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Translation and psychometrics of the HPV impact profile in Iranian women

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Abstract

Introduction The human papillomavirus (HPV) significantly impacts women's physical and psychological health, and there is a notable absence of specialized tools to assess its psychosocial effects comprehensively. The HPV Impact Profile (HIP) was developed to address this need. This study focuses on the translation and validation of the HIP for use among Iranian women.

Methods This methodological study was conducted among women diagnosed with HPV from May 2022 to July 2023. A total of 300 women participated by completing an online self-administered questionnaire. The HIP was translated into Persian following standardized procedures. The psychometric properties of the Persian version were evaluated through multiple validation methods: face validity (qualitative and quantitative), content validity (qualitative and quantitative), construct validity (exploratory factor analysis and confirmatory factor analysis), convergent and divergent validity, and reliability (Cronbach's alpha and McDonald's omega).

Results The original HIP consisted of 29 items. Following the translation process, the Persian version underwent rigorous psychometric validation. During the face validity assessment, no items were removed. However, during the content validity evaluation, 2 items were deleted, resulting in 27 items for further analysis. Exploratory factor analysis led to the removal of an additional 2 items, reducing the number to 25 items. Three factors were extracted, which collectively explained 81.65% of the total variance. Confirmatory factor analysis confirmed a good model fit, with all indices meeting the recommended thresholds. Reliability assessments demonstrated high internal consistency and stability, with Cronbach's alpha calculated at 0.932 and McDonald's omega at 0.996.

Conclusion The Persian version of the HIP-25 exhibits strong psychometric properties, including high validity and reliability. It is a robust tool for assessing the quality of life among Iranian women with HPV, and it can be effectively utilized in clinical and research settings to better understand and address the psychosocial impacts of HPV.

Keywords HPV, Quality of Life, Validation, Psychosocial effects

Introduction

Human papillomavirus (HPV) is a major public health concern due to its high prevalence and potential to cause cancer [1]. Reactions to a positive HPV diagnosis often include shock, fear, confusion, distress, and financial worries. The psychological burden of sexually transmitted diseases (STDs) includes self-blame, fear of disclosure, negative body image, and stigmatization by healthcare providers. Instances of seeking anonymous healthcare services or avoiding insurance highlight the significant stigma experienced by those affected [2].

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HPV's negative impact on psychosocial health, marital relations, sexual function, and quality of life (QoL) has been widely reported among patients with genital warts and HPV-related diseases [2–5]. A qualitative study indicated that an HPV diagnosis can trigger two types of reactions in women: negative affect due to STD stigma and cancer fear, and positive affect associated with lifestyle changes and safer sexual behaviors to help clear HPV. Infected women noted that regular follow-ups, safe sex practices, and spirituality helped them manage their condition [6].

Despite extensive research on HPV, few studies have used specific questionnaires to assess the psychosocial effects of HPV-related diseases. General instruments have often been used to measure anxiety, depression, self-esteem, and QoL among women with different HPV statuses [7–10]. These nonspecific measurements may not capture all essential features of HPV-related conditions. However, specific questionnaires have been developed to evaluate the psychological impacts of abnormal pap smears and cervical dysplasia [11–14]. Few studies have utilized validated questionnaires to assess the psychosocial burden of genital warts and HPV. Appropriate tools for assessing health-related QoL and the psychosocial impact of HPV are crucial for designing effective interventions to meet patient needs in clinical settings.

A recent systematic review of studies from 1995 to 2017 identified 13 tools used to assess the impact of HPV on QoL. Of these, 9 were generic tools, and 4 were specific tools: CECA-10 (Cuestionario Especifico en Condilomas Acuminados), the CSFQ (Changes in Sexual Functioning Questionnaire), the Skindex-29, the HIP (HPV Impact Profile), and the HPV-QoL questionnaire [15]. Each tool served a specific purpose. CECA (2005) focused on sexual and emotional dimensions [16], CSFQ assessed sexual changes [17], Skindex measured dermatology-specific QoL [18], and the HPV-QoL assessed the impact of HPV and related interventions on health-related QoL [19]. The HIP, developed in the US in 2009 [20], comprises 29 questions across seven domains to evaluate the psychosocial burden of HPV. It can be used in research and clinical settings to identify affected areas and improve patients' QoL. Its validity and reliability have been confirmed in Spain [21], Portugal [22], and Lebanon [23].

