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Original Article

Translation and psychometric evaluation of an instrument to assess the health beliefs of Pakistani mothers regarding human papillomavirus vaccination

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ABSTRACT

Objective: Investigating mothers' health beliefs regarding human papillomavirus (HPV) vaccination is essential for understanding their decisions regarding vaccinating their daughters against HPV. There is no available validated instrument to measure the health beliefs of Pakistani mothers regarding HPV vaccination for their daughters. The purpose of this study was to translate the Human Papillomavirus Vaccination Scale – Health Belief Model (HPVS-HBM) into Urdu and to evaluate the psychometric properties of the translated Urdu version among Pakistani mothers in Hong Kong.

Methods: This was a descriptive correlational study for which a convenience sample of 260 Pakistani women was recruited. The original HPVS-HBM questionnaire was translated from English to Urdu according to Brislin's model. A panel of experts reviewed the translated questionnaire and assessed the content validity of the items and the scale. Face validity was assessed in a sample of five Pakistani mothers, while structural validity was examined by an exploratory factor analysis. Internal consistency and test–retest reliability were assessed to evaluate the reliability of the translated instrument.

Results: The translated questionnaire demonstrated good face validity and content validity (item-level content validity index: 0.83–1.00; scale-level content validity index: 0.89–1.00). Factor analysis of the 22 items in the scale revealed a three-factor structure (perceived susceptibility, perceived severity and perceived benefits), which accounted for 77.66% of the total variance. The translated questionnaire also showed good internal consistency (Cronbach's alpha: 0.93–0.98) and acceptable test–retest reliability (weighted kappa: 0.49–0.96; intra-class correlation coefficient: 0.83–0.93).

Conclusions: The translated Urdu version of the HPVS-HBM demonstrated desirable psychometric properties, indicating that it could be used as a valid and reliable instrument for measuring Pakistani mothers' health beliefs regarding HPV vaccination for their daughters in Hong Kong.

Introduction

Human papillomavirus (HPV) infection is the most prevalent reproductive tract infection, accounting for the majority of cervical cancer cases.[1] According to the World Health Organization (WHO),[1] cervical cancer was the fourth most common cancer among women worldwide, accounting for 342,000 deaths in 2020. HPV vaccination is safe and the most cost-effective public health measure against HPV infection and cervical cancer.[1] In Hong Kong, HPV vaccination has been approved for use in girls aged 9 or above since 2006. Up to 2021, HPV vaccine uptake among adolescent girls was lower in Hong Kong (25%)[2] than in Australia, Canada, Ireland, the United Kingdom (UK), and the United States (US) (66%, 87%, 71%, 59% and 48%, respectively).[3] HPV vaccine uptake in Hong Kong is even substantially lower than the WHO-recommended full vaccination rate of 90% of girls by the age of 15 to eliminate cervical cancer.[4]

Ethnic disparities in HPV vaccine uptake are a global phenomenon. Previous studies have consistently reported that HPV vaccine uptake was lower among adolescent girls of ethnic minorities (EMs) than among their local counterparts.[5–9] There is a dearth of local studies investigating HPV vaccine uptake among EM adolescent girls in Hong Kong. Among the various EMs in Hong Kong, further investigation of HPV vaccine uptake in the Pakistani EM group is needed for the following reasons: First, the population of Pakistani migrants has significantly increased in recent years.

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Pakistan is one of the top 10 emigration countries in the world.[10] In 2022, over 40% of all international migrants were born in Asia, with nearly 20% originating from six Asian countries, including Pakistan.[11] The top three destination regions of Pakistani migrants are the Middle East, Asia, and Europe.[10] The number of Pakistani migrants in Hong Kong has increased rapidly by 35%, from 18,042 in 2011 to 24,358 in 2021,[12] making this group one of the largest EM communities in Hong Kong. It is essential to address the health needs of the Pakistani EM group as the numbers of Pakistani migrants continue to grow both locally and internationally. Second, the Pakistani EM population is at a disadvantage when accessing health services. Studies have highlighted that Pakistani EM women face barriers to HPV vaccine uptake, including low HPV vaccine awareness, sex-related concerns, and a perception that vaccination is unnecessary due to their Muslim beliefs.[7,9,13,14] Local researchers in Hong Kong have also detected a lower uptake of preventive health services among South Asian EMs, including the Pakistani EM population, than among the local population.[15] The barriers to accessing HPV vaccination services faced by the Pakistani EM group and the growing size of this population mean that the risk of cervical cancer is increasing in this population, which in turn increases the burden on the health care system.

