



## What do South Asian immigrant women know about HPV, cervical cancer and its early detection: A cross-sectional Australian study



Zufishan Alam, MBBS<sup>1,\*</sup>, Judith Ann Dean, PhD<sup>2</sup>, Monika Janda, PhD<sup>3</sup>

<sup>1</sup> Centre for Health Services Research, Faculty of Medicine, The University of Queensland, Woolloongabba Queensland 4102, Australia

<sup>2</sup> School of Public Health, Faculty of Medicine, The University of Queensland, Herston Queensland 4006

<sup>3</sup> Centre for Health Services Research, Faculty of Medicine, The University of Queensland, Woolloongabba Queensland 4102, Australia

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### ABSTRACT

Cervical cancer commonly caused by Human Papillomavirus (HPV) imposes a significant burden in Asia. This study examined the awareness and knowledge of HPV, cervical cancer, and its early detection methods among South Asian immigrant women in Australia to determine factors associated with knowledge deficits. A cross-sectional internet-based survey was completed by a convenience sample of women (n=148), with South-Asian background, residing in Queensland during May-October 2019. Main outcome variables were awareness of HPV, cervical cancer, cervical screening test (Pap test and HPV test) and HPV test self-sampling availability (Yes/No). HPV and cervical cancer knowledge were assessed via 16-item and 20 item aggregated scales respectively, (higher scores indicating better knowledge). Five individual items queried knowledge of the Pap and HPV test, and one item actual cervical screening uptake. One-way ANOVA was used to study differences in HPV and cervical cancer knowledge among sociodemographic groups. Of 148 participating women, 55% (n=86) had heard of HPV, 77% (n=114) of cervical cancer and 81.8% (n=121) of Pap tests. Only one third of participants (n=49) were aware that now an HPV test is used for cervical screening and 10% (n=15) of its self-sampling availability, whereas 55.4% (n=82) reported participation in screening previously. The mean HPV knowledge score was 5.3 (S.D: 5.7) and mean cervical cancer knowledge score 9.8 (S.D: 6.5) with zero being the most common score on both scales. Higher knowledge scores were significantly associated with higher educational level, English language proficiency, discussion with a GP on the topic and previous participation in screening. The majority of participants lacked detailed knowledge about the available screening tests. This study identified key target groups for future interventions.

### Introduction

Despite significant advances in the understanding of aetiology and prevention (vaccination and early detection) of cervical cancer, it remains a leading cause of death among women worldwide, especially those living in low and middle-income countries (Walboomers et al., 1999, Shrestha et al., 2018, Sung et al., 2022). Multiple randomised controlled trials showed that HPV testing is more effective in detecting cervical cancer early (Velentzis et al., 2017, Ogilvie et al., 2018, Ronco et al., 2010). Australia introduced its renewed cervical screening program in 2017, replacing the Papanicolaou (Pap) screening test with primary Human Papillomavirus (HPV) testing (Australian Government Department of Health 2018). The renewed screening program, in conjunction with the primary prevention strategy of HPV vaccination included in the National Immunisation Program Schedule in 2007, has paved the way towards the elimination of cervical cancer in Australia in the coming years (Hall et al., 2018). This aligns with the recent objective

set by World Health Organisation to eliminate cervical cancer globally (Gultekin et al., 2020).

Knowledge and attitudes are critical for the uptake of preventive activities (Brotherton et al., 2010, Agius et al., 2010, Pitts et al., 2010, Cooper Robbins et al., 2010, Tung et al., 2016). HPV and cervical cancer knowledge among the general Australian population is moderate to high (Pitts and Clarke, 2002, Pitts et al., 2007, Giles and Garland, 2006). Likewise, Gunasekaran and colleagues reported that HPV knowledge was significantly higher among Australian-born women (Odds Ratio 3.10, 95% Confidence Interval: 1.15-8.36) compared to overseas-born women (Gunasekaran et al., 2013). In comparison, only 25% of African immigrant women had detailed knowledge on cervical cancer and 41% on cervical screening (Anaman et al., 2016, Jirojwong and Mander-son, 2001, Lesjak et al., 1997). Before implementation of the renewed program, two studies explored Australian women's attitudes towards the program changes. Most women were accepting of the new program, with reservations mainly focused on the longer interval between

\* Corresponding author.