Understanding the characteristics of tools used to assess HPV patients' QoL is essential for their effective use in clinical settings. The HIP is designed to evaluate QoL from a psychosocial perspective in HPV carriers. This study aims to translate and psychometrically analyze the HIP questionnaire among Iranian women with HPV, marking its first validation in the Iranian language.

Methods

Study design and participants

This methodological study aimed to describe the characteristics of HPV (HIP) among Iranian women diagnosed with HPV from May 2022 to July 2023 at a laboratory reference center. Participants were women visiting the Pasteur Lab/Pathology Center in Babol, Mazandaran Province, Iran, for HPV testing. Data extracted from electronic pathology records included age, sampling date, Pap smear results, HPV infection status, and contact information. HPV diagnosis was conducted using the ABRONIKA kit and real-time PCR.

Inclusion criteria comprised all women of reproductive age diagnosed with HPV who could read and write in Persian. Exclusion criteria encompassed pregnancy, co-infection with other sexually transmitted infections, and refusal to participate. Data collection involved initial phone calls with HPV-positive samples. The researcher introduced the study, explained its objectives and procedures, and stressed the confidentiality of information. Verbal consent was obtained from participants, followed by administration of a questionnaire on individual characteristics. The HIP questionnaire was completed by participants via Porsline, accessible through the provided link (https://Survey.Porsline.Ir). The link reiterated the study's purpose and prompted participants to complete the questionnaire upon agreement. Researchers confirmed receipt of completed questionnaires and ensured data integrity.

Sample size

Sample size adequacy is a critical consideration in psychometric studies, yet there is no definitive consensus on the appropriate size, leading to various guidelines. For instance, Gorsuch suggests a minimum of 5 participants per variable and a total sample size of at least 100 individuals [24]. Others recommend ten participants per variable [25], while some propose three participants per variable [26]. Another perspective, based on correlations, indicates that a sample size of 100 to 200 respondents is generally sufficient for most purposes [27]. In this study, a total of 330 individuals was utilized to conduct construct validity [EFA ($N=150$) and CFA ($N=150$)]. Additionally, to assess stability, 30 individuals completed the questionnaire twice, with a two-week interval.

The HPV Impact Profile (HIP)

The English version of the HIP was developed and its psychometrics assessed by Mast et al. in 2009 [28]. This self-report questionnaire consists of 29 items organized into 7 dimensions: 1. worries/Concerns (e.g., "I'm worried about abnormal Pap test results"). 2. Emotional Impact (e.g., "I feel anxious when I think about my recent

gynecological exam or test results"). 3. Sexual Influence (e.g., "After my recent gynecological examination or test results, I have less sex"). 4. Self-Image (e.g., "When I look at the results of my recent gynecological examination or test results, I feel that my body is sexually attractive"). 5. Partner/Transmission (e.g., "After my recent gynecological examination or test results, I am worried that sex with my partner may cause him to get an infection"). 6. Interaction with Doctors (e.g., "I felt that my recent gynecological examination process was embarrassing"). 7. Health Control/Life Impact (e.g., "After my recent gynecological examination or test results, I feel able to focus on everyday matters as usual"). According to previous studies [21, 22], responses are measured on a Likert scale ranging from 0 (Not at all) to 10 (Excellent). Each dimension score is calculated by summing the scores of its respective questions and dividing by the number of questions in that dimension. Similarly, the total score is calculated by summing all item scores and dividing by the total number of items. Higher scores indicate a greater psychosocial impact of HPV.

Psychometric procedure

This study included 330 women diagnosed with HPV and was structured into two main stages: 1) the translation phase of the tool, and 2) the quantitative stage focused on assessing the psychometric properties of the profile.

Translation process

Regarding the translation process, the English version of the HIP comprises 29 items across 7 dimensions. In this study, the initial step involved securing permission from the HIP's original designer. Subsequently, the Persian version of the profile was developed following the standard protocol outlined by the World Health Organization (http://www.who.int/substance_abuse/research_tools/translation/en). The translation process utilized the forward–backward method, where two bilingual individuals proficient in both English and Persian, and knowledgeable about the research, independently translated the tool into Persian. These two translations were then synthesized by the research team into a single Persian version. Any discrepancies between the translations were resolved through discussions and consensus among the translators, considering various word and term equivalencies, to achieve a cohesive Persian version of the questionnaire. Regarding the translation process, the English version of the HIP consists of 29 items across 7.

Psychometric properties

During this phase, the evaluation of the psychometric properties of the Persian version of the HIP was conducted. This assessment included a thorough analysis of several aspects:

- Face validity, assessed both qualitatively and quantitatively.
- Content validity, evaluated through both qualitative and quantitative methods.
- Construct validity.
- Reliability.