To identify strategies to improve HPV vaccine uptake among Pakistani adolescent girls, it is essential to understand the health beliefs of their parents. Parents play a major role in decision-making regarding HPV vaccination for adolescents, with mothers' health beliefs shown to be particularly strongly associated with HPV vaccine uptake among adolescent girls.[14,16–19] Hence, understanding mothers' health beliefs is essential for improving HPV vaccine uptake among adolescent girls. Studies have revealed that South Asian women, including Pakistani women, have distinct health beliefs, such as beliefs about cancer and vaccination.[20–22] Therefore, examining the health beliefs of Pakistani EM women is crucial.

Health beliefs regarding HPV vaccination can be assessed using the Health Belief Model (HBM), which is widely used to predict preventive health behaviours according to five constructs: perceived susceptibility to a disease, perceived severity of a disease, perceived benefits of a health behaviour, perceived barriers to a health behaviour and cues to action.[23] To date, no translated and validated instrument is available for measuring the health beliefs of Pakistani EM mothers in Hong Kong. Several HBM-guided instruments are available for measuring health beliefs regarding HPV vaccination.[24–27] However, some of them do not measure all of the HBM-related belief constructs, whereas others contain items not conceptually relevant to the corresponding constructs. Therefore, an instrument, namely the Human Papillomavirus Vaccination Scale–Health Belief Model (HPVS-HBM), was adopted in this study as it is a well-structured instrument that measures all five of the HBM constructs and only comprises relevant items designed for measuring the corresponding constructs. The HPVS-HBM is a 26-item scale adapted from a study by Gerend and Shepherd[28] and has been used to measure health beliefs regarding HPV vaccination among young adult women in the US using all the five HBM constructs of perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action. The subscales of this instrument have demonstrated good reliability in the abovementioned US population.[28] The purpose of this study was to translate the HPVS-HBM into Urdu and evaluate the psychometric properties of the Urdu version (HPVS-HBM-U) among Pakistani EM mothers in Hong Kong.

Methods

Study setting and participants

This was a non-experimental, descriptive and correlational study. The inclusion criteria for participants were as follows: Pakistani women who (1) were currently living in Hong Kong; (2) had at least one daughter aged between 9 and 17 years; (3) were aged 18 or above; and (4) were able to communicate in English or Urdu. Women diagnosed with psychiatric illnesses were excluded. The participants were recruited from a variety of settings, including local EM organisations, non-governmental organisations (NGOs), community centres and mosques. Convenience sampling was performed to facilitate the recruitment of eligible participants. Eligible participants were also encouraged to refer potential participants of their acquaintances.

The sample size to examine the structural validity of the HPVS-HBM by factor analysis was determined according to the commonly adopted rule of thumb of '10 subjects per item' for the sample size requirement for factor analysis.[29] Accordingly, a sample of 260 was deemed to be adequate for the factor analysis of the 26-item HPVS-HBM.