E-mail addresses: [z.alam@uq.net.au](mailto:z.alam@uq.net.au) (Z. Alam), [j.dean4@uq.edu.au](mailto:j.dean4@uq.edu.au) (J.A. Dean), [m.janda@uq.edu.au](mailto:m.janda@uq.edu.au) (M. Janda).

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screening examinations compared to the bi-annual Pap test, and the later starting age (Scalzo and Mullins, 2015, Jayasinghe et al., 2016). Among under-screened and never-screened women, HPV self-sampling may be the preferred screening option, as supported by a randomized controlled trial reporting increase in screening uptake using this approach (Sultana et al., 2016, Sultana et al., 2015). However, no study to date has assessed the knowledge of immigrant women of the renewed program or self-sampling option (Dodd et al., 2020, Nagendiram et al., 2020).

Notably, an increasing proportion of immigrants to Australia come from South Asia (Australian Government Department of Home Affairs 2019), a region with some of the highest incidence and mortality rates for cervical cancer in the world (Serrano et al., 2018). It has been suggested that South Asian women have lower cervical screening uptake rates (OR: 0.54, 95% CI: 0.48-0.61) compared to other women in Australia as estimated by Aminisani and colleagues (Aminisani et al., 2011, Taylor et al., 2001). This cross-sectional study aimed to assess awareness (having heard of) and knowledge (having detailed understanding of) about HPV, cervical cancer and its screening methods among Australian South Asian immigrant women and determine the factors associated with knowledge.

## Methods

### Sample size and participants

Data for this observational, cross-sectional study were collected using an online survey conducted from May to October 2019. Eligible participants were immigrant women from South Asian background, 20-74 years of age, able to read, write or understand English, residing in Queensland, who completed the survey via the RedCAP platform. Although the current screening program covers women aged 25-74 years, we included women aged 20-75 yrs to assess the extent of knowledge of the women who had already taken the Pap test, about HPV and cervical cancer, as well as Pap and HPV test. Participants were recruited through convenience and snowball sampling, via distribution of flyers with the link to the survey on social media i.e., Facebook, Twitter, University website, and word of mouth. Flyers were also distributed at local community centres, community organisations working with migrants and at cultural events where South Asian women tend to socialise. According to the 2016 Census of Population and Housing, the overall population of immigrants from South Asian background (Indian, Sri Lankan, Bangladeshi, Pakistani, Nepalese, Bhutanese, Maldivian and Fijian Indian) in Australia was 114,000, with 43% women in the target age range. Since the exact proportion of South Asian immigrant women taking part in cervical screening is unknown, to ensure maximum variance, it was estimated to be 50% (compared to 56% overall in Australia). Working with 95% confidence level, a survey sample size of 150 was required to achieve a survey margin of error of 8%. This study was granted ethical clearance by the University of Queensland Human Research Ethics Committee (Approval no: 2018001749).

### Survey design

The survey was developed after an extensive literature search. It consisted of four sections in the following order: a) demographic and health care utilisation characteristics; b) HPV awareness and knowledge; c) cervical cancer awareness and knowledge; and d) cervical screening (Pap and HPV) test awareness and knowledge and self-sampling availability awareness. Demographic questions assessed age (<30 years, 30-49 years and 50 years and above), ethnicity, duration of stay in Australia (<5 years, 5-10 years, and >10 years), language spoken at home, educational level (primary, secondary, tertiary), English language proficiency (very well, well, not well), employment status (employed, unemployed or student), marital status (single/divorced/separated or partnered/married), parity (no children, 1 or 2, 3 or more) and sexual activity (yes, no, prefer

not to say). Health care utilisation was assessed by access to Medicare (yes, no), access to regular GP (yes, no) and access to private insurance (yes, no). Two additional questions in this section assessed if GP had discussed cervical cancer prevention with the participants (yes, no) and if they had participated in cervical screening previously (yes, no).