Face validity

Face validity was evaluated using both qualitative and quantitative methodologies. For the qualitative approach, the profile was distributed to 15 individuals diagnosed with HPV, who provided feedback on the items' difficulty, relevance, and clarity. Suggestions for item modifications were incorporated based on their feedback. In the quantitative method, the same group of 15 HPV patients involved in the qualitative assessment was asked to rate the importance of each item. They used a scoring system where 5 = extremely important, 4 = moderately important, 3 = somewhat important, 2 = slightly important, and 1 = not important at all. The impact score for each item was then calculated using a specified formula. Items with a minimum impact score of 1.5 were retained [29].

$$\text{Impact Score} = \text{Frequency (\%)} \times \text{Importance}$$

Frequency (%): The number of individuals who assigned scores of 4 and 5 to the items.

Importance: The mean importance score based on the Likert scale.

Content validity

The content validity of the Persian version of HIP was assessed using both qualitative and quantitative methods. In the qualitative approach, the profile was reviewed by 15 experts in midwifery, who had experience in translating and evaluating psychometric instruments. They assessed the profile for grammar, wording, item allocation, and scaling, and provided feedback leading to specific item revisions. In the quantitative method, Content Validity Ratio (CVR) was calculated. The same 15 experts rated the necessity of each item on a 3-point Likert scale (1 = not necessary, 2 = useful but not necessary, 3 = necessary). CVR was computed using the formula [ne – (N/2)]/(N/2), where "ne" is the number of experts who rated the item as 3 (necessary), and "N" is the total number of experts. The minimum acceptable CVR value was determined based on the Lawshe Table [30], employing a strict method that considered only necessary items.

Table 1. Sociodemographic and clinical characteristics of the participants with mean score of HIP (*N*=300)

Demographic characteristics		Frequency (percent)	Mean HIP ± (SD)	MD(95%CI)	*P* value
Age	> 30	188 (62.7)	69.44 ± 14.37	1.12 (-2.21 to 4.47)	0.507
	30 ≤	112 (37.3)	68.31 ± 14.01		
Marital status	Single	(48) 144	68.82 ± 14.55	-0.37 (-3.61 to 2.86)	0.821
	Married	(52) 156	69.19 ± 13.95		
Occupation	Unemployed	(64) 192	68.35 ± 14.54	1.71 (-5.20 to 1.53)	0.284
	employed	(36) 108	70.19 ± 13.62		
Residence place	Urban	(86.7) 260	69.15 ± 14.26	1.00 (2.42 to -3.76)	0.679
	Rural	(13.3) 40	68.15 ± 14.10		
Education level	≤ diploma	(43) 129	67.85 ± 13.92	-2.04 (-5.30 to 1.21)	0.218
	> diploma	(57) 171	69.90 ± 14.42		
Type of HPV	Low-risk	(68.7) 206	69.36 ± 13.94	1.11 (-2.37 to 4.60)	0.530
	High-risk	(31.3) 94	68.25 ± 14.86		

SD Standard Deviation, *MD* Mean Difference, *HIP* HPV Impact Profile, *CI* Confidence Interval

Subsequently, the Content Validity Index (CVI) was calculated for the items. The same 15 experts assessed the items using a Likert scale ranging from "completely relevant" to "irrelevant." A minimum CVI value of 0.78 was set as the threshold for excellence, as per Polit et al. (2007), involving at least 6 experts [31]. Furthermore, the study computed the Scale-level Content Validity Index (S-CVI/UA) and Average Content Validity Index (S-CVI/Ave), aiming for minimum acceptable values of 0.8 and 0.9, respectively [32, 33].

Item analysis

Before assessing construct validity, an item analysis was conducted to identify any potential issues with the items. This analysis focused on calculating the corrected item-total correlation for each item. Items with correlation coefficients less than 0.32 or greater than 0.9 were flagged for potential deletion, based on established criteria [34].

Construct validity

During this phase, a descriptive cross-sectional study was conducted with a sample of 300 individuals diagnosed with HPV, recruited from the Women's Clinic of Rohani Hospital in Babol using convenience sampling. Data collection included demographic and clinical variables such as age, gender, education level, marital status, place of residence, type of HPV, and responses to the Persian version of the HIP questionnaire.

