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Condyloma acuminata prevalence, clinical characteristics, and associated malignancies in Saudi patients at a tertiary care center

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Availability of data and materials: all data generated or analyzed during this study are included in this article.

Abstract

Condyloma acuminata (CA) are benign anogenital warts caused by the human papillomavirus (HPV). Worldwide, HPV is the most common sexually transmitted disease (STD). Data from Saudi Arabia (SA) remains limited. This study aims to assess CA prevalence, clinical characteristics, co-existing STDs, fertility issues, and malignancies at the tertiary care center King Abdulaziz Medical City (KAMC), Riyadh, SA. A total of 118 patients diagnosed with CA were included. RStudio (version 2024.9.1.394, Boston, MA, USA) with R version 4.4.2. was utilized for statistical analysis. Among 15,016 patients attending the Dermatology Department during the study period, 118 were diagnosed with CA, constituting a prevalence of 0.79%. The majority of patients were male (n=69; 58.5%), with a median age of 33 years at the time of diagnosis. Perianal (n=40; 33.9%) and vulvar (n=39; 33.1%) regions were the most affected sites. Smoking (n=30; 25.4%), extramarital sexual activity (n=5; 8.8%), and abnormal Pap smear results (n=6; 5.7%) were significant findings. Immunodeficiency was noted in 3 patients (2.5%), and HPV vaccination status was low (n=6; 5.7%). Anogenital warts were found in 115 patients (97.5%), with Buschke-Löwenstein tumors in 3 patients (2.5%). Infertility was reported in 10 patients (17.2%); the majority had primary infertility (n=8; 80.0%). HPV vaccination, awareness, and prevention strategies are necessary to reduce CA burden and complications.

Introduction

Condyloma acuminata (CA) is a pathological condition, also known as benign neoplasms or warts in the genital area, caused by the human papillomavirus (HPV).[1] More than 100 types of HPV have been isolated from patients, and it has been found that the number of HPV strains infecting the anogenital region exceeds 40.[2] The most common strains of HPV that are found in association with CA are types 6 and 11.[2] Various complications that are associated with CA can significantly affect patients, including an impact on psychological health, leading to anxiety and feelings of guilt.[2] One of the significant associations with HPV infection-caused cellular dysplasia is rectal and penile cancer in males and cervical cancer in females.[3]

In terms of sexually transmitted diseases (STDs), HPV is considered one of the most prevalent infections around the world, with a prevalence rate of around 9-13%.[3] Individuals ranging in age from 20 to 39 years who are sexually active are most frequently impacted.[4] Several factors contribute to the risk of HPV infection, including multiple sexual partners, history of STDs such as chlamydia and gonorrhea, smoking, and human immunodeficiency virus (HIV) infection.[3,5] Since anogenital warts are not a reportable disease, it is hard to correctly estimate their prevalence and report a statistically correct figure.[2] However, it has been reported recently that the incidence of anogenital warts in the USA ranges from 1.1 to 1.2 cases per 1,000 individuals annually.[6] Moreover, in the USA, the

prevalence of CA is reported to be 40% of any HPV infection.[7] Locally, it is perceived that CA is less prevalent in Saudi Arabia (SA) due mainly to religious and social reasons. To our knowledge, there are no studies on the prevalence of CA in SA.

Based on the literature review, no studies have been published in SA that have addressed the prevalence, clinical characteristics, and associated malignancies among patients affected with CA. Hence, there is a significant gap in the literature on SA, which may pose a substantial burden for dermatologists and patients and hinder effective patient management. We aimed to determine the overall prevalence, clinical characteristics, and underlying complications associated with CA among Saudi patients at King Abdulaziz Medical City (KAMC), Riyadh, SA.

Materials and Methods

In this retrospective chart review, individuals with a confirmed diagnosis of CA were retrospectively identified through the BESTCare system within the timeframe spanning from January 2015 to January 2024 at KAMC. The utilization of the BESTCare system guarantees the comprehensive inclusion of nearly all clinically recognized cases of CA, enabling access to their detailed medical records for this study.

Selection criteria and sample size

This study included participants with a confirmed diagnosis of CA by a board-certified dermatologist between the period of January 2015 and January 2024, regardless of age and gender. Patients who lacked a confirmed diagnosis by a board-certified dermatologist were excluded from the study.