### Outcome measures

HPV, cervical cancer, cervical screening test, Pap test, HPV test and self sampling test availability awareness were determined by asking if women have ever heard of them (yes/no). The participants who responded yes were then asked specific questions about each topic, using scales validated in previous studies. The HPV knowledge measure (Cronbach Alpha:0.83, test retest reliability:0.79) (Waller et al., 2013), consisted of 16 items about HPV (risk factors, consequences, prevention), that were asked through the question: "Please read each of the following statements about HPV and indicate whether they are TRUE or FALSE, if you do not know the answer, click "Don't know". For each correct response, a score of 1 was given and individual responses were summed up to obtain an overall score, for a maximum score of 16, with higher scores indicating better knowledge.

The cervical cancer awareness measure (Cronbach Alpha:0.84, test retest reliability:0.77) (Simon et al., 2012), was used to assess cervical cancer knowledge. This measure first asked women to recall any cervical cancer risk factors and signs/symptoms using two open-ended questions: "What factors, do you think or believe, can put women at risk of developing cervical cancer?" and "What do you think are the warning signs and symptoms of cervical cancer?". Women were then presented with nine risk factors and 11 signs/symptoms of cervical cancer for recognition. The risk factor question asked: "The following may or may not increase a woman's chance of developing cervical cancer. Indicate if you agree that each of these can increase a woman's chance of developing cervical cancer?" (Yes, No or Don't know). The sign and symptoms question asked: "Do you think the following may be warning signs for cervical cancer?" (Yes, No or Don't know). For each correct answer, they received a score of 1. Each score was added for a maximum of 20, with higher score indicating better knowledge.

Awareness of cervical screening was assessed by the question, if the participants had previously heard of any cervical screening test, and if they had heard of the screening test in their home country. A question also asked about their information sources for cervical screening test in Australia (newspaper, general practitioner, other health professional, friends and family or community gatherings). Participants who had heard of Pap and HPV test were then asked questions pertaining to the knowledge and test guidelines in Australia, using the cervical screening test measure (Pitts and Clarke, 2002, Giles and Garland, 2006), in multiple choice format (tick as many options as considered correct). One item queried Pap test knowledge (purpose of test) and four items HPV test knowledge (purpose of the test, recommended frequency, recommended first age, meaning of a positive HPV test). The survey was pilot tested with 10 participants from South Asian background for clarity, acceptability, feasibility, time taken to complete, and ease of completion. Based on the feedback, it was shortened and thereafter used for data collection.

### Statistical analysis

Statistical analysis was performed using R statistical software (R Core Team, 2020). Descriptive analysis summarised the sociodemographic and health care utilisation characteristics, HPV, cervical cancer, cervical screening test (Pap test, HPV test) and HPV self sampling method availability awareness, expressed as counts and percentages. Continuous knowledge scores were determined using summary statistics i.e., mean, minimum, maximum, standard deviation (S.D). One way ANOVA and independent sample t-tests were conducted to study differences among de-

mographic groups in their HPV and cervical cancer knowledge scores. A p-value of 0.05 was considered statistically significant.

## Results

### Characteristics of participants

Overall, 200 women clicked the link to the survey, and 159 completed it, thus giving a response rate of 79.5%. After excluding responses with missing data and entries from women with non-South Asian background, 148 responses remained for analysis. The characteristics of participants are presented in Table A. Of the eight countries forming South Asia, six were represented. Women were predominantly from India (34.5%) and Pakistan (31.7%), followed by Sri Lanka (13.5%), and other countries (20.3%). Participants' mean age was 34.6 years (range 20-64; SD  $\pm$ 7.58), and 55.4% of the women were between 30-39 years. The majority of women were married (84.4%), and had two children or less (48.6%). Most of them had completed tertiary education (85%) and 48% were currently employed. More than one-third of the women (40.5%) had lived in Australia for less than 5 years and the majority of women reported having access to Medicare (80.4%). Although 84.5% of the participants had a regular healthcare provider such as General Practitioner (GP), less than half (46.6%) reported that a GP had discussed cervical cancer prevention with them. Of the overall participants, almost half (56.8%) reported having undertaken cervical screening before.