The construct validity of the Persian version of HIP was evaluated through both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). EFA utilized the Maximum Likelihood method with Promax rotation [35]. The adequacy of the sample was assessed using the Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test, with a KMO value above 0.7 considered acceptable [36]. Factors were extracted based on Eigenvalues and the Scree Plot, retaining factors with Eigenvalues greater than 1 [37, 38]. Items were assigned to factors based on a minimum factor loading criterion determined by the formula $CV = 5.152 \div \sqrt{(n-2)}$, where CV represents the minimum factor loading and n is the sample size. Items with communalities below 0.2 were excluded from EFA [36].

For confirmatory factor analysis, the maximum-likelihood method was used, evaluating model fitness with several goodness-of-fit indices. Acceptable model fit criteria included root mean square error of approximation (RMSEA) < 0.08, chi-square ($\chi 2$) test, chi-square/degrees of freedom ratio ($\chi 2/df$) < 3.0, goodness-of-fit index (GFI) > 0.9, parsimonious comparative fit index (PCFI) > 0.5, and adjusted goodness-of-fit index (AGFI) > 0.8 [36, 39]. Additionally, incremental fit index (IFI) > 0.9 indicated acceptable model fit, with values > 0.8 for GFI and IFI also considered acceptable. Items with standardized factor loadings below 0.5 were excluded from the CFA model [36].

Convergent and divergent validity

The convergent and divergent validity of the Persian version of HIP were assessed using Fornell and Larcker's approach [40]. Convergent validity was established if (a) the Average Variance Extracted (AVE) was greater than 0.5, and (b) the Composite Reliability (CR) exceeded 0.7. For discriminant validity, it was ensured that the Maximum Shared Squared Variance (MSV) for each construct was less than its AVE [41]. This criterion helps to differentiate between constructs, ensuring that each factor

Table 2 Results of exploratory factor analysis (EFA) for Persian version of HIP

Factors	Item	Factor loading	h2*	M ± SD	Skew (kurtosis)	λ**	%variance
Worries and emotions related to reproductive health	I am worried about having pain during future gynecologist visits	0.993	0.527	37.44 ± 10.07	−0.407(−0.594)	8.85	35.40%
	I felt my recent gynecology procedures were embarrassing	0.808	0.54				
	When I think about my recent gynecology exam or test results, I feel ashamed	0.771	0.543				
	After my recent gynecological exam or test results, the quality of my sleep has decreased	0.764	0.459				
	I felt disgusted by my recent gynecology exam or test results	0.664	0.628				
	When I think about my recent gynecology exam or test results, I feel anxious	0.649	0.569				
	I am worried about having abnormal Pap test results	0.644	0.639				
	I feel concerned about having genital warts	0.641	0.643				
	I feel my recent gynecology test results were unexpected	0.605	0.278				
	I am worried there are no treatments to cure genital warts	0.577	0.644				
	I am concerned I will get cervical cancer in the future	0.562	0.612				
	When I think about my recent gynecology exam or test results, I feel angry	0.553	0.591				
	When I think about my recent gynecology exam or test results, I feel good about myself	0.55	0.54				
	When I think about my recent gynecology exam or test results, I feel depressed	0.534	0.561				
Psychological Effects of Positive Test Results	I am worried that there is no treatments to cure cervical cancer	0.872	0.631	9.55 ± 3.00	0.257(−0.518)	6.445	25.78%
	After my recent gynecology exam or test results, I am having less sex	0.692	0.342				
	After my recent gynecological exam or test results, the quality of my sleep has decreased	0.626	0.368				
	I am worried about having abnormal Pap test results	0.439	0.578				

Table 2 (continued)

Factors	Item	Factor loading	h2*	M ± SD	Skew (kurtosis)	λ**	%variance
Self-Control After Positive Test Results	When I think about my recent gynecology exam or test results, I feel in control of my health	0.738	0.507	22.01 ± 3.83	−0.922(1.395)	5.118	20.47%
	After my recent gynecology exam or test results, I feel I can concentrate as well as usual on everyday matters	0.737	0.494				
	When I think about my recent gynecology exam or test results, I feel my body is sexually attractive	0.716	0.463				
	After my recent gynecology exam or test results, I feel optimistic about my future gynecological health	0.639	0.445				
	After my recent gynecological exam or test results, I feel satisfied with my sex life	0.59	0.387				
	After my recent gynecology exam or test results, I feel confident my partner will accept me	0.536	0.264				
	When I think about my recent gynecology exam or test results, I feel good about myself	0.532	0.301				

h2*: Communalities; λ** = Eigenvalue

represents a distinct aspect of the measurement model without overlap.

