms (230), 66.9% (153) stated that avoidance of pregnancy was the main reason for condom use.

Knowledge about HPV, cervical cancer screening and the HPV vaccine

Among the interviewed women, 242 (52.0%) had ever heard about HPV, but only 36.4% (182) of respondents stated that the main cause of cervical cancer is HPV. Among those women who were aware of cervical cancer screening (263), 78.0% (205) reported having attended at least once for cervical cancer screening. The vast majority of respondents (413, 82.6%) indicated that they would return for treatment in the event of a positive cervical cancer screening test result.

Half (234, 46.8%) of the respondents were unaware of the HPV vaccine. The majority (369, 73.8%) would accept vaccination if it were offered and nearly all (475, 95%) were willing to receive more information about the HPV vaccine and cervical cancer prevention. The preferred sources of information mentioned by study participants were medical counselling (247, 52.0%), television (125, 26.4%), printed educational materials (96, 20.2%) and short-term trainings (26, 5.4%).

Awareness of cervical cancer screening was higher among women aged 30+ years (66.0%) compared to women aged ≤30 years (44.8%) (PR 1.59; 95% CI 1.31–1.96). Employment seemed to be a factor: 49.1% of unemployed women had ever heard about cervical cancer screening compared to 64.1% of employed women (PR 0.73; 95% CI 0.60–0.89). Awareness of cervical cancer screening was higher among women with a family income ≥US$600 compared to women with a lower family income (PR 1.39; 95% CI 1.23–1.59). These factors remained significant in multivariate analysis (Table 1). The same variables were significantly associated (by bivariate as well as multivariate analysis) with HPV awareness among women.

Cervical cancer screening

Of the 500 women interviewed, 497 (96.5%) consented to undergo cervical cancer screening. Cervical cancer screening test results were negative for intraepithelial lesions or malignancy in the majority (86.8%) of cases. Cervical cancer screening test results are presented in Table 2.

HPV seroprevalence

Of the 500 women, 320 lived in either Tbilisi or Rustavi and thus were eligible for the HPV seroprevalence sub-study, and 317 agreed to provide a blood sample for testing. Compared to those not providing a blood sample, women in the sub-study were more likely to be older (p<0.001) (median age 32 vs 30 years among those who did and did not provide blood, respectively), slightly more likely to have heard of cervical cancer screening (p=0.019) and have a history of an STI (p=0.004); no significant differences in education and employment were noted.

Of those women who were tested, 67 (21.1%) were positive for HPV. In bivariate analysis, lack of condom use (PR 2.77; 95% CI 1.79–4.27) and lack of knowledge about HPV (PR 1.77; 95% CI 1.15–2.72) were both associated with seropositivity compared to those women who reported using condoms or who were aware of HPV. The overall proportion of women reporting current or past smoking was 35.3%, but there was no association between ever-smoking and HPV seropositivity.

Multivariate analysis identified absence of condom use and lack of knowledge about cervical cancer screening as independently associated with HPV seropositivity (Table 3).

DISCUSSION

This is the first study to investigate HPV, cervical cancer screening and HPV vaccine knowledge in Georgian women. The study found that cervical cancer screening knowledge is associated with advanced education, which is consistent with some other studies. Around half (52.0%) of the interviewed women had heard about HPV, which is lower than previous reports from other developing countries, for example, Colombia.[17] Encouragingly, 36.4% of respondents knew about the link between HPV and cervical cancer, and awareness of this relationship was higher among women who had ever had cervical cancer screening, a finding that emphasises the

Table 1 Association of cervical cancer screening knowledge with various factors

Demographic and occupational factors	Total (*n*)	Heard about cervical cancer screening [*n* (%)]	Bivariate PR (95% CI)	aPR (95% CI)
Age group (years)				
≤30	210	94 (44.80)	1	1
>30	256	169 (66.00)	1.59 (1.31–1.96)	1.47 (1.22–1.78)
Missing values	34			
Education level				
High school	43	16 (37.20)	1	1
College	419	246 (58.70)	2.21 (1.23–3.99)	1.13 (0.74–1.71)
Missing values	38			
Employment				
No	234	115 (49.10)	1	1
Yes	231	148 (64.10)	0.73 (0.60–0.89)	0.92 (0.74–1.14)
Missing values	35			
Family income				
<US$600	277	135 (48.70)	1	1
≥US$600	119	91 (76.50)	1.39 (1.23–1.59)	1.55 (1.28–1.86)
Missing values	104			
Have you ever heard about STIs?				
No	48	13 (27.10)	1	1
Yes	409	243 (59.40)	3.43 (1.87–6.31)	2.65 (1.22–5.75)
Missing values	43			
Have you ever had an STI?				
No	248	115 (46.40)	1	1
Yes	189	129 (68.30)	1.46 (1.24–1.72)	1.51 (1.20–1.90)
Missing values	63			

aPR, adjusted prevalence ratio; CI, confidence interval; PR, prevalence ratio; STI, sexually transmitted infection.

importance of routine cervical cancer screening counselling by health care workers. Whilst a prescription is not necessary in order to undergo cervical cancer screening in Georgia, the related counselling may be a valuable mode of conveying information about cervical cancer screening, suggesting a potential means of increasing utilisation of the free State Screening Program services.