Study instrument

A self-reported questionnaire comprising two sections was developed. The first section collected sociodemographic information, including age, monthly household income, marital status, place of birth, duration of residence in Hong Kong, religion, age of the daughter, availability of health insurance for the daughter, self-history and family history of cervical or genital diseases, awareness of HPV and HPV vaccination, sources and trusted sources of HPV vaccine information, and uptake of cervical cancer screening and health check-ups. The second section was the HPVS-HBM, a 26-item scale developed by Gerend and Shepherd[28] that uses HBM constructs to measure health beliefs regarding HPV vaccination among young adult women. It consists of six subscales: perceived susceptibility (beliefs about the risk of contracting the disease), perceived severity (beliefs about the seriousness of the disease), perceived benefits (beliefs about the efficacy of the health behaviour in lowering the risk of contracting the disease or the seriousness of the disease), perceived barriers-cost (perceived negative aspects of a health action in relation to financial cost), perceived barriers-safety concerns (perceived negative aspects of a health action in relation to concerns about the safety of the health action) and cues to action (the trigger of a health action). Unless otherwise specified, the items were rated by the participants on a 7-point Likert scale (from 1 'strongly disagree' to 7 'strongly agree'). As the target participants of the current study were mothers of adolescent girls, the subjects of all of the items on the original scales were changed from young women to mothers of adolescent girls. The perceived susceptibility subscale consisted of nine items to assess the participants' anticipated risk of their daughters contracting HPV infection, cervical cancer and genital warts. Cronbach's alpha for this subscale was 0.94. The perceived severity subscale consisted of nine items to assess the participants' anticipated severity of the consequences of their daughters contracting HPV-related diseases and cervical cancer. Cronbach's alpha for this subscale was 0.91. The perceived benefits subscale consisted of four items assessing the participants' beliefs about the efficacy of the HPV vaccine in reducing their daughters' risk of getting an HPV infection, cervical cancer, genital warts or having an abnormal Pap test. Cronbach's alpha for this subscale was 0.88. The perceived barrier-cost subscale was measured by a single item: 'How much would the following factors prevent you from getting your daughter vaccinated for HPV? If the vaccine costs too much.' The perceived barrier-safety concern subscale consisted of two items asking for agreement on whether concerns about vaccine side effects and vaccine safety would prevent the participants from having their daughters vaccinated against HPV. Cronbach's alpha for the safety concern subscale was 0.87. The cues to action subscale was assessed by a single item: 'Has a physician, health care provider or clinic recommended that you vaccinate your daughter against HPV?' The scores of each subscale were calculated by summing the items in each construct. A higher score indicated a higher level of the concepts measured by the subscales.

The psychometric evaluation of the HPVS-HBM-U was conducted in two phases: (1) translation and content validity evaluation; and (2) psychometric property evaluation.

Phase I: Translation and content validity evaluation

Translation of the Papillomavirus Vaccination Scale-Health Belief Model

Brislin's model[30] was adopted to translate the instrument from English to Urdu. The original instrument was first independently translated by a bilingual health care expert from English to Urdu. Then, it was back-translated to English by a second independent bilingual professional translator with a Master's degree in English linguistics. The principal investigator then compared the original and back-translated versions to ensure content equivalence. No major discrepancies in the concepts between the translated and original versions were detected. A minor discrepancy was found in the translation of the wording of 'genital wart' as there is no such medical term in Urdu. After a discussion among the researcher and translators, the literally translated version of the word obtained from forward translation was used.

Content validity and face validity evaluation

Content validity was evaluated to determine the appropriateness and relevance of the instrument. A panel was formed, comprising five medical or nursing experts who were bilingual in English and Urdu. The experts were invited to directly compare the original and translated instruments and to rate each of the 26 items in the translated instrument in terms of clarity of wording, item relevance to the construct and appropriateness for the target participants on a 4-point scale (1 = not at all relevant; 2 = somewhat relevant; 3 = relevant; 4 = very relevant). They were also invited to comment and advise on the modification of the items being rated with 1 or 2, based on which the items were revised. The panel was invited again to review the revised items for relevance and appropriateness.[31]

Face validity was used to determine whether the instrument looked like what it was measuring and to predict the participants' willingness to complete the questionnaire.[31] Five Pakistani mothers were invited to provide their opinions on the relevance of the items to the subscales, the cultural relevance of the items, the clarity of the contents, their ease in answering the questions and the time spent in completing the questionnaire.

Phase II: Psychometric property evaluation of the Papillomavirus Vaccination Scale-Health Belief Model

A sample of the target population was recruited to evaluate the psychometric properties of the translated version to ensure reliability and validity. Reliability was assessed by internal consistency and test–retest reliability, the latter of which was evaluated by administering a survey to a sample of 20 participants twice at a 2-week interval and comparing the results.[31] Exploratory factor analysis (EFA) was conducted to examine the structural validity of the translated instrument.[31]