### HPV Awareness and knowledge

Of the 148 participants, just over half (54.9%) had heard of HPV before. The participants who had not heard of HPV were assigned the score of zero for the respective scales and the results are reported for overall participants, not only for the ones who had heard. Among the risk factors for HPV infection, "Having many sexual partners increases the risk of getting HPV" was correctly identified by (46.6%) of participants, while only few participants (7.4%) were able to answer correctly that HPV infection usually doesn't need any treatment (Supplementary Table A). The mean HPV knowledge score for overall participants was 5.3 (range 0-16; SD  $\pm$ 5.7). The score that most participants obtained was 0 (47.5%) followed by 14 (7.43%). Women with lower educational level, lower English proficiency, currently unemployed, with lack of access to private health insurance, lack of awareness of a cervical screening test, lack of discussion by GP about cervical cancer prevention and lack of previous cervical screening participation had significantly lower ( $p < 0.05$ ) HPV knowledge scores compared to other women (Table C).

### Awareness and knowledge of cervical cancer

Of the 148 participating women, 77% (n=114) had heard of cervical cancer before. The participants who had not heard of cervical cancer were assigned the score of zero for the respective scales and the results are reported for overall participants, not only for the ones who had heard. The mean score for cervical cancer knowledge recall among overall participants was 1.5 (range: 0-10, SD  $\pm$ 1.9), with the majority of women unable to recall any risk factor and sign/symptom. Refer to Supplementary Table B for detailed answers given by participants to cervical cancer knowledge recall questions. Among the risk factors for cervical cancer, "Having many sexual partners" was most commonly recalled by the participants (18.9%); for the signs/symptoms, "Vaginal bleeding between periods" was most commonly recalled (31.8%). The mean cervical cancer knowledge recognition score was 9.8 (range: 0-20, SD  $\pm$ 6.5) with the majority of the respondents getting a score of 0 (25.7%) followed by 15 (9.5%). Of the cervical cancer risk factors, "Not going for Pap test" was recognised most frequently by the women (68.2%); the sign/symptom, "Persistent vaginal discharge that smells unpleasant" was most commonly correctly recognised (71.5%) (Supplementary Table A). Women with lower educational level, lower English

**Table A**

Sociodemographic and health utilisation characteristics of 148 women participating in the survey

Characteristics	No. of participants n (%)
Age	
20-29 years	37 (25)
30-39 years	82 (55.4)
40 years and above	29 (19.6)
Ethnicity	
Indian	51 (34.5)
Pakistani	47 (31.8)
Sri Lankan	20 (13.5)
Other (Bengali, Nepalese, Indo Fijian)	30 (20.3)
Educational Status	
Primary	None (0)
Secondary	22 (14.9)
Tertiary	126 (85.1)
Duration of stay in Australia	
<5 years	60 (40.5)
5-10 years	41 (27.7)
>10 years	47 (31.8)
Native language	
Urdu	52 (35.1)
Hindi	19 (12.8)
Sinhalese	15 (10.1)
Bengali	13 (8.8)
Other	44 (29.7)
English	5 (3.4)
Religion	
Muslim	75 (50.7)
Hinduism	35 (23.7)
Buddhism	14 (9.5)
Other (Christianity, Sikhism, Atheism, Prefer not to say)	24 (16.2)
Sexually Active	
Yes	111 (75)
No	23 (15.5)
Prefer not to say	14 (9.5)
Parity (No. of children)	
None	52 (35.1)
2 or less	72 (48.6)
3 or more	24 (16.2)
Work arrangement	
Employed	71 (48.0)
Unemployed	39 (26.4)
Student	38 (25.7)
Ability to speak English	
Very well	82 (55.4)
Well	61 (41.2)
Not well	5 (3.4)
Access to Medicare	
Yes	119 (80.4)
No	29 (19.6)
Access to Private health insurance	
Yes	76 (51.4)
No	70 (47.3)
Regular source of health care provider (HCP)	
Yes	125 (79.7)
No	23 (20.3)
GP discussed cervical cancer prevention	
Yes	69 (46.6)
No	79 (53.4)
Previous participation in cervical screening test	
Yes	82 (55.4)
No	66 (44.6)