The seroprevalence of HPV types 6, 11, 16 and 18 was 21.1%, which is comparable to findings in developed countries. An HPV seroprevalence study conducted in Australia in 2005 revealed that seropositivity for any HPV vaccine strain (types 6, 11, 16 or 18) was 23.8% among the female population.[18] Another cross-sectional study among women in the Czech Republic demonstrated that 28.5% had any of the four anti-VLPs derived from HPV types 6, 11, 16 or 18. Studies from developing countries show higher rates of HPV seropositivity.[19] In Colombia and South Africa the seroprevalence of HPV-16 alone was nearly 45% among women, which is much higher than the present study result.[20 21]

HPV seropositivity was negatively associated with condom use. This is consistent with other reports.[22] Contrary to some studies, we did not find any association between tobacco use and seropositivity.[23]

Our study revealed a pervasive lack of awareness about HPV vaccine among Georgian women.[24] Although 44.1% of the respondents were unaware of HPV vaccination, 83.1% of women indicated that they would have the vaccine if it were offered to them free of charge. Additionally, the majority of interviewed women reported a willingness to receive more information about HPV and cervical cancer prevention, suggesting that favourable conditions exist in which to launch an awareness campaign. A small majority (52.0%) of women would prefer a physician's consultation as a means of learning more about HPV. Women who had ever had an STI were more

Table 2 Cervical cancer screening results

Results	*n* (%)
Negative for intraepithelial lesion or malignancy (NILM)	431 (86.7)
Atypical squamous cells of undetermined significance (ASC-US)	35 (7.0)
Atypical squamous cells of undetermined significance cannot exclude HSIL (ASC-H)	12 (2.4)
High-grade squamous intraepithelial lesion (HSIL)	2 (0.4)
Low-grade squamous intraepithelial lesion (LSIL)	2 (0.4)
Atypical endocervical cells (AEC), not otherwise specified (NOS)	1 (0.2)
Unsatisfactory smear (U/N)	14 (2.8)

Table 3 Association of human papillomavirus seroprevalence with different factors

Factors	Total (*n*)	Positive HPV seroprevalence [*n* (%)]	Bivariate PR (95% CI)	aPR (95% CI)
Age group (years)				
>30	189	38 (20.10)	1	1
≤30	128	29 (22.70)	1.13 (0.73–1.73)	1.03 (0.91–1.17)
Education level				
College	283	59 (20.80)	1	1
High school	32	8 (25.00)	1.19 (0.63–2.28)	0.89 (0.72–1.11)
Missing values	2			
Employment				
Yes	167	33 (19.80)	1	1
No	150	34 (22.70)	1.15 (0.75–1.75)	1.05 (0.92–1.19)
Condom use				
Yes	172	26 (15.10)	1	1
No	86	36 (41.90)	2.77 (1.79–4.27)	1.23 (1.09–1.38)
Missing values	59			
Age of first sexual intercourse (years)				
>18	78	17 (21.80)	1	1
≤18	231	50 (21.60)	0.99 (0.61–1.62)	1.06 (0.92–1.17)
Missing values	8			
Have you ever heard about cervical cancer screening?				
Yes	189	30 (15.90)	1	1
No	125	35 (28.00)	1.77 (1.15–2.72)	1.16 (1.02–1.32)
Missing values	3			
Have you ever had an STI?				
Yes	143	33 (23.10)	1	1
No	156	30 (19.20)	0.83 (0.54–1.29)	0.93 (0.77–1.12)
Missing values	18			
Has your partner had an STI?				
Yes	116	29 (25.00)	1	1
No	101	22 (21.80)	0.87 (0.54–1.42)	0.99 (0.81–1.21)
Missing values	100			

aPR, adjusted prevalence ratio; CI, confidence interval; HPV, human papillomavirus; PR, prevalence ratio; STI, sexually transmitted infection.

likely to know about cervical cancer screening, reinforcing the important advocacy role of health care workers. A multidisciplinary approach to providing information about HPV screening and treatment is recommended. First, however, it is important to confirm that Georgian health care workers are adequately informed. A preliminary study conducted in this group revealed gaps in knowledge about HPV and the prevention of cervical cancer,[25] however the majority of physicians expressed a keen interest in learning more about these issues.[25]

Most of the women interviewed also indicated that television and printed materials are effective modes of communication. These results highlight the importance of developing and launching more comprehensive public awareness campaigns using mass media to increase awareness and knowledge about HPV.

Historically, cervical cancer screening has rarely been implemented in Georgia, and the lack of early screening is likely to contribute to the high rates of invasive cervical cancer in this country. Little is known about the distribution of cervical cancer screening results among asymptomatic women in Georgia. Our team previously conducted an evaluation of cervical cancer screening in women presenting to WCCs with abnormal gynaecological symptoms (abnormal discharge or bleeding) and documented abnormal cervical cancer screening test results in 19% of these women.[26] The finding in the present study that 13% of women had an abnormal cervical cancer screening test result indicates the continued need to investigate the relatively high level of abnormal cervical cytology in Georgian women as part of comprehensive efforts to improve cerivcal cancer prevention in Georgia.

One key limitation of this study is the use of a consecutive sample of women investigated whilst undergoing postnatal care. As a result, the sample represents

only reproductive-aged women who have delivered a child. Another limitation is the participants' self-reported history of cervical cancer screening and STIs, which was not validated from their medical records. Such measures tend to be underestimates; however, it is not clear whether measures of association would be biased. The HPV seroprevalence test utilised was a combined test for anti-VLP derived from HPV types 6/11/16/18 in blood serum. The study funding was insufficient to test for each HPV type separately, and was limited to only 300 samples, hence the emphasis on establishing firm figures for the Georgian capital, Tbilisi.

Although constrained by limited funding, this study provides one benchmark assessment of awareness about cervical cancer screening and prevention among Georgian women. Half the respondents were aware of HPV, and one-third knew that HPV causes cervical cancer. Encouragingly, more than 80% of respondents indicated that they would have the HPV vaccine if it were offered to them free of charge. One challenge to overcome is the lack of routine gynaecological care, making it difficult to reach Georgian women. A multi-pronged outreach campaign involving physician appeals to women via direct counselling, television and print media can build awareness about the importance of cervical cancer screening and prevention, and encourage women to seek out these important services.

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