Data collection procedure

Ethical approval was sought from the ethics committee of the study institution. The contact persons of the stated study settings were contacted by the researcher. Help in recruiting participants was sought from the contact persons and social workers after explaining the study details. Information sheets stating the purpose, nature and procedure of the study and an explanation of the details were provided to the eligible participants. Written consent was obtained from all of the participants upon their agreement to participate in the study. Trained female data collectors of Pakistani ethnicity and then administered the paper-based questionnaire. Training provided for the data collectors included demonstrations and practice sessions on the administration of the questionnaire. Role-playing and debriefing sessions were also included for the data collectors to come up with a standardised method to administer the questionnaire. The data collectors assisted the participants in completing the questionnaire by reading out the items one by one and recording the participants' responses. For participants recruited through referrals from existing participants, their contact information was obtained from the existing participants after the referred participants had provided consent. The referred participants were then contacted by phone to provide them with study details and obtain their verbal consent for participation. They were offered the option to complete the questionnaire in a telephone interview under the guidance of a data collector or to complete the electronic questionnaire on their own. As all of the referred participants preferred to fill out the electronic questionnaire, their email addresses were obtained if they consented. The link to the electronic questionnaire was sent through an email or a short text message via phone upon agreement by the referred participants. All of the electronic questionnaires were self-completed by the participants. As the participants might not be familiar with some of the keywords in the questionnaire (e.g., 'HPV' and 'genital warts'), definitions of these terms were provided when they first appeared in the questionnaire. All of the participants received a HK$20 (US$2.5) cash coupon upon returning the completed survey. A subsample of 20 participants was invited to complete the questionnaire again at a two-week interval to evaluate the test–retest reliability.

Data analysis

IBM SPSS version 28 (International Business Machines Corporation, NY) was used to analyse the data. Descriptive statistics, such as frequency, percentage, mean and standard deviation, were used to present the study variables. The normality of the continuous variables was assessed by measuring their skewness and kurtosis statistics.

For test–retest reliability, weighted kappa was used to assess the agreement between the test and retest scores of each individual item. Moderate, good and very good agreements are reflected by kappa values of 0.40 to < 0.60, 0.60 to < 0.80 and 0.80 to 1.00, respectively.[32] The test–retest reliability of the subscales was assessed by intraclass correlation coefficient (ICC), with values of < 0.50, 0.50 to < 0.75, 0.75 to < 0.9 and ≥ 0.90 indicating poor, moderate, good and excellent strength of agreement, respectively.[33]

Internal consistency reflects the extent to which items within an instrument measure various aspects of the same construct. Constructs assessed by single items, including perceived barriers-cost and cues to action, cannot be evaluated for internal consistency. The internal consistency of the instrument, based on the other multi-item constructs, was evaluated using Cronbach's alpha coefficient, with unidimensionality, tau-equivalence and normal distribution of the construct supported. The values > 0.6 to < 0.8 indicate acceptable internal consistency, and values ≥ 0.8 indicate very good internal consistency.[34] The internal consistency of the items was also assessed using corrected item-to-total correlations. Items with corrected item-to-total correlation coefficients < 0.30 were regarded as heterogenous, whereas those with values > 0.80 were regarded as homogenous.[35]

For content validity, the item-level content validity index (I-CVI) and the scale-level content validity index (S-CVI) were determined using the 4-point scale ratings given by the expert panel members for the clarity of wording and relevance of the items to the constructs. The I-CVI was computed by dividing the number of experts who had provided a rating of three or four by the total number of experts. The S-CVI was computed by averaging the I-CVIs. An I-CVI > 0.8 and an S-CVI > 0.9 indicate good validity.[31]

As the structural validity of the original instrument had not previously been evaluated, we assessed it using EFA with principal axis factoring and promax rotation to explore the factor structure of the translated instrument. As three constructs of the instrument comprised fewer than three items, they were not included in the factor analysis.[32] The remaining 22 items assessing perceived susceptibility (9 items), perceived severity (9 items), and perceived benefits (4 items) were evaluated by EFA. Sample adequacy was evaluated using Kaiser–Meyer–Okin (KMO) statistics, while Bartlett's test of sphericity was used to evaluate the presence of correlations among variables and thus

the appropriateness of factor analysis. A KMO value of $\geq$ 0.5 was considered acceptable, while the statistically significant Bartlett's test of sphericity ($P < 0.05$) suggests substantial correlations among the factors.[36] An item-factor loading $\geq$ 0.4 was applied to support the validity.[37]

Results

Participant characteristics

A total of 305 Pakistani mothers were approached from February to August 2022, among whom 294 were eligible to participate and 277 agreed to participate in the study. Of the 277 participants, 17 (6.13%) did not complete the questionnaire or gave invalid responses, as indicated by the consistent selection of the same answers, and thus were excluded from the analysis. The remaining 260 participants who had completed the questionnaire were retained in the data analysis. There were no missing values, as the data collectors ensured that for those questionnaires conducted during face-to-face interviews, all responses were collected for all of the items, and the setting of the electronic questionnaire was such that it could not be submitted unless responses to all of the items were entered. The mean age of the mothers was 40.19 years (SD = 6.56). As for the education level, 44.60% of the mothers had received a primary education or below (Table 1).