language proficiency, shorter duration of stay in Australia, lack of cervical cancer prevention discussion with GPs, lack of awareness of cervical screening test and lack of previous participation in cervical screening test had significant lower ( $p < 0.05$ ) cervical cancer knowledge scores than other women (Table C).

### Awareness and knowledge of cervical screening test

Of the 148 participating women, 84.5% had heard of a screening test for cervical cancer (Table B). Nearly half (48.6%) had heard about it in

**Table B**

Awareness of HPV, cervical cancer, cervical screening test among 148 women participating in the survey and subsequent knowledge of HPV test among knowledgeable participants (n=49) that had heard of it before

Statement	No of participants (n) (%)
Have you heard of Human Papillomavirus?	Yes (80) (54%) No (68) (46%)
Have you heard of cervical cancer?	Yes (114) (77%) No (34) (23%)
Have you heard of cervical cancer screening test?	Yes (125) (84.5) No (23) (15.5)
Have you heard of cervical screening in your home country?	Yes (72) (48.6) No (76) (51.3)
Have you heard of the Pap test for screening of cervical cancer?	Yes (121) (81.8%) No (27) (18.6%)
Have you heard of the HPV test for screening of cervical cancer?	Yes (49) (33.1%) No (99) (66.9%)
What do you think is HPV test?	Scraping done to look for Human Papillomavirus (HPV) (44) (89.8%) A test for sexually transmitted diseases (STDs) (2) (4.1%) Speculum examination of the vagina (7) (14.3%) Treatment of cervical cancer (1) (2.0%) Don't know (5) (10.2%)
What is the recommended frequency of the HPV test?	Annually (7) (14.3%) Every 2 yrs (14) (28.6%) Every Five years (21) (42.9%) Don't know (7) (14.3%)
What is the recommended age for women to have their first HPV test?	18 yrs (15) (30.6%) 20 yrs (2) (4.1%) 25 yrs (21) (42.9%) Don't know (11) (22.4%)
What does positive HPV test mean?	Abnormal precancerous cells (34) (69.4%) Infection (14) (28.6%) Cancer (9) (18.4%) Don't know (6) (12.2%)
Are you aware that self-sampling for HPV test is also available?	Yes (15) (30.6%) No (133) (69.4%)

their home country. Of the types of cervical screening tests, 81.6% were aware of Pap test offered for cervical screening, while only 33% had heard of the HPV test. The most common source of information for cervical screening test in Australia were GPs (46.6%) followed by family and friends (18.9%) and other health professionals (14.9%). Other sources of information such as newspaper/magazine (8.8%), Radio/Television (8.1%) and community gatherings (4.7%) were less commonly mentioned.

Regarding knowledge of Pap test, the purpose of the Pap test (scraping to look for abnormal cells) was correctly identified by 71.9% of participants among those that were aware of Pap test (Supplementary Table C). Whereas for HPV test, the purpose of test (scraping done to look for HPV) was correctly identified by 89.8% of participants that were aware of HPV test, the recommended frequency (every 5 years) and recommended first age for the test (25 years) by 42.9%, and the meaning of a positive HPV test (infection) by 28.6% of the informed participants. Less than one third (30.6%) of the informed participants were aware of self-sampling test availability (Table B).