The total number of patients visiting the Dermatology Department at KAMC was 15,016; among these patients, we successfully identified 118 patients with a verified diagnosis of CA.

Data collection and analysis

In accordance with the Institutional Review Board approval from the King Abdullah International Medical Research Centre, the study group extracted data from the BESTCare system, which included CA records for all patients. The purpose of this retrospective chart review was to determine the prevalence, clinical characteristics, and associated malignancies of CA in patients presenting to the Dermatology Department. Three primary outcomes were extracted from KAMC's electronic medical records. The first outcome was to determine the prevalence of CA. In addition, we collected demographics and clinical characteristics associated with CA, including age, gender, marital status, personal history of anogenital warts, HPV vaccination status, and Pap smear results. Clinical characteristics encompassed morphological features and subtypes of CA. Moreover, we obtained data

on comorbidities and complications associated with CA, including malignancies such as cervical, vulvar, oropharyngeal, penile, and anal cancers and STD co-infections. Treatment modality information was inconsistently documented in the electronic medical records and, therefore, was excluded from the current data collection and analysis.

Statistical analysis

The collected data were analyzed statistically using RStudio (version 2024.9.1.394, Boston, MA, USA) with R version 4.4.2. Categorical variables were presented as counts, frequencies, and percentages, while continuous variables were presented as medians with interquartile ranges (IQRs). Subjects with missing information for a specific feature were removed from the percentage calculations related to that particular feature.

Results

Prevalence, demographic, and clinical characteristics

Initially, we collected data from 143 patients with CA. However, we excluded four patients without a confirmed diagnosis and 20 patients due to incomplete documentation of essential data. Therefore, a total of 118 patients were included in this study, out of 15,016 patients attending the Dermatology Department during the study period, corresponding to a prevalence of 0.79%. Among them, the majority were male (n=69; 58.5%) (Figure 1), and the median age at the time of diagnosis was 33 years (IQR: 26.0-42.0) (Figure 2). Most patients were married (n=71; 80.7%), with 19 patients (38.0%) reporting a spousal history of CA. Vaccination against HPV was reported by 6 patients (5.7%). Among female participants, 33 (67.3%) reported having undergone a Pap smear test; of these, 6 presented abnormal results (Table 1).

Risk factors for transmission or development of new lesions

The history of extramarital sexual activities was documented in 5 participants (8.8%), with 1 of these cases involving unprotected intercourse (Figure 3). Laser hair removal was reported in 10 patients (25.6%), while smoking was prevalent in 30 patients (39.0%). Three (2.9%) participants were immunocompromised, with underlying causes including HIV and post-renal transplant. The use of immunomodulatory medications was reported in 8 patients (7.7%), with the most frequently used medications being tacrolimus and chemotherapy (Table 2).

Description of sites involved

Perianal (n=40; 33.9%), vulvar (n=39; 33.1%), and inguinal (n=38; 32.2%) sites were the most frequently affected in patients with CA. Other commonly affected sites included penile (n=37; 31.4%), anal, and scrotal (n=15; 12.7%) regions (Figure 4).

Morphological characteristics and diagnosis

Most cases were diagnosed clinically; however, among participants, 17 (14.8%) had biopsy-proven diagnoses of CA. Verrucous morphology was the most common (n=61; 63.5%), followed by flat-topped lesions (n=5; 5.4%) and filiform lesions (n=6; 6.5%). Most lesions were greater than 4 in number (n=79; 74.5%). Anogenital warts were identified in 115 (97.5%) cases, with Buschke-Löwenstein tumors noted in 3 patients (2.5%) (Table 3).

Comorbidities and complications

An active malignancy was present in 2 cases at the time of diagnosis (1 cervical and 1 oropharyngeal cancer). A previous history of malignancies was reported in 4 patients, including cranial tumors, diffuse large B-cell lymphoma stage IV, Kaposi's sarcoma, and myeloproliferative neoplasm. Among CA patients, an STD work-up was requested for 115 individuals (97%). Nine patients (7.8%) were diagnosed with STD infections, with hepatitis B virus (HBV) being the most common infection in 7 (87.5%) of these cases. Subsequently, herpes simplex virus (HSV) was identified in 5 patients (62.5%) and human immunodeficiency virus (HIV) in 2 patients (25.0%). Infertility was noted in 10 cases (17.2%), predominantly primary infertility in 8 patients (80.0%) (Table 4).