Phase I results

Content validity and face validity

The HPVS-HBM-U demonstrated good content validity. The expert panel members considered the instrument to be clearly written, appropriate and culturally relevant to assess the mothers' health beliefs regarding HPV vaccination for their daughters. The I-CVIs of all of the 26 items ranged from 0.83 to 1.00, whereas the S-CVIs of the construct subscales ranged from 0.89 to 1.00. The values supported the good content validity of the instrument. The face validity was supported by five Pakistani mothers, all of whom commented that they encountered no difficulty in understanding and answering the questions. The average time required to complete all of the items was 15–20 min.

Phase II results

Structural validity

The structural validity of the constructs comprising at least three items, namely the constructs of perceived susceptibility, perceived severity and perceived benefits (total of 22 items), was evaluated by EFA.

Table 1
Demographic characteristics of study participants (N = 260).

Demographics	Mean (SD) or *n* (%)
Age of mothers (years)	40.19 (6.56)
Age of daughters (years)	13.15 (3.03)
Duration of residence (years)	16.63 (9.67)
Education level	
Primary or below	116 (44.62)
Secondary	97 (37.31)
Tertiary or above	47 (18.08)
Family income (monthly) (HK$)	
10,000 or below	56 (21.54)
10,001 to 20,000	159 (61.15)
20,001 to 30,000	29 (11.15)
30,000 or above	16 (6.15)
Marital status	
Married	254 (97.69)
Single/never married/divorced/ separated/widow	6 (2.31)
Religion	
Islam	259 (99.62)
Non-Islamic religion (Sikhism, Hinduism, Buddhism, Christianity, others)	1 (0.38)

The factor analysis revealed a three-factor structure, which explained 77.66% of the total variance. All of the 22 items loaded on the three factors had factor loadings of $\geq$ 0.71 and were interpretable in relation to the HBM constructs. The communalities of the 22 items ranged from 0.56 to 0.92, indicating moderate to high relations among all of the items.[38] Of the 22 items, nine were loaded on factor 1, 'perceived severity'; nine on factor 2, 'perceived susceptibility'; and four on factor 3, 'perceived benefits'. The factor loadings of the items loaded on factor 1, 'perceived severity', ranged from 0.84 to 0.99, with 58.09% of the variance explained by factor 1; those loaded on factor 2, 'perceived susceptibility', ranged from 0.71 to 0.90, with 12.20% of the variance explained by factor 2; and those loaded on factor 3, 'perceived benefits', ranged from 0.82 to 0.97, with 7.37% of the variance explained by factor 3. Table 2 summarises the result of the factor analysis.

Internal consistency and test–retest reliability

The constructs evaluated for internal consistency and test–retest reliability were perceived susceptibility, perceived severity, perceived benefits and perceived barrier-safety concerns. The normality of the variables was supported by skewness statistics as follows: perceived susceptibility (skewness: −0.35, SD: 0.15; kurtosis: 0.30, SD: 0.30), perceived severity (skewness: −0.55, SD: 0.15; kurtosis: −0.50, SD: 0.30), perceived benefits (skewness: −1.21, SD: 0.15; kurtosis: 1.65, SD: 0.30), and perceived barrier-safety concerns (skewness: 0.39, SD: 0.15; kurtosis: −1.06, SD: 0.30).

The Cronbach's alpha values for the constructs of perceived susceptibility, perceived severity, perceived benefits and perceived barrier-safety concerns were 0.94, 0.98, 0.95 and 0.93, respectively, indicating good internal consistency. The corrected item-to-total correlation coefficients of these constructs were mostly above 0.80 (perceived susceptibility: 0.71–0.84; perceived severity: 0.90–0.95; perceived benefits: 0.83–0.93; perceived barrier-safety concerns: 0.87), indicating homogeneity of the items within the constructs.