## Discussion

The three aims of this study were to assess awareness and knowledge of South Asian immigrant women in Australia about a) HPV b) cervical cancer and c) cervical screening methods. The results suggest that many participants lacked a detailed understanding of risk factors and consequences of HPV infection and its link with cervical cancer. HPV knowledge score and cervical cancer knowledge score were low, with fewer than half women correctly identifying that HPV can cause cervical cancer. Participants also had low knowledge sufficiency about Pap and HPV tests. Moreover, only one third of the participants were aware of the changes made to the cervical screening program.

A small number of studies have measured HPV knowledge in the Australian population and found it to be lower among women who

were younger, had lower socioeconomic status and were born overseas (Tung et al., 2016, Gunasekaran et al., 2013). Similarly another study comparing HPV awareness and literacy among participants from Australia, USA and UK suggested that the Australian population had lower awareness levels than that of USA but higher than that of UK. The knowledge scores, however did not show any significant differences among individuals (Marlow et al., 2013). Studies conducted on immigrants in different countries show that they commonly have lower levels of HPV and cervical cancer literacy than long term residents and improving it can reduce inequalities of health services uptake between immigrants and other residents (Beltran et al., 2016, Ralston et al., 2003, Garbers and Chiasson, 2004, Lorini et al., 2020). HPV awareness (54%) and knowledge score (5.3) in the present study were lower compared to previous reports of 72% and 8.31 for Australian women (Marlow et al., 2013). Only 44.6% women in this study were able to correctly identify that HPV can cause cervical cancer, compared to 70% and 97% in two previous studies conducted among Australian women (Tung et al., 2016, Marlow et al., 2013). This indicates educational needs among South Asian immigrants regarding HPV.

The finding of low cervical cancer knowledge is consistent with another study conducted in the UK that compared cervical cancer knowledge in White and non-White women (Low et al., 2012). While only one third of participants (33.1%) in the current study were aware of the new HPV test, the majority of them (81%) were aware of the Pap test. Although 58.8% of overall participants (71.9% of aware participants) were able to identify the Pap test's purpose, yet it is lower compared to results from another study for Australian native women (94%) (Giles and Garland, 2006). Only 31% of the overall participants understood what the HPV test is. Lower adequacy in knowledge of cervical cancer and screening test is found to be consistent with the findings for immigrant women from other backgrounds living in Australia (Alam et al., 2021). Taking this into consideration, education about cervical cancer and the test change from Pap to HPV is required to raise South Asian

**Table C**

Sociodemographic, health care and previous screening history factors associated with HPV knowledge and cervical cancer knowledge using Analysis of variance (ANOVA)/Independent t-test (n=148)

