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Women's attitudes towards a human papillomavirus-based cervical cancer screening strategy: a systematic review

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ABSTRACT

Objective To provide insights into women's attitudes towards a human papillomavirus (HPV)-based cervical cancer screening strategy.

Data sources Medline, Web of Science Core Collection, Cochrane Library, PsycINFO, CINAHL and ClinicalTrials.gov were systematically searched for published and ongoing studies (last search conducted in August 2021).

Methods of study selection The search identified 3162 references. Qualitative and quantitative studies dealing with women's attitudes towards, and acceptance of, an HPV-based cervical cancer screening strategy in Western healthcare systems were included. For data analysis, thematic analysis was used and synthesised findings were presented descriptively.

Tabulation, integration, and results Twelve studies (including 9928 women) from USA, Canada, UK and Australia met the inclusion criteria. Women's attitudes towards HPV-based screening strategies were mainly affected by the understanding of (i) the personal risk of an HPV infection, (ii) the implication of a positive finding and (iii) the overall screening purpose. Women who considered their personal risk of HPV to be low and women who feared negative implications of a positive finding were more likely to express negative attitudes, whereas positive attitudes were particularly expressed by women understanding the screening purpose. Overall acceptance of an HPV-based screening strategy ranged between 13% and 84%.

Conclusion This systematic review provides insights into the attitudes towards HPV-based cervical cancer screening and its acceptability based on studies conducted with women from USA, Canada, UK and Australia. This knowledge is essential for the development of education and information strategies to support the implementation of HPV-based cervical cancer screening.

Systematic review registration PROSPERO (CRD42020178957).

Key messages

What is already known on this topic

⇒ Changing cervical cancer screening from cytology to HPV-based screening could influence the acceptability and thus the overall success of screening programmes. Understanding women's attitudes towards an HPV-based screening strategy is therefore essential for the development of successful screening and implementation strategies.

What this study adds

⇒ Women with negative attitudes towards HPV-based screening particularly fear that being tested for a sexually transmitted infection may lead to stigmatisation. On the other hand, women with positive attitudes value the advantages of (potential) detection of earlier disease and a lower test frequency.

How this study might impact research, practice or policy

⇒ Introducing HPV-based screening requires women-centred education focusing on the aetiology and risk factors of cervical cancer. Broader knowledge of the benefits and harms of such a screening strategy may help to reduce psychological distress associated with testing for an infection that is mainly sexually transmitted.

INTRODUCTION

Of all malignant tumours, cervical cancer is the one that can best be prevented by screening.[1–3] For many years, cervical cancer screening has been based on cytological testing (ie, the Pap test) for the early detection of cellular changes associated with precancerous cervical lesions. These cellular changes can be triggered by human papillomavirus (HPV)—in particular, some 'high-risk' types like HPV types 16 and 18. Newer, high certainty evidence has established the effectiveness of cervical cancer screening strategies based on the detection of HPV.[4 5] Women who tested positive for high-risk HPV are referred to cytology testing for the early detection and treatment of cellular changes, if necessary. Women who test HPV-negative, on the other hand, are not at a higher risk of developing precancerous lesions—at least not within the next 3 to 5 years.

While several countries worldwide (including Australia,[6] the Netherlands[7] and UK[8]) have already implemented HPV-based cervical cancer screening with cytology triage, others are still preparing the implementation.[9] An HPV-based screening strategy with cytology triage involves follow-up cytological examinations only for those women with a positive HPV test. Changing cervical cancer screening from cytology to HPV-based screening could influence the acceptability and thus overall success of the screening programme, because some HPV-based screening regimens offer the option of self-sampling and screenings are recommended less frequently than with cytology testing.[10]

Understanding women's views and experiences—particularly when screened for a cancer-causing sexually transmitted infection—may improve successful implementation of, and adherence to, screening strategies.

Therefore, we conducted a systematic review and qualitative meta-synthesis examining women's attitudes towards an HPV-based screening strategy for prevention of cervical cancer.

METHODS

We adhered to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) statement.[11]

This review is part of a Health Technology Assessment, including also a clinical effectiveness and health economic assessment, for which the protocol was registered a priori in PROSPERO (CRD42020178957). Compared with the protocol registered in PROSPERO, which focused on the assessment of clinical effectiveness, the approach for this review was modified (see methods below for specifications).