Reliability

Reliability of the Persian version of HIP was evaluated using both internal consistency and stability methods. Internal consistency was assessed using Cronbach's alpha (α), McDonald's omega (Ω), and average inter-item correlation (AIC) indices. Values greater than 0.7 for α and Ω, and AIC values ranging from 0.2 to 0.4 or higher, were considered indicative of good internal consistency [42]. Absolute reliability was evaluated through the standard error of measurement (SEM) formula: SEM = Pooled SD × $\sqrt{(1 - ICC)}$, where ICC is the Intraclass Correlation Coefficient reflecting stability over time [36].

For responsiveness assessment, minimal detectable change (MDC) and minimal important change (MIC) were calculated. MDC95% was determined using the formula: MDC95% = SEM × $\sqrt{2}$ × 1.96, indicating the smallest change that can be detected with 95% confidence. MIC was computed as MIC = 0.5 × SD of the Δ score, providing insight into the smallest change considered important by patients or clinicians. If MIC is smaller than MDC, the index is deemed responsive. Interpretability was examined for ceiling effect, floor effect, and MDC to gauge how easily scores can reach extreme values and the smallest change detectable by the measurement [34].

Ceiling and floor effect

The presence of ceiling and floor effects in a scale indicates that items representing the maximum and minimum intensity of the phenomenon may not be adequately included. Specifically, ceiling and floor effects are identified when 15% or more of the scores reach the maximum or minimum limit. This suggests that a significant portion of participants' responses are clustered at either extreme of the scale, indicating limited variability in responses and potentially impacting the scale's sensitivity to detect changes or differences across the spectrum of the phenomenon under study [43].

Scoring

In the Persian version of the HIP, a Likert scale was employed for responding to the items. In the final version of the index, a standardization method with a scale of 0 to 100 was used for scoring and comparing scores across the various dimensions of the index. To convert subscale

and total scores to a scale of 0 to 100, the following linear transformation formula was utilized [34]:

$$\text{transformed score} = \frac{\text{actual raw score} - \text{lowest possible raw score}}{\text{possible raw score range}} \times 100$$

Multivariate normality and outliers

Skewness (±3) and kurtosis (±7) were critical measures used to assess several aspects including normal distribution, outliers, missing data, and the individual characteristics of both univariate and multivariate data distributions [44]. Additionally, Mahalanobis d-squared ($P<0.001$) was applied to detect multivariate outliers, while the Mardia coefficient of multivariate kurtosis (<8) was utilized to evaluate multivariate normality [45]. These statistical techniques were essential for evaluating data quality, identifying anomalies, and ensuring the appropriateness of the data for further analysis.

Data analysis

Data were entered in SPSS 27 software. In order to check the construct validity of the Persian version of HIP,