Sociodemographic groups	N	HPV knowledge score		Cervical cancer knowledge score	
		Mean (SD)	Significance	Mean (SD)	Significance
Age groups			F (2, 145) = 1.85, p=0.2		F (2,145) =2.76, p=0.07
Age group 1 (<30yrs)	37	3.8 (5.0)		7.8 (6.8)	
Age group 2 (30-39 yrs)	82	5.9 (6.0)		10.2 (6.7)	
Age group 3 (40 yrs and above)	29	5.9 (5.8)		11.3 (6.8)	
Educational level			t (146) = -2.5, p= 0.01*		t (146) = -3.1, p= 0.002**
Secondary	22	2.5 (4.6)		5.9 (3.3)	
Tertiary	126	5.8 (5.8)		10.5 (2.8)	
Ancestry			F (3, 144) = 2.20, p=0.09		F (3,144) =1.31, p=0.5
Indian	51	6.4 (6.3)		10.7 (5.6)	
Pakistani	47	3.7 (5.2)		8.7 (7.2)	
Sri Lankan	20	6.4 (5.7)		10.4 (6.4)	
Other (Bengali, Nepalese, Indo Fijian)	30	5.5 (5.3)		9.8 (7.1)	
Duration of stay in Australia			F (2, 145) = 1.43, p=0.2		F (2,145) = 3.13.1, p=0.05*
<5 yrs	60	4.8 (5.6)		8.8 (6.8)	
5-10 yrs	41	4.8 (5.4)		9.1 (5.8)	
>10 yrs	47	6.5 (6.1)		11.8 (6.3)	
Ability to speak English			F (2, 145) = 7.39, p=0.0009***		F (2,145) = 4.27, p=0.007**
Very Well	82	6.8 (6.0)		11.0 (6.1)	
Well	61	3.9 (5.0)		8.7 (6.7)	
Not well	5	0 (0)		3.2 (7.2)	
Native language			F (5, 142) = 3.14, p=0.01*		F (5,142) = 2.4, p=0.04*
Urdu	52	3.7 (5.2)		8.6 (7.1)	
Hindi	19	4.2 (5.5)		11.3 (3.9)	
Bengali	13	6.9 (5.4)		13.3 (5.1)	
English	5	12.6 (2.1)		15.6 (4.4)	
Sinhalese	15	6.3 (5.8)		10.3 (6.5)	
Other (Telegu, Tamil, Gujarati, Malayalam, Punjabi, Kannada, Sindhi, Nepalese)	44	6.0 (6.1)		8.8 (6.8)	
Employment status			F (2, 145) = 7.17, p=0.001**		F (2,145) = 1.1, p=0.3
Employed	71	6.9 (6.1)		10.5 (6.5)	
Unemployed	38	2.7 (4.4)		9.8 (7.0)	
Student	39	5.2 (5.4)		8.6 (6.1)	
Marital status			t (146) = -0.6, p=0.5		t (146) = -0.97, p=0.5
Single/ Separated/Divorced	23	6.0 (5.2)		11.0 (6.8)	
Married/Partnered	125	5.2 (5.8)		9.6 (6.5)	
Sexually active			F (2, 145) = 0.04, p=1.0		F (2,145) = 0.33, p=0.7
Yes	111	6.0 (5.99)		10.1 (6.5)	
No	23	5.1 (5.1)		9.0 (7.5)	
Prefer not to say	14	5.2 (5.2)		9.3 (5.6)	
Parity			F (2, 145) = 2.72, p=0.07		F (2,145) = 0.53, p=0.6
None	52	5.0 (5.3)		9.1 (6.3)	
2 or less	72	6.3 (6.0)		10.3 (6.5)	
3 or more	24	3.3 (5.3)		9.9 (7.1)	
Access to Medicare card			t (146) = -0.18, p=0.9		t (146) = -1.7, p=0.08
Yes	119	5.4 (5.9)		10.3 (6.5)	
No	29	5.2 (5.2)		7.9 (6.6)	
Access to Regular GP			t (146) = -0.47, p=0.6		t (146) = -0.7, p=0.5
Yes	125	5.4 (5.8)		9.98 (6.6)	
No	23	4.8 (5.7)		9.0 (6.6)	
Access to Private health insurance			t (146) = -2.88, p=0.005**		t (146) = -1.7, p=0.08
Yes	78	6.6 (5.9)		10.7 (6.2)	
No	70	3.9 (5.2)		8.9 (6.8)	
Discussion with GP on cervical cancer prevention			t (146) = -2.9, p=0.004**		t (146) = -3.5, p=0.0006***
Yes	69	6.8 (6.0)		11.8 (5.8)	
No	79	4.1 (5.3)		8.1 (6.9)	
Had heard of cervical screening test			t (146) = -3.57, p<0.0004***		t (146) = -7.211.3, p<0.0003***
Yes	125	6.0 (5.8)		11.3 (5.8)	
No	23	1.6 (3.1)		2.0 (4.7)	
Had taken cervical screening test			t (146) = -3.52, p<0.0006***		t (146) = -5.6, p=0.0009***
Yes	82	6.8 (5.9)		11.4 (5.8)	
No	66	3.6 (5.0)		7.9 (6.9)	