For test–retest reliability, the weighted kappa revealed moderate to very good strength of agreement between the baseline and retest scores of the items (perceived susceptibility: 0.49–0.86; perceived severity: 0.75–0.96; perceived benefits: 0.73–0.85; perceived barrier-safety concerns: 0.77–0.88), while the ICC values of the constructs ranged from 0.83 to 0.93, indicating good to excellent strength of agreement between the baseline and retest scores of the constructs (Table 3).

Discussion

Discussion of main findings

In this study, the English version of the HPVS-HBM was translated into Urdu, and the psychometric properties of the translated Urdu version were evaluated. The desirable psychometric properties of the translated instrument provide evidence supporting its use as a reliable and valid tool for measuring Pakistani mothers' beliefs regarding HPV vaccination for their daughters.

The translation of the HPVS-HBM and validation of the HPVS-HBM-U were performed following a rigorous procedure, including forward–backward translation, content validation by expert panel members and face validation by the target participants. The high I-CVIs (0.83–1.00) and S-CVIs (0.89–1.00) of the translated version fulfilled the criterion for good content validity,[31] indicating that the instrument is appropriate for the constructs being measured and has a relevant socio-cultural background for use among Pakistani women in Hong Kong.

The internal consistency and test–retest reliability of the translated instrument were established. Cronbach's alpha values for all of the measured constructs were > 0.90, which was much higher than the value for adequate internal consistency and thus supported the homogeneity of the instrument.[32] The results are comparable to those of the original version.[28] The stability of the translated instrument was also supported. The ICC values of the measured constructs ranged from 0.83 to 0.93,

Table 2
Results of the exploratory factor analysis.

Items	Communalities	Factor loadings		
		Factor 1 Perceived severity	Factor 2 Perceived susceptibility	Factor 3 Perceived benefits
1. If my daughter doesn't get vaccinated for HPV, how likely is it that she'll become infected with genital HPV in the future?	0.59	−0.05	**0.80**	−0.01
2. If my daughter doesn't get vaccinated for HPV, how likely is it that she'll get cervical cancer in the future?	0.67	−0.13	**0.90**	−0.03
3. If my daughter doesn't get vaccinated for HPV, how likely is it that she'll get genital warts in the future?	0.66	−0.11	**0.86**	0.04
4. If my daughter doesn't get vaccinated for HPV, I think her chances of getting a genital HPV infection sometime in the future will be.	0.59	0.02	**0.79**	−0.09
5. If my daughter doesn't get vaccinated for HPV, I think her chances of getting cervical cancer sometime in the future will be.	0.63	0.06	**0.78**	−0.05
6. If my daughter doesn't get vaccinated for HPV, I think her chances of getting genital warts sometime in the future will be.	0.56	0.04	**0.76**	−0.09
7. If my daughter doesn't get vaccinated with HPV, I would feel that she would be vulnerable to genital HPV infection in the future.	0.75	0.13	**0.74**	0.07
8. If my daughter doesn't get vaccinated with HPV, I would feel that she would be vulnerable to cervical cancer in the future.	0.72	0.14	**0.72**	0.08
9. If my daughter doesn't get vaccinated with HPV, I would feel that she would be vulnerable to genital warts in the future.	0.78	0.14	**0.71**	0.14
10. My daughter being infected with HPV would have major consequences on my daughter's life.	0.83	**0.84**	0.08	0.04
11. My daughter having cervical cancer would have major consequences on my daughter's life.	0.81	**0.89**	0.06	−0.03
12. My daughter having genital warts would have major consequences on my daughter's life.	0.82	**0.86**	0.09	−0.03
13. My daughter being infected with HPV would be devastating for me.	0.86	**0.93**	−0.04	0.04
14. My daughter having cervical cancer would be devastating for me.	0.89	**0.91**	−0.00	0.05
15. My daughter having genital warts would be devastating for me.	0.91	**0.95**	−0.02	0.02
16. It would be very serious if my daughter became infected with HPV.	0.89	**0.96**	−0.02	−0.00
17. It would be very serious if my daughter had cervical cancer.	0.86	**0.99**	−0.04	−0.05
18. It would be very serious if my daughter had genital warts.	0.91	**0.97**	−0.05	0.02
19. Getting my daughter vaccinated for HPV will help protect her from genital HPV infection.	0.73	−0.02	0.10	**0.82**
20. If my daughter gets vaccinated for HPV, she can reduce her risk of cervical cancer.	0.85	0.02	−0.05	**0.93**
21. Getting my daughter vaccinated for HPV will decrease her chances of getting genital warts.	0.92	0.00	−0.03	**0.97**
22. Getting the HPV vaccine will help reduce my daughter's chances of having an abnormal Pap test.	0.84	0.06	−0.06	**0.91**
Eigenvalues	–	12.78	2.68	1.62
Variance % (total) (77.66%)	–	58.09	12.20	7.37