Comprehensive systematic literature searches for relevant studies were conducted following the recommendation of PRESS (Peer Review of Electronic Search Strategies).[12] We searched Medline, Web of Science Core Collection, Cochrane Library, PsycINFO and CINAHL (initial searches took place in November 2019 and an update search in Medline was performed in August 2021). The search strategy for the clinical effectiveness domain of the Health Technology Assessment was adapted and combined with additional search terms designed to identify studies examining preferences and attitudes. The Medline search strategy of the current review is displayed in the supplemental material S1. Search strategies for the other databases were adapted from the Medline strategy. We did not apply study filters for study designs as filters may exclude relevant studies dealing with our research question.[13] We also did not use any date or language restrictions in the electronic searches. Searches for ongoing or unpublished but completed studies were performed in ClinicalTrials.gov.[14] We used relevant studies and/or systematic reviews to search for additional references via PubMed using the 'similar articles function'[15] and forward citation tracking using the Web of Science Core Collection. Reference lists of eligible studies and systematic reviews were reviewed to identify any other studies that might not have been retrieved by the electronic searches.

The titles and abstracts of the identified references were independently screened by two reviewers (CS, JN), and full texts of all potentially relevant articles were obtained. Full-text screening was also conducted independently (by the same two reviewers) and reasons for exclusions were documented. Any disagreement was resolved by consensus. The complete screening process was conducted in Covidence.[16]

Study selection

We included qualitative, quantitative or mixed-methods studies focusing on asymptomatic women close to or within the age range suitable for cervical cancer screening in Western countries—that is, 25 to 65 years.[17]

Studies examining the attitudes of women who were not representative of women eligible for standard screening procedures[18] were not of interest. Therefore, studies on women with a high risk of cervical cancer (eg, due to a compromised immune system), with known cytological abnormalities, cervical cancer or a total or radical hysterectomy were excluded.

Furthermore, we included only studies that were conducted in high-income countries (Human Development Index>0.88; European Economic Area countries, United Kingdom, New Zealand, Australia, Japan, USA and Canada) for better applicability to Western settings.[19 20] Review articles, case reports and results reported solely in abstract form as well as work that was not peer reviewed were excluded.

Phenomena of interest

Our phenomena of interest were both attitudes towards, and acceptance of, HPV-based cervical

cancer screening. In women eligible for cervical cancer screening the primary HPV testing could be used in two different screening strategies—either as a stand-alone test or followed by cytology in those women with a positive HPV test. 'Attitudes' were defined as thoughts and feelings that might or might not be reflected in a particular behaviour. 'Acceptance' was defined as a tendency to follow an HPV-based screening guideline. We did not consider studies focusing on co-testing (using HPV testing in combination with cytology), or studies addressing preferences and/or attitudes related to the acceptance of cervical cancer screening in general (in terms of 'should I go for screening?'). These questions have been evaluated before.[21 22] We also excluded studies addressing: preferences of caregivers, family members and healthcare professionals, information needs, factors related to screening acceptance, preferences towards HPV vaccines or prolonged screening intervals.

Extraction of data

We extracted study characteristics (eg, author and study country, year of publication, data collection methods used and number of participants), characteristics of the study population (eg, age range, ethnicities) and the attitudes towards HPV-based screening, including acceptance rates. Data from each study were extracted by one reviewer (JN) and checked by a second (CS).

Quality assessment

We evaluated the risk of bias and applicability of results using the Mixed Methods Appraisal Tool (MMAT).[23 24] Again, two reviewers (JN, CS) independently assessed study quality. Disagreements were resolved through discussion until consensus was reached.

Synthesis of findings

Data on women's attitudes towards, and acceptance of, HPV-based screening were analysed separately. For the qualitative data on attitudes towards HPV-based screening, we applied a thematic analysis (using inductive coding) and descriptive presentation of the synthesised findings. Data analysis was an iterative process and started with familiarisation and extraction of the data. Text sections, including descriptions of themes and categories offered by the study authors as well as exemplary comments by study participants, were analysed and manually coded. First, one reviewer (JN) read through the text about three to five times to familiarise herself with the data and then independently extracted any data that reflected attitudes towards HPV-based screening. Then, the same reviewer manually coded any extracted qualitative data related to women's attitudes towards HPV-based screening using the codes (i) positive, (ii) neutral, (iii) negative attitudes. Both steps were checked by the second reviewer (CS) and any conflicts were resolved by discussion. Finally, categories related to women's attitudes towards HPV-based screening were defined based on the findings of the primary studies.[25]

