ORIGINAL

Positivity of HPV based-screening test in the early detection of pre-invasive cervical lesions at Punta Gorda Polyclinic, Toledo, 2024

Positividad de la prueba de VPH y detección temprana de lesiones cervicales preinvasivas en el Policlínico de Punta Gorda, Distrito de Toledo, Belice, 2024

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RESUMEN

Introduction: Cervical cancer is highly preventable and is primarily caused by persistent infection with high-risk human papillomavirus (HPV), with HPV DNA testing serving as a key tool for early detection. **Objective:** To determine HPV test positivity and associated factors among women attending the Punta Gorda Polyclinic, Toledo District, Belize, in 2024. **Methods:** A retrospective descriptive study was conducted including 87 women who underwent HPV DNA testing as part of routine cervical cancer screening. Sociodemographic variables, risk factors, and HPV-related outcomes were analyzed using descriptive statistics and chi-square tests. **Results:** Overall HPV positivity was 64.4%, indicating a high burden of infection in the study population. HPV positivity was significantly higher among women older than 35 years ($p < 0.001$), and notable differences were observed across ethnic groups, with higher positivity among Maya women ($p = 0.013$). Genotype analysis showed a predominance of other high-risk HPV types (57.1%), followed by HPV-16 (25%) and HPV-18 (17.9%). **Conclusions:** These findings demonstrate a high prevalence of HPV infection among women screened at the primary care level. The results support the use of HPV DNA testing as a primary screening strategy and reinforce the importance of HPV vaccination programs tailored to the local epidemiological context, in line with World Health Organization goals for cervical cancer prevention.

Keywords: Human papillomavirus; HPV testing; Cervical cancer; Primary health care; Belize

ABSTRACT

Introducción: El cáncer cervicouterino es altamente prevenible y está principalmente asociado a la infección persistente por VPH de alto riesgo, siendo la prueba de ADN de VPH una herramienta clave para la detección temprana. **Objetivo:** Determinar la positividad de la prueba de VPH y los factores asociados en mujeres atendidas en el Policlínico de Punta Gorda, Distrito Toledo, Belize, durante 2024. **Métodos:** Se realizó un estudio descriptivo retrospectivo que incluyó a 87 mujeres sometidas a tamizaje con prueba de ADN de VPH. Se analizaron variables sociodemográficas, factores de riesgo y resultados del VPH mediante estadística descriptiva y pruebas de chi-cuadrado. **Resultados:** La positividad global de VPH fue de 64.4%, evidenciando una alta tasa de infección. La positividad fue significativamente mayor en mujeres mayores de 35 años ($p<0.001$) y se observaron diferencias relevantes entre grupos étnicos, con mayor positividad en mujeres mayas ($p=0.013$). En cuanto a los genotipos, predominó el grupo de otros VPH de alto riesgo (57.1%), seguido de VPH-16 (25%) y VPH-18 (17.9%). **Conclusiones:** Los hallazgos demuestran una elevada prevalencia de infección por VPH en la población estudiada. Los resultados respaldan el uso de la prueba de VPH como estrategia primaria de tamizaje y refuerzan la importancia de la vacunación, adaptadas al contexto epidemiológico local, en concordancia con los objetivos de la OMS para la prevención del cáncer cervicouterino.

Palabras clave: Virus del papiloma humano; Prueba del VPH; Cáncer cervicouterino; Atención primaria de salud; Belice

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INTRODUCTION

Cervical cancer remains one of the most preventable malignancies worldwide, yet it continues to impose a substantial burden in low- and middle-income countries. Persistent infection with high-risk human papillomavirus (HPV) is the primary etiological factor for cervical intraepithelial neoplasia and invasive cancer. Advances in molecular screening, particularly HPV DNA testing, have dramatically improved early detection of pre-invasive lesions, enabling more effective prevention strategies.[1,2]

In the past five years, emerging evidence has underscored both the performance and challenges of HPV-based screening programs in diverse contexts. For example, a study during the COVID-19 pandemic observed shifts in HPV genotype prevalence among screening populations, highlighting how disruptions to health services can affect viral transmission and detection rates.[3] Furthermore, research comparing self-sampling to clinician-collected samples found nearly perfect agreement in HPV detection, supporting the feasibility of more accessible screening modalities.[4] In community-based screening efforts, such as a pilot program in Ghana, high-risk HPV positivity reached nearly 39%, illustrating the substantial burden in under-screened populations.[5] Systematic reviews and modeling studies have also emphasized that appropriate triage and risk stratification are key to translating HPV positivity into clinically relevant outcomes, such as colposcopy or treatment.[6]

Despite these global advances, there is a critical need for context-specific data, particularly in Belize, where cervical cancer screening coverage remains limited and epidemiological data are sparse. Measuring HPV test positivity among women enrolled in early detection programs at facilities such as the Punta Gorda Polyclinic can inform local public health strategies, guide resource allocation, and improve clinical follow-up protocols. This study aims to quantify the positivity rate of HPV testing in the Punta Gorda Polyclinic, Toledo District, Belize, and assess its value for detecting pre-invasive cervical lesions in 2024.