Factor extraction method: Principal axis factoring. Factor rotation method: Promax rotation. Bold numbers indicate factor loadings ≥ 0.4. $N = 260$. KMO value = 0.93. Barlett's test of sphericity: chi-square = 8671.646, df = 231, $P < 0.001$. HPV, human papillomavirus.

indicating good to excellent agreement between the baseline and retest scores of the constructs. The weighted kappa of the 22 measured items reflected moderate to very good agreement between the baseline and retest scores. Among the 22 items, items 1 and 2 had relatively low weighted kappa values of 0.53 and 0.49, respectively. Both of these items measured the construct of perceived susceptibility: Item 1 asked, 'If my daughter doesn't get vaccinated for HPV, how likely is it that she'll become infected with genital HPV in the future?' In the baseline period, 35% of the mothers reported that they perceived a negative likelihood (including very unlikely, somewhat likely and a little unlikely) of their daughters contracting genital HPV infection in the future, while 55% of the mothers reported a positive likelihood (including very likely, somewhat likely and a little likely). In the retest period, the percentage of mothers who reported a negative likelihood of their daughters contracting HPV infection in the future decreased to 20%, while the percentage of mothers who reported a positive likelihood increased to 75%, indicating that, in the retest period, more mothers perceived that their daughters would be infected with HPV in the future. A similar pattern was demonstrated for Item 2, which asked, 'If my daughter doesn't get vaccinated for HPV, how likely is it that she'll get cervical cancer in the future?' The percentage of mothers who perceived a positive likelihood of their daughters getting cervical cancer in the future increased from 55% in the baseline period to 75% in the retest period. Notably, only 40% of the respondents had heard of HPV before participating in this study. This low percentage of mothers in the baseline period who perceived a positive likelihood of their daughters getting HPV infection or cervical cancer in the future may be attributable to their low awareness of these diseases, due to which they were not able to determine the risk of their daughters contracting any HPV-related disease.[39] Participation in the current study may have stimulated their interest in self-searching for related information, which could have, in turn, influenced their perceived susceptibility.

The results of the factor analysis support a three-factor structure consistent with the three underlying theoretical constructs of perceived susceptibility, perceived severity and perceived benefits that were measured. As mentioned in the section of "Data analysis" three constructs, namely 'perceived barrier-cost', 'perceived barrier-safety concerns' and 'cues to action', were not included in the factor analysis because they comprised fewer than three items.[32] The remaining 22 items assessing perceived susceptibility, perceived severity and perceived benefits were evaluated by EFA. Although the two-item construct of perceived barrier-safety concerns was not evaluated in the EFA model, the homogeneity of its two items in measuring the related construct was supported by a high Cronbach's alpha value of 0.93. Together with the remaining two constructs (perceived barrier-cost and cues to action) that were assessed by a single item, the translated instrument consists of six constructs, which is consistent with the number of theoretical constructs proposed in the original instrument.[28]

Table 3
Corrected item-to-total correlation & Cronbach's alpha for internal consistency, weighted kappa and intraclass correlation coefficient for test-retest reliability.

Constructs/Items	Corrected item-to-total correlation	Cronbach's alpha	Weighted kappa	Intraclass correlation coefficient
Perceived susceptibility		0.94		0.83
Q1	0.74		0.53	
Q2	0.78		0.49	
Q3	0.78		0.63	
Q4	0.74		0.86	
Q5	0.76		0.78	
Q6	0.71		0.82	
Q7	0.84		0.66	
Q8	0.82		0.68	
Q9	0.84		0.69	
Perceived severity		0.98		0.93
Q10	0.90		0.92	
Q11	0.90		0.96	
Q12	0.90		0.96	
Q13	0.91		0.79	
Q14	0.93		0.78	
Q15	0.94		0.75	
Q16	0.94		0.94	
Q17	0.92		0.82	
Q18	0.95		0.81	
Perceived benefit		0.95		0.88
Q19	0.83		0.80	
Q20	0.90		0.84	
Q21	0.93		0.85	
Q22	0.89		0.73	
Perceived barrier-safety concerns		0.93		0.84
Q23	0.87		0.77	
Q24	0.87		0.88	