women's awareness and knowledge levels at least to those observed among Australian-born women. Moreover, it is imperative to provide the women an understanding of test's purpose as it has been suggested to aid cervical screening adherence (Ogunsiji et al., 2013, Anaman-Torgbor et al., 2017, Metusela et al., 2017, Marlow et al., 2015). Results suggest that less than half of the women had heard of the screening test in their home countries (48.6%). Previous studies reported that lack of concept of screening in home countries may be one of the reasons for lower knowledge and uptake of screening in immigrants (Vahabi and Lofters, 2016, Mullins et al., 2014, Elmore et al., 2020). Thus a need for including cervical screening education and support among other health care services for newly arriving immigrants can't be overlooked.

Results also indicate that very few (10.1% of overall) participants knew about the availability of self-sampling option introduced in the new screening program. Although current screening guidelines for self-sampling state that it is only available for never screened and under screened (being overdue for test for more than two years) women (Australian Government Department of Health 2018) it may be helpful to increase access to self-sampling option for this population. Given the cultural background, modesty and reluctance towards cervical screening, self-sampling could potentially increase South Asian women's screening uptake (Marlow et al., 2015, Vahabi and Lofters, 2016, Mullins et al., 2014). However, self-sampling directions need to be clear and easy to follow, taking into account the potential for language barriers and reservations women may hold against this method such as inability to perform test accurately or belief that it could lead to self harm (Elmore et al., 2020, Howard et al., 2009).

Results indicate that women with low educational levels and lower English language proficiency levels and those not employed are less likely to be knowledgeable of HPV and cervical cancer, whereas those that are more knowledgeable are significantly more likely to have previously participated in screening. Several other studies conducted on immigrant women in Australia have also suggested these factors to be linked with low cervical screening practices among women (Taylor et al., 2001, Shelley et al., 1994, Wain et al., 2001, Siahpush and Singh, 2002). It can be implied that women who have more access to information, whether through University or workplace relations, have higher health literacy levels. Therefore it is essential to design comprehensible information materials, in native languages specifically focusing on women from less privileged backgrounds and with fewer social contacts. Health utilisation was found to be strongly associated with HPV and cervical cancer knowledge in this, as well as previous studies (Shelley et al., 1994, Luque et al., 2010, Markovic et al., 2002, Cheek et al., 1999), suggesting that information provision by a health care provider is important. In the present sample, more than half of the participants had not had a discussion with a GP on the topic. This indicates a need to devise interventional strategies to help GPs inform women from culturally and linguistically diverse backgrounds routinely on the topic.

### Limitations

This study focused on HPV and cervical cancer prevention literacy among South Asian immigrant women living in Queensland, Australia. Participants for this study were recruited through convenience sampling method and the sample size was small, therefore results cannot be generalised for the overall South Asian population in Australia. Women who participated were able to read English, this could lead to potential bias, excluding women unable to do so. The findings reported will thus only be applicable to women understanding English, not representative of non-English speaking participants. Thus, qualitative data collection and future research made possible by translation of questionnaire into various South Asian languages could be useful. Additionally, it was difficult to reach women from certain immigrant backgrounds such as Nepalese and Bhutanese communities due to scarce numbers, leading to overrepresentation of women from other backgrounds.

### Conclusion

This research adds to the existing literature on HPV and cervical screening knowledge among immigrant women in Australia. It suggests the need to increase knowledge about cervical cancer and its prevention in South Asian immigrant women by creating informative and culturally sensitive resources using range of evidence-based strategies. It is also imperative to disseminate these resources, with the involvement of health care professionals and relevant stakeholders. This could improve cervical screening in at-risk population thus ensuring their equitable uptake by immigrants.

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### Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author, the data are not publicly available due to ethical restrictions (their containing information that could compromise the privacy of research participants).

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jmh.2022.100102.

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