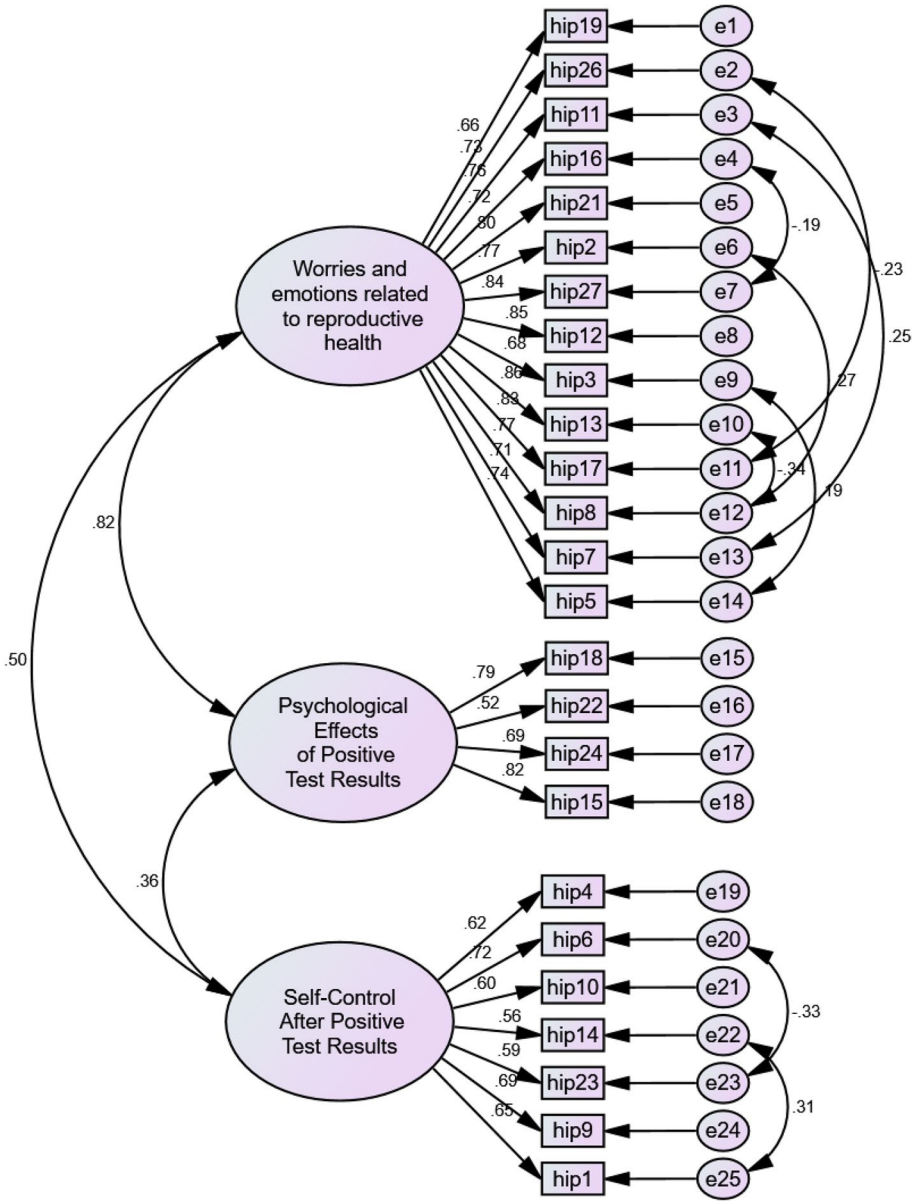

Fig. 1 The CFA of the Persian version of the HIP

Table 3 Fit model indices of the CFA of the Persian version of the HIP

Indices model	χ^2	df	*p* value	χ^2/ df	RMSEA	PCLOSE	PCFI	AGFI	GFI	IFI
CFA model	270.325	208	0.002	1.300	0.037	0.966	0.577	0.846	0.902	0.868

χ^2 chi-square, χ^2/ *df* chi-square/degree-of-freedom ratio, *RMSEA* root mean square of error of approximation, *PCLOSE* for close fit of the population RMSEA, *PCFI* parsimonious comparative fit index, *AGFI* adjusted goodness-of-fit index, *GFI* goodness-of-fit index, *IFI* incremental fit index

exploratory factor analysis with maximum likelihood method was used. The same software was also used to calculate McDonald's omega coefficient and Cronbach's alpha. Furthermore, AMOS version 24 was employed for examining CFA in this study.

Ethical considerations

The Ethics Committee of Babol University of Medical Sciences approved this research proposal (IR.MUBABOL.REC.1400.160). All participants signed the written consent form and the rights of the participants were preserved (all data were kept anonymous and confidential).

Results

In this study, 300 HPV patients participated, with a mean age of 29.13 years (± 5.55) (Table 1.).

Item reduction

Face validity

The qualitative method resulted in revisions to the wording of statements based on expert recommendations. In the quantitative face validity phase, all item scores exceeded 1.5.

Content validity

In the qualitative content validity assessment, items were revised based on experts' feedback. During the quantitative phase of content validity, 2 items were excluded from the study as their CVR was below 0.49. The remaining 27 items showed a CVI of ≥ 0.78 and a Kappa of ≥ 0.75, confirming their retention in the study.

Construct validity

Before conducting construct validity, a content analysis was performed, resulting in the removal of one item due to a correlation below 0.32. This left 26 items for the construct validity assessment. Exploratory factor analysis began with the Kaiser–Meyer–Olkin (KMO) test to assess sample adequacy, yielding an index of 0.932. Bartlett's test of sphericity (df = 300, $p = 0.0E0$, $x^{\wedge 2} = 3998.075$) confirmed significant correlations between variables, validating the sample size. Three factors were extracted based on eigenvalues greater than one and the scree plot.