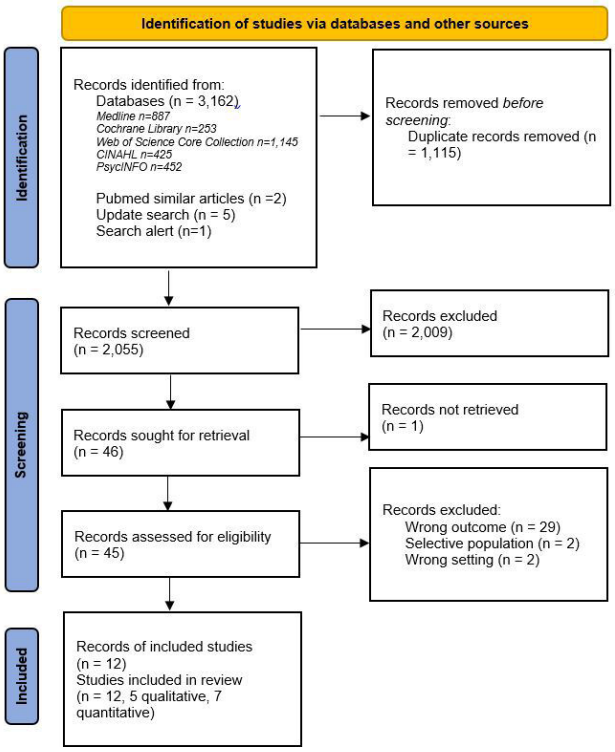

Figure 1 PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) flow chart[11].

The quantitative data on the acceptance of HPV-based screening and the categories (positive, neutral and negative attitudes towards HPV-based screening) emerging from the qualitative analysis were summarised descriptively. We summarised the questions, keeping to the original wording as closely as possible, alongside with the responses and their distribution. A meta-analysis across studies was not possible due to heterogeneity of the data and findings.

RESULTS

The searches identified 3170 citations, including 1115 duplicates. Among the 2055 unique records screened, 2009 were excluded based on title and abstract (eg, wrong setting, no focus on HPV testing, clinical studies, editorials), and 45 were considered for full-text screening. Of these, twelve studies were included (five qualitative studies, seven quantitative studies). Thirty-three studies did not meet the eligibility criteria and were excluded (eg, the outcome of interest was not addressed, the population did not represent the general screening population, or the setting did not meet our inclusion criteria). Studies that were excluded at full-text screening are cited in the supplemental material S2.

The detailed study selection process is presented in figure 1. A search in ClinicalTrials.gov (date of the search: 11 August 2021) identified no relevant ongoing studies.

Table 1 Key study characteristics of the included studies

Author, year/ country	Data collection	Study Start (m/y)–end (m/y)	N (women)	Age range (y)	Ethnicity	Study population	Phenomena of interest
Qualitative study design							
Dodd, 2020/ Australia[29]	Semistructured interviews	12/18–12/18	26	<35–>66	22/26 Born in Australia 4/26 Not born in Australia	▶ HPV status: 15/26 positive, 8/26 negative, 3/26 unsure ▶ 9/26 HPV vaccinated ▶ Relationship status: 13/26 married or living with partner, 5/26 single or dating, 7/26 separated, divorced or widowed	Understanding the screening purpose
McCaffery, 2003/UK[26]	Focus group discussions	07/00–09/00	71	20–59	16/71 African-Caribbean 19/71 Indian 20/71 Pakistani 16/71 White British 41/71 Not born in UK	▶ Women eligible for cervical cancer screening; without any history of CIN or previous total hysterectomy ▶ None of the women in this study were offered HPV tests or had previously participated in HPV-based screening ▶ Relationship status: 44/71 married or living with a partner	Understanding the implication of a positive finding; understanding the screening purpose
McCaffery, 2006/ England[27]	In-depth interviews	06/01-12/03	74	20–64	41/74 White British 17/74 South Asian 16/74 African Caribbean	▶ Women participating in HPV-based screening; all had received their HPV result ▶ HPV status: 57/74 positive, 17/74 negative ▶ Relationship status: 45/74 married or in a relationship (with or without cohabiting)	Understanding the implication of a positive finding; understanding the screening purpose
Nagendiram, 2020/ Australia[30]	Semistructured interviews	03/19–04/19	14	20–58	No information provided	▶ 12/14 Participate in screening, 2/14 are under-screened according to the guideline	Understanding the screening purpose
Patel, 2018/ England[28]	Semistructured interviews, focus group discussions	04/15–12/16	46	25–65	20/46 White British 26/46 White Eastern European	▶ Women participating in a screening programme, which already includes HPV-based screening ▶ Some have experienced abnormal smear results and some have not ▶ Relationship status: 36 married or in a relationship	Understanding the personal risk; understanding the implication of a positive finding; understanding the screening purpose
Quantitative study design (observational)							
Gerend, 2017/ USA[32]	Online questionnaire via mail	2014	313	21–65	59/313 Non-white 250/313 White 38/313 Hispanic/Latina ethnicity	▶ Relationship status: 187/313 married or living as married ▶ 19/313 Never had a Pap test ▶ 80/313 History of abnormal Pap test ▶ 20/313 Previous HPV infection ▶ 38/313 Received at least one dose of HPV vaccine ▶ All participants were informed that HPV-based screening could one day replace Pap testing to become the principal method for cervical cancer screening	Acceptance
Jayasinghe, 2016/ Australia[36]	Online questionnaire	02/14–03/14	199	16–28	118/199 Born in Australia	▶ Women participated in the Young Female Health Initiative study ▶ 101/199 Received at least one dose of HPV vaccine ▶ 50/199 Never had a Pap test	Acceptance
Ogilvie, 2013/ Canada[34]	Online questionnaire	05/11–09/11	981	25–65	81/981 Chinese 24/981 Aboriginal 876/981 Caucasian and other	▶ Women participated in the HPV FOCAL study ▶ Relationship status: 689/981 married	Acceptance