Discussion

CA is among the most common STDs in young adults. While they are non-cancerous, they impose a considerable financial strain on healthcare systems and create a significant psychological burden on patients.[8] In a systematic review of the incidence and prevalence of CA published by Patel *et al.* in 2013, it was estimated that the annual incidence of CA ranges between 160 and 289 per 100,000, and it constitutes about 0.74% of the total number of patients visiting the Dermatology Department.[1] Similarly, in another study that was conducted in Southern Brazil, the authors examined a cohort of 3,447 patients and found that CA was prevalent among 1,140 cases, constituting a prevalence of 33.1%.[9] In contrast, the prevalence of CA in our cohort was markedly lower (0.79%), which may reflect differences in social and cultural factors or health-seeking behaviors. Moreover, in our study, the participants were on average 33 years of age, with a predominance of males, which is consistent with other studies reporting a peak in age distribution for CA between the ages of 20 and 40.[4,10] However, in terms of gender predominance, according to Fleischer *et al.*, CA prevalence was higher

among females, while Yuan *et al.* found a higher prevalence among males, which is likely due to the greater sample of males compared to females in their study.[4,10] Additionally, in our study, a high percentage of 94.3% of participants had not been vaccinated against HPV, which further validates the importance of raising awareness and acceptance regarding HPV vaccination.[5,11]

A history of extramarital sexual activity was reported by 8.8% of participants. Previous research has shown that a partner's extramarital sexual activity is associated with an increased risk of HPV infection; specifically, women whose husbands reported such behavior had significantly higher odds of HPV positivity (odds ratio [OR]=1.54; 95% confidence interval [CI]: 1.29-1.84).[12]

In terms of CA complications, developing malignancies is the most serious risk. In our study, although not statistically significant, only 2 patients were found to have cancer, specifically cervical and oropharyngeal cancer. Furthermore, a study by Nordenvall *et al*. reported a significant association between CA and the risk of several cancers.[13] Specifically, they reported a strong link between CA and an elevated risk of cancers in the vulva, vagina, penis, and anus.[13] Furthermore, they describe standardized incidence ratios of 10.2 for vulvar cancer, 12 for vaginal cancer, and 21.9 for penile cancer. Buschke-Löwenstein tumors, a recognized complication of CA, are a type of verrucous carcinoma first described by Buschke and Löwenstein in 1925. They are considered a rare subtype of squamous cell carcinoma.[14,15] In our study, 3 patients were found to have Buschke-Löwenstein tumors, constituting 2% of our population.

The prevalence of STDs accounts for 7.8% of our population. Reported cases included HBV, HIV, and HSV, further complicating their health status. Similarly, Purwoko *et al.* highlighted that among their 115 cases of CA, 26.8% of these cases were HIV positive, and key risk factors included being male, having multiple sexual partners, and engaging in homosexual activities.[16] Similarly, 49 patients out of 159 (30.8%) HIV-infected individuals developed CA in a study conducted in Brazil, reinforcing the importance of comprehensive sexual health strategies that cover both conditions.[17] Moreover, the reported prevalence of infertility was 17.2% in our study, which aligns with previous research indicating that HPV infections can negatively impact fertility, both through direct effects on reproductive health and via related complications.[18] Overall, these results underscore the multifactorial risks associated with HPV and its potential long-term health implications.

Limitations

The study was limited by its monocentric design. Additionally, some cases may have been missed due to incomplete patient records in the system. Furthermore, treatment modalities could not be assessed due to insufficient documentation in the records, constraining the assessment of management patterns and associated outcomes in our sample. In addition, unfortunately, HPV typing is not

available in our center; such data can help identify high-risk HPV infection, which requires closer monitoring and effective treatment. Therefore, more studies involving diverse populations, larger sample sizes, and longer follow-up with documented treatment approaches and clinical outcomes are recommended to enhance the generalizability and accuracy of the findings.

Conclusions

In summary, until now, this is the first descriptive study on CA prevalence in SA. Identifying demographic groups provides insights for healthcare providers and public health to implement strategies aimed at reducing the associated complications of CA.

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Figure 1. Pie chart describing the gender distribution of patients.