Items with factor loadings ≤ 0.3, communalities < 0.2, and cross-loadings were excluded, resulting in 25 items remaining after the structural validity phase. These 3 factors collectively explained 81.65% of the variance and were labeled as follows: worries and emotions related to reproductive health (Factor 1), psychological effects of positive test results (Factor 2), and self-control after positive test results (Factor 3), as agreed by the research team. Table 2 presents the results of construct validity and variance explained by each factor. Subsequently, confirmatory factor analysis (CFA) validated the construct validity of the model, with indices falling within acceptable ranges (Fig. 1 & Table 3). AVE, MSV, and CR results confirmed convergent validity across all factors, with discriminant validity established for Factor 3 (see Table 4).

Table 4 The indices of convergent and discriminate validity

Factors	CR	AVE	MSV
Worries and emotions related to reproductive health	0.953	0.590	0.645
Psychological Effects of Positive Test Results	.803	0.511	0.645
Self-Control After Positive Test Results	0.826	0.400	0.250

CR Composite Reliability, *AVE* Average Variance Extracted, *MSV* Maximum Shared Squared Variance

Reliability

The stability of the profile was confirmed robust based on the results of the Intraclass Correlation Coefficient (ICC). Absolute reliability was assessed with a SEM of 0.900, indicating that the index score can vary by approximately ± 0.900 in repeated measurements of an individual variable. Regarding responsiveness, both the Minimal Detectable Change (MDC), Minimal Important Change (MIC), and the absence of ceiling and floor effects were examined. Notably, a floor effect of 0% and a ceiling effect of 1.3% were observed, indicating that the index is free from these biases and is interpretable (Table 5).

Scoring

The final version of the Persian HIP comprises 25 items grouped into 3 factors. These items are rated using a 4-option Likert scale. The index score ranges from a minimum of 25 to a maximum of 100. Items in the first and second factors are directly scored (Low = 1, Moderate = 2,

Table 5 Descriptive statistics and reliability measures for the Persian version of HIP factors ($n=300$)

Factors	ICC	CI95%	*P* Value	Ω	α	AIC	SEM	MDC	MIC
Worries and emotions related to reproductive health	0.993	0.985 to 0.997	0.001 >	0.938	0.937	0.516	0.842	2.335	0.520
Psychological Effects of Positive Test Results	0.949	0.892 to 0.976	0.001 >	0.775	0.772	0.458	0.678	1.879	0.3592
Self-Control After Positive Test Results	0.996	0.992 to 0.998	0.001 >	0.821	0.821	0.395	0.242	0.671	0.371
Total	0.996	0.992 to 0.998	0.001 >	0.933	0.932	0.345	0.900	2.495	0.708

ICC Intraclass correlation coefficient, *Ω* McDonald's omega, *α* Cronbach's alpha, *AIC* average inter-item correlation, *SEM* standard error of measurement, *MDC* minimal detectable change, *MIC* minimal important change

High = 3, Very High = 4), whereas items in the third factor are inversely scored (Low = 4, Moderate = 3, High = 2, Very High = 1). The index score is calculated linearly and spans from 0 to 100. A lower score indicates a lesser impact of HPV, while a higher score indicates a greater impact on the affected individual.

Discussion

In this study, the HIP questionnaire was translated and psychometrically analyzed among Iranian women diagnosed with HPV. The Iranian version of the HIP included 25 items across three domains, each showing appropriate adjustment indicators. These domains were categorized as follows: worries and emotions related to reproductive health (Factor 1), psychological effects of positive test results (Factor 2), and self-control after positive test results (Factor 3). It is noteworthy that the original version of the HIP consisted of 29 items distributed across 7 domains, which included 'worries and concerns', 'emotional impact', 'sexual influence', 'self-image', 'partner/transmission concerns', 'interaction with doctors', and 'health control/life impact' [28].

The present study employed EFA and CFA to evaluate the factor structure validity of the HIP questionnaire among Iranian women with HPV. During in the psychometric stages of the tool, 4 items were removed due to low factor loadings, resulting in the identification of 3 subscales within the HIP questionnaire through EFA. Therefore, when using a tool, there may be changes in the number of its items. In the exploratory and confirmatory factor analysis for the Spanish version of the Human Papilloma Virus Impact Profile (HIP) showed a seven-factor structure but Only two items (1 and 10) had low factor loads and were removed from the confirmatory analysis [21]. The cultural adaptation of a specific tool to be used in society must be modified according to the characteristics of the target society in order to be localized. Therefore, when using a tool, there may be changes in the number of its items.

Previous research has consistently highlighted the negative impact of a positive HPV test on worries and emotions related to reproductive health [46–48]. However, a systematic review concluded that more research is needed to understand the psychological effects of a positive HPV test due to existing uncertainties [49].