METHODS

A retrospective descriptive study was conducted at the primary care level of the Punta Gorda Polyclinic, Toledo District, Belize, during the year 2024. The study population consisted of 237 women of reproductive age registered in the RAWA System and belonging to the catchment area of the Punta Gorda Primary Care Provider under the National Health Insurance (NHI) program. From this universe, a sample of 87 women who had undergone a high-performance HPV DNA test during routine cervical cancer screening in 2024 was selected for analysis.

Because the proportion of HPV positivity in this population was unknown, we used a conservative expected prevalence of 50%, with a 95% confidence level and 10% precision, which yielded a minimum required sample of approximately 73 participants. The final sample of 87 women exceeded this threshold and ensured adequate precision for the primary analysis.

Screening Framework

Cervical cancer screening in Belize follows national and WHO recommendations. Women aged 30–65 are screened with a high-performance HPV test every five years, while women living with HIV are screened every three years starting at age 25. Although NHI continues to provide Pap smears as part of routine screening, HPV DNA testing is the preferred modality for early detection of pre-invasive cervical lesions. Clinical guidelines also specify screening intervals for younger women, post-treatment follow-up, and exceptions for individuals with hysterectomy or compromised immune systems.

Variables

The following variables were collected from electronic and clinical records:

- Sociodemographic variables: age (continuous), ethnicity (categorized according to national standards).
- Risk factors: sexual activity, age at sexual debut, number of sexual partners, smoking status, immunocompromised status (including HIV), contraception type (if applicable), and prior cervical screening history.
- HPV-related outcomes: HPV test result (positive/negative), high-risk HPV genotype detected (e.g., HPV-16, HPV-18, or other high-risk groups), and any documented follow-up procedures.

Data Analysis

Data were anonymized and entered into a structured database. Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize participant characteristics and test outcomes. Associations between sociodemographic/risk factors and HPV positivity were evaluated using the chi-square test, with a 95% significance level ($p < 0.05$).

Ethical Considerations

The study adhered to the principles of the Declaration of Helsinki. Only de-identified secondary data from routine clinical records were used. Permission for data use was obtained from the Punta Gorda Polyclinic administration and the NHI authority. No direct contact with patients occurred, and confidentiality was ensured throughout the research process.

RESULTS

A total of 87 women attending primary health care services in Punta Gorda, Toledo District, during 2024 were included in the study. Human papillomavirus (HPV) testing was positive in 56 participants (64.4%).

Women younger than 35 years represented 40.2% of the study population. In this group, HPV positivity was observed in 33 participants (94.3%), while only 2 women (5.7%) tested negative. In contrast, women aged 35 years or older accounted for 59.8% of the sample (n = 52), with 23 HPV-positive cases (44.2%). The association between age group and HPV positivity was statistically significant ($p < 0.001$) (Table 1, Fig. 1).

Regarding ethnicity, Maya women constituted the largest subgroup (47.1%; n = 41) and showed the highest proportion of HPV positivity, with 33 positive cases (80.5%). Among Garifuna women (31.0%; n = 27), 15 tested positive (55.6%), while Creole/other ethnic groups (21.8%; n = 19) presented the lowest proportion of HPV positivity (42.1%). Differences in HPV positivity across ethnic groups were statistically significant (p = 0.013) (Table 1, Fig. 2).

Table 1. Distribution of HPV test results according to age group and ethnicity (N = 87)

Variable	Total n (%)	HPV+ n (%)	HPV– n (%)	p-value
Age group				
< 35 years	35 (40.2)	33 (94.3)	2 (5.7)	<0.001
≥ 35 years	52 (59.8)	23 (44.2)	29 (55.8)	
Ethnicity				
Maya	41 (47.1)	33 (80.5)	9 (19.5)	0.013
Garífuna	27 (31.0)	15 (55.6)	12 (44.4)	
Creole / other	19 (21.8)	8 (42.1)	11 (57.9)	

Source: BHIS

Early sexual debut (before 18 years of age) was reported by 48 women (55.2%), among whom 29 (60.4%) tested positive for HPV. Sexual intercourse without condom use was the most frequently reported risk factor (64.4%; n = 56), with 39 HPV-positive cases (69.6%). A history of two or more sexual partners was documented in 12 participants (13.8%), of whom 8 (66.7%) were HPV positive.

Smoking and immunosuppression were infrequently reported, affecting 4 (4.6%) and 5 (5.7%) participants, respectively. Among immunosuppressed women, 4 tested positive for HPV (80.0%). However, no statistically significant associations were observed between HPV positivity and any of the evaluated risk factors (χ^2 test, all p > 0.05) (Table 2, Fig. 3).