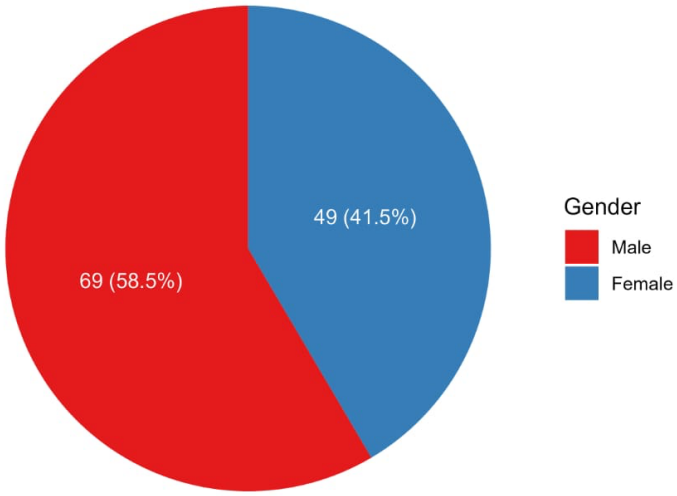

Figure 2. Boxplots depicting patients' age and age at diagnosis.

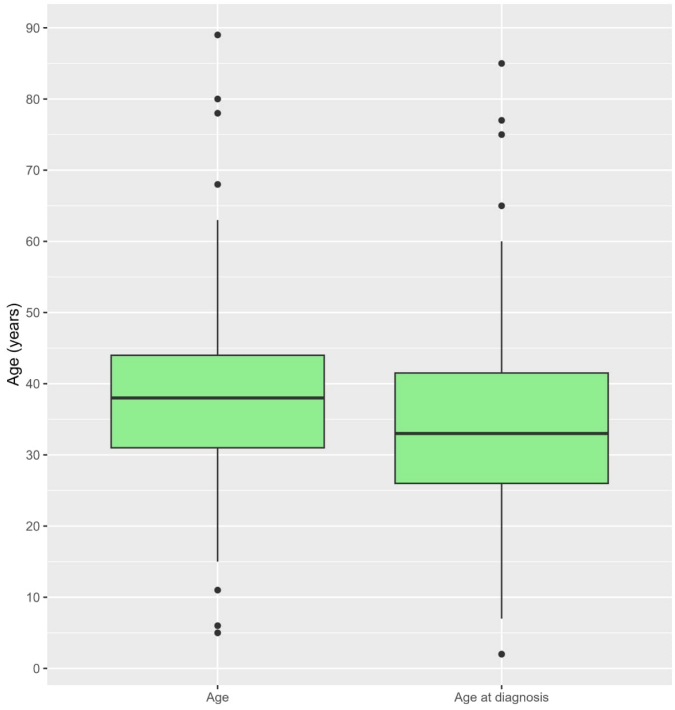

Table 1. Demographic and clinical characteristics (n=118).

Characteristic	**Total n (%)**		**Yes n (%)**	**No n (%)**
Age at diagnosis, years (median)	33.0 (26.0-42.0)			
Gender				
Male	69 (58.5)			
Female	49 (41.5)			
Married	88 (75)		71 (80.7)	17 (19.3)
If yes, spouse's history of CA	50 (70)		19 (38.0)	31 (62.0)
If yes, spouse received HPV vaccine	48 (68)		1 (2.1)	47 (97.9)
Employed	58 (49)		22 (37.9)	36 (62.1)
Past history of warts (other than anogenital)	107 (91)		9 (8.4)	98 (91.6)
Vaccinated (HPV)	105 (89)		6 (5.7)	99 (94.3)
Pap smear test	49 (41.5)		33 (67.3)	16 (32.7)
If done, Pap smear results	32 (97%)			
	26 (81.3) Negative	6 (18.8) Positive		

CA, condyloma acuminata; HPV, human papillomavirus; median = Q1-Q3.

Figure 3. Frequencies of risk factors for CA.