To assess the internal consistency of the questionnaire, Cronbach's alpha coefficient was calculated [50]. Cronbach's alpha measures the extent to which all items in a scale measure the same construct, with values ranging from 0 to 1. The worries and emotions related to reproductive health subscale displayed the highest internal consistency with a Cronbach's alpha of 0.937, while the psychological effects of positive test results had a slightly lower alpha value of 0.772. Overall, the Content Validity Index for HIP-25 was 0.78, with a Kappa value of ≥ 0.75, indicating satisfactory content validity [51]. Additionally, the ICC for all subscales was ≥ 0.9, indicating excellent stability [52]. Furthermore, all subscales and the entire questionnaire demonstrated good internal consistency with Cronbach's alpha coefficients exceeding 0.77 [53]. For descriptive studies, a Cronbach's alpha ≥ 0.6 is generally considered acceptable [54]. In this study, test–retest analysis involving 30 women diagnosed with HPV showed a high level of stability, as indicated by the Intraclass Correlation Coefficient (ICC) results falling within the substantial to almost perfect range (0.61–1) [55].

The researchers concluded that the final Persian version of the HIP demonstrates robust psychometric properties, making it suitable for use in clinical trials and for assessing the quality of life among women with HPV. The study highlighted the profound impact of HPV infection on quality of life, noting associations with genital warts that lead to significant psychological effects and feelings of shame. Literature reviews consistently underscored the substantial psychosocial, economic, and health burdens associated with HPV-related diseases, including anxiety, stress, and sexual dysfunction [8, 19, 56–58]. However, it is important to acknowledge the limitations of the current study. The use of a convenience sample recruited from a gynecology clinic means that the findings may not generalize to the entire population of females with HPV infection. Therefore, the results of this study may not directly apply to individuals with HPV who have not sought treatment at healthcare facilities. It is notably that the sample size utilized is small. The another limitation of

this study was imprecise answering to HIP items by some participants as well as their sociocultural wide diversity.

Conclusion

In conclusion, the Persian HIP-25 questionnaire has proven to be not only a robust tool but also a sensitive one for assessing the quality of life in women dealing with HPV. Its simplicity, combined with strong validity and reliability indicators, makes it highly suitable for clinical use and research applications. By incorporating necessary cultural adjustments, this questionnaire has the potential to transcend its current scope and be adapted for diverse populations and settings worldwide. Its ability to capture nuanced aspects of psychological and emotional impacts underscores its significance in understanding and addressing the broader implications of HPV infection beyond medical parameters alone.

Abbreviations

HPV	Human papilloma virus\
QoL	Quality of life
STDs	Sexual transmitted diseases
HIP	HPV Impact Profile
CECA-10	Cuestionario Especifico en Condilomas Acuminados
CSFQ	Changes in Sexual Functioning Questionnaire
CVR	Content Validity Ratio
CVI	Content Validity Index
EFA	Exploratory factor analysis
CFA	Confirmatory factor analysis
KMO	Kaiser-Meyer-Olkin
RMSEA	Root mean square of error of approximation
GFI	Goodness-of-fit index
IFI	Incremental fit index
PCFI	Parsimonious comparative fit index
AGFI	Adjusted goodness-of-fit index
MSV	Maximum Shared Squared Variance
CR	Composite Reliability
AVE	Average Variance Extracted
SEM	Standard error of measurement
MDC	Minimal detectable change
MIC	Minimal important change
AIC	Average inter-item correlation
ICC	Intraclass Correlation Coefficient

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Code availability

Not applicable.

Authors' contributions

AB and FNA, contributed to study design, execution, analysis, manu¬script drafting, and critical discussion. SR analyzed the data and prepared the manuscript. ES reviewed the literature and data collection. All authors read and approved the final manuscript.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

All study was performed in accordance with relevant guidelines and regulations (Declaration of Helsinki)", Participants were provided with comprehensive information about the study through both verbal communication and written documentation. A study nurse approached eligible patients consecutively, delivering detailed information about the study and securing written informed consent from those willing to participate. It is noteworthy that all collected data were kept anonymous and confidential. All methodologies were conducted in strict accordance with the pertinent guidelines and regulations. This research project was reviewed in Health Research Institute—Babol University of Medical Sciences and approved with the ethics ID IR.MUBABOL.REC.1400.160.

Written consent was obtained from the participants while maintaining the confidentiality.

Consent for publication

All authors consent for publication.

Competing interests

The authors declare no competing interests.

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