Table 2. HPV test results according to selected risk factors (N = 87)

Risk factor	Total n (%)	HPV+ n (%)	HPV– n (%)	p-value
Sexual debut <18 years	48 (55.2)	29 (60.4)	19 (39.6)	0.53
Unprotected sex	56 (64.4)	39 (69.6)	17 (30.4)	0.251
≥2 sexual partners	12 (13.8)	8 (66.7)	4 (33.3)	1
Smoking	4 (4.6)	2 (50.0)	2 (50.0)	0.936
Immunosuppression	5 (5.7)	4 (80.0)	1 (20.0)	0.786
Total	87 (100)	56 (64.4)	31 (35.6)	–

Source: BHIS

Among the 56 women with a positive HPV test, genotype distribution showed a predominance of non-16/18 high-risk or other HPV variants. HPV-16 was detected in 14 cases (25.0%), while HPV-18 was identified in 10 cases (17.9%). The remaining 32 cases (57.1%) corresponded to other HPV genotypes included in the assay panel (Table 3). Overall, HPV-16 and HPV-18 together accounted for 42.9% of all HPV-positive results, whereas non-16/18 genotypes represented more than half of detected infections.

Table 3. Distribution of HPV genotypes among HPV-positive women (N = 56)

HPV genotype	n	%
HPV-16	14	25
HPV-18	10	17.9
Other HPV genotypes	32	57.1
Total	56	100

Source: BHIS

DISCUSSION

In this cross-sectional sample from Punta Gorda, Belize, HPV positivity was high (56/87, 64.4%), with a genotype distribution dominated by non-16/18 types. The concentration of HPV positivity in women <35 years and the elevated proportions among Maya women are notable findings with immediate programmatic relevance for primary prevention and targeted screening.

Belize carries a disproportionate cervical cancer burden relative to many countries in the Region of the Americas, with national estimates indicating approximately 34 new cervical cancer cases and 25 deaths annually and a crude incidence rate around 17 per 100,000 women; these national indicators underscore the public-health significance of the present findings. The high prevalence of HPV in younger women in our sample echoes population-level observations that transmission and prevalent infections concentrate in early reproductive ages, even when genotype composition varies by setting.[7]

The predominance of non-16/18 high-risk genotypes in our HPV-positive cohort is consistent with multiple recent regional and global reports showing a growing relative contribution of non-16/18 types to overall infections and precancerous lesions, even though HPV-16 remains the genotype most strongly associated with high-grade lesions in Latin America. Data from the ESTAMPA cohort and other genotype surveys in Latin America indicate that while HPV-16 accounts for a large share of CIN2+/CIN3+ and invasive disease, non-16/18 types (including 52, 58, 51 and others) frequently predominate among cross-sectional HPV-positive samples and may represent a substantial fraction of infections detected by screening programs. This pattern has implications for risk-stratified management, since genotype-specific risk differs and non-16/18 infections may be common

but variably oncogenic.[8,9]

Age-specific differences in HPV positivity documented here, support a screening strategy that prioritizes accurate HPV detection in younger cohorts and strong linkage to triage or treatment pathways for those at highest immediate risk. Current WHO recommendations favour primary HPV testing as the preferred screening modality with age thresholds and intervals designed to balance benefits and harms; for women living with HIV the recommended starting age and interval differ, underscoring the need for locally appropriate algorithms that account for population risk and health-system capacity.[10]

Implementation and scale-up of vaccination and high-quality screening are central to cervical cancer control in Belize. Recent Belize policy actions and regional immunization efforts (including moves toward single-dose schedules and strengthened surveillance) are encouraging, but coverage gaps remain: global reporting systems and PAHO summaries document uneven HPV vaccine uptake in the Caribbean and emphasize the need to close coverage gaps to realize vaccine impact. Strengthening vaccine delivery alongside expansion of accessible HPV testing and robust referral/treatment pathways would amplify preventive gains suggested by decreasing precancer trends in other settings with high vaccine coverage.[11-13]

Finally, the Belizean health-system context, with documented limitations in workforce distribution, pathology capacity, and outreach, may blunt the impact of screening and vaccination unless programmatic bottlenecks are addressed. Qualitative and infrastructure assessments in Belize identify barriers at patient, provider, organizational and policy levels that align with the demographic and access patterns observed in this sample; therefore, targeted investments in rural outreach, diagnostic capacity and triage pathways are logical priorities.[8,14,15]

CONCLUSIONS

The high HPV positivity, particularly in women <35 years, and the predominance of non-16/18 genotypes in this sample from Punta Gorda support strengthening HPV testing, improving triage and treatment capacity, and accelerating vaccine uptake with attention to coverage equity across ethnic and geographic subgroups. These measures align with WHO elimination goals and with national capacity assessments that identify pragmatic targets for investment.

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Disclosure

The authors declare that they have no conflicts of interest.

Authorship

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- Maelemnis Pompa Olivet: Conceptualization, data curation, formal analysis, writing – review & editing.
- Sofia Lopez: Conceptualization.

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