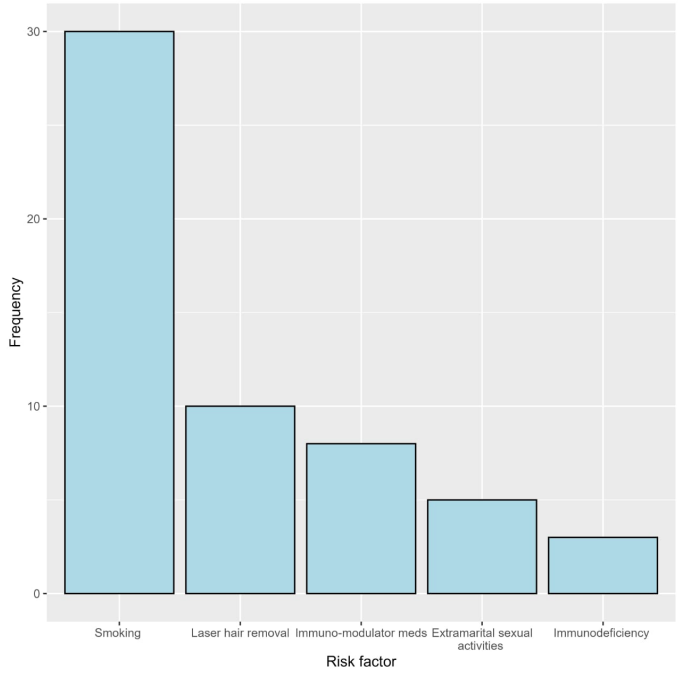

Table 2. Risk factors of CA transmission or the development of new lesions (n=118).

Characteristic	**Total n (%)**	**Yes n (%)**	**No n (%)**
History of extramarital sexual activities	57 (48)	5 (8.8)	52 (91.2)
If yes, was it unprotected?	3 (60)	1 (33.3)	2 (66.7)
Laser hair removal	39 (33)	10 (25.6)	29 (74.4)
Smoking	77 (65)	30 (39.0)	47 (61.0)
Immunodeficiency	104 (88)	3 (2.9)	101 (97.1)
If yes, reason for immunodeficiency			
HIV	2 (67)	1 (50.0)	1 (50.0)
Post-renal transplant	2 (67)	1 (50.0)	1 (50.0)
Immuno-modulator meds	104 (88)	8 (7.7)	96 (92.3)
If yes, type of the immuno-modulator meds*			
Chemotherapy	6 (75)	2 (33.3)	4 (66.7)
Cyclosporine	6 (75)	1 (16.7)	5 (83.3)
R-EPOCH	6 (75)	1 (16.7)	5 (83.3)
R-CHOP	6 (75)	1 (16.7)	5 (83.3)
Tacrolimus	6 (75)	2 (33.3)	4 (66.7)
Hydrocortisone	6 (75)	1 (16.7)	5 (83.3)
Prednisolone	6 (75)	1 (16.7)	5 (83.3)
MMF	6 (75)	1 (16.7)	5 (83.3)

HIV, human immunodeficiency virus; R-EPOCH, rituximab, etoposide phosphate, prednisone, vincristine sulfate (Oncovin), cyclophosphamide, and hydroxydaunorubicin; R-CHOP, rituximab, cyclophosphamide, hydroxydaunorubicin, vincristine sulfate (Oncovin), and prednisone; MMF, mycophenolate mofetil; *multiple-response item.

Figure 4. Description of the sites involved among patients with CA.