Limitations

Although the findings of this study support the HPVS-HBM-U as a reliable and valid tool for assessing health beliefs regarding HPV vaccination in the community, its limitations should be noted. Firstly, the HPVS-HBM-U was evaluated among mothers with daughters only; no mothers with sons were recruited for the psychometric testing of the instrument. Therefore, the validity and reliability of using the instrument for assessing the health beliefs of Pakistani mothers regarding HPV vaccination for their sons were not established. A study revealed that the factors associated with HPV vaccine acceptability were different between parents with sons and parents with daughters.[40] Parental health beliefs regarding vaccinating adolescent boys and their association with HPV vaccine uptake may be different from those regarding vaccinating adolescent girls. Thus, future studies could consider recruiting mothers with sons to explore their health beliefs regarding vaccinating their sons. Second, the study settings were mainly NGOs and community centres. Thus, the recruited participants were mainly Pakistani mothers who were actively accessing services from community organisations but not those who did not actively seek services from such organisations. More socially isolated women may be underrepresented in the present study, and hence, the findings may not be generalisable to this particular group. Third, the HPVS-HBM-U is a self-reported instrument that has the disadvantages of response bias commonly associated with self-reported instruments.[41,42] The participants may have responded in a socially desirable way instead of providing truthful answers, especially when answering sensitive questions[41,42] such as those related to their perception of the risk of their daughters contracting a sexually transmitted infection. Fourth, the sample size selected for the test–retest reliability assessment was relatively small, though a minimum sample size of 20 is acceptable for reliability assessment.[43] Future studies should recruit a larger sample to obtain more reliable data and results.

Implications for nursing practice and research

Nevertheless, this study provides implications for practice. The results support the HPVS-HBM-U as a valid and reliable tool for measuring the health beliefs of Pakistani women regarding HPV vaccination for their daughters in Hong Kong. By assessing the health beliefs of Pakistani mothers, more culturally appropriate information could be obtained to inform interventions to promote HPV vaccination in the Pakistani EM population. The findings could also advise health care policymakers regarding resource allocation to support HPV vaccination costs for this population in Hong Kong.

Conclusions

The HPVS-HBM-U demonstrated desirable psychometric properties for assessing Pakistani mothers' beliefs regarding HPV vaccination for their daughters. This instrument can inform nursing interventions for facilitating parental decision-making regarding HPV vaccination for Pakistani adolescent girls in Hong Kong.

Ethics statement

Ethical approval was obtained from the ethics committee of the study institution (The Survey and Behavioural Research Ethics Committee of the Chinese University of Hong Kong, Reference No. SBRE-21-0187). Written consent was obtained from all of the participants prior to data collection if they agreed to participate in the study. The purpose, nature and procedure of the study were provided in an information sheet and were verbally explained to the study participants. Participation was voluntary. All of the data were anonymous and used for research purposes only. For the electronic survey, information describing the study was displayed at the beginning of the electronic survey interface. Clear descriptions were provided to explain the study procedures and to collect participants' consent to participate in the study. Active clicking of the button to load the subsequent page of the electronic survey indicated the participants' implied consent to participate in the study.

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CRediT authorship contribution statement

Pinky P. K. Lee: Conceptualization; Methodology; Project administration; Formal analysis; Writing – original draft; Funding acquisition. Dorothy N. S. Chan: Supervision; Writing – Reviewing and Editing. K.C. Choi: Formal analysis; Writing – Reviewing and Editing. Winnie K. W. So: Supervision. Writing – Reviewing and Editing. The corresponding author had final responsibility for the decision to submit for publication. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

Declaration of competing interest

All authors have no conflicts of interest to declare. Dorothy N. S. Chan, K. C. Choi and Winnie K. W. So, are the editorial board members of the *Asia-Pacific Journal of Oncology Nursing*. The article underwent the journal's standard review procedures, with peer review conducted independently of their research groups.

Data availability statement

The data support the findings of this study are available from the corresponding author, Dorothy N. S. Chan, upon reasonable request.

Declaration of Generative AI and AI-assisted technologies in the writing process

No AI tools/services were used during the preparation of this work.

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