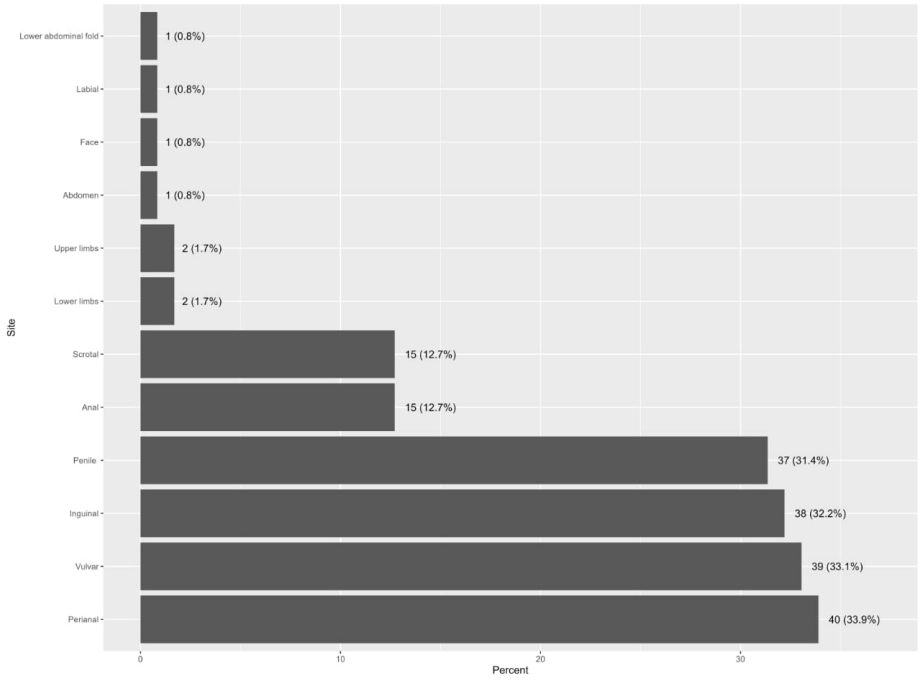

Table 3. Morphological characteristics and types of diagnoses (n=118).

Characteristic	**Total n (%)**	**Yes n (%)**	**No n (%)**
Biopsy proven	115 (97)	17 (14.8)	98 (85.2)
Morphology			
Flat-topped	93 (79)	5 (5.4)	88 (94.6)
Verrucous	96 (81)	61 (63.5)	35 (36.5)
Filiform	92 (78)	6 (6.5)	86 (93.5)
Color*			
Erythematous	118 (100)	1 (0.8)	117 (99.2)
Hyperpigmented	118 (100)	30 (25.4)	88 (74.6)
Skin-colored	118 (100)	21 (17.8)	97 (82.2)
Yellowish	118 (100)	1 (0.8)	117 (99.2)
Number of lesions			
1	106 (90)	7 (6.6)	99 (93.4)
2-4	106 (90)	20 (18.9)	86 (81.1)
>4	106 (90)	79 (74.5)	27 (25.5)
Anogenital warts	118 (100)	115 (97.5)	3 (2.5)
Bowenoid papillomatosis	118 (100)	0 (0.0)	118 (100.0)
Erythrodysplasia of queyrat	118 (100)	0 (0.0)	118 (100.0)
Buschke-Löwenstein	118 (100)	3 (2.5)	115 (97.5)

*Multiple-response item.

Table 4. Comorbidities and complications (n=118).

Characteristic	**Total n (%)**	**Yes n (%)**	**No n (%)**
Malignancy			
Cervical	2 (1.7)	1 (50.0)	1 (50.0)
Vulvar	2 (1.7)	0 (0.0)	0 (0.0)
Oropharyngeal	2 (1.7)	1 (50.0)	1 (50.0)
Penile	2 (1.7)	0 (0.0)	0 (0.0)
Anal	2 (1.7)	0 (0.0)	0 (0.0)
Family history of malignancy	106 (90)	2 (1.9)	104 (98.1)
If yes, type of familial malignancy			
Breast cancer	1 (50)	1 (100.0)	0 (0.0)
History of previous malignancy	109 (92)	4 (3.7)	105 (96.3)
If yes, type of previous malignancy			
Cranial tumor	4 (100)	1 (25.0)	3 (75.0)
DLBCL stage IV	4 (100)	1 (25.0)	3 (75.0)
Kapsoi's sarcoma	4 (100)	1 (25.0)	3 (75.0)
MPN	4 (100)	1 (25.0)	3 (75.0)
STD infections	115 (97)	9 (7.8)	106 (92.2)
If yes, type of STD infection*			
HBV	8 (89)	7 (87.5)	1 (12.5)
HIV	8 (89)	2 (25.0)	6 (75.0)
HSV	8 (89)	5 (62.5)	3 (37.5)
Infertility	58 (49)	10 (17.2)	48 (82.8)
If yes, type of infertility			
Primary	10 (100)	8 (80.0)	2 (20.0)
Secondary	10 (100)	2 (20.0)	8 (80.0)

DLBCL, diffuse large B-cell lymphoma; MPN, myeloproliferative neoplasm; STD, sexually transmitted disease; HBV, hepatitis B virus; HIV, human immunodeficiency virus; HSV, herpes simplex virus; *multiple-response item.