Continued

Table 1 Continued

Author, year/ country	Data collection	Study Start (m/y)–end (m/y)	N (women)	Age range (y)	Ethnicity	Study population	Phenomena of interest
Saraiya, 2018/ USA[33]	Online questionnaire	09/15	1309	18–>65	997/1309 White 124/1309 Black 131/1309 Hispanic 57/1309 Other	▶ 146/1,309 Received HPV vaccination ▶ 67/1,309 Previous HPV infection	Acceptance
Silver, 2015/ USA[31]	Interviewer-administered survey	03/08–03/11	551	36–62	420/551 White 91/551 Black 40/551 Other	▶ Women enrolled in HPV in Perimenopause Study ▶ 260/551 Reported having an abnormal Pap smear prior to study enrolment; 131/551 ever had colposcopy ▶ 545/551 Reported having a Pap smear within the past 3 years ▶ 386/551 Reported sex with a steady partner at study enrolment ▶ Relationship status: 356/551 married	Understanding the screening purpose
Smith, 2021/ Canada[37]	Online questionnaire	08/17–02/18	5532	25–65	No detailed information provided (reflects the North American population)	▶ Women enrolled from both arms (HPV- or cytology-based screening) in the HPV FOCAL study ▶ All women were provided with information about HPV, HPV testing and cervical cancer ▶ Relationship status: 3806/5336 living with a partner	Acceptance; understanding the implication of a positive finding; understanding the screening purpose
Thompson, 2020/ USA[35]	Online questionnaire	2018	812	30–65	187/812 Black/African American 553/812 White/ Caucasian 151/812 Hispanic/ Latina	▶ Relationship status: 404/812 married	Acceptance; understanding the screening purpose

CIN, cervical intraepithelial neoplasia; HPV, Human papillomavirus; m, month; y, year(s).

Key study characteristics are summarised in table 1. In brief, three qualitative studies were conducted in the United Kingdom[26–28] and two in Australia.[29 30] Of the seven quantitative studies, six were conducted in the USA[31–36] and one in Canada.[37] In total, 231 women were included across the qualitative studies (ranging from 14 to 74 women per study), and 9697 women were considered in the quantitative studies (ranging from 199 to 5532 women per study). The women's age varied between 16 and >65 years and mixed populations (ie, women with ethnically diverse backgrounds including White, South Asian, African Caribbean/ American and Hispanic) were recruited across the studies.

The qualitative studies provided insights into women's attitudes towards HPV-based screening using in-depth interviews,[27] focus group discussions,[26 28] and semistructured interviews.[28–30] The quantitative studies addressed both women's attitudes towards HPV-based screening (n=3) and/or the acceptance of HPV-based compared with cytology-based screening (n=6) using an interviewer-administered survey or online questionnaires.[31–37]

Two studies[31 32] focused on co-testing (concurrent HPV testing and cytology, which is not the focus of our review). However, in these studies, we could extract data on the attitudes of women towards the idea of completely replacing the Pap test with primary HPV testing, which is why we decided to include them.

Phenomena of interest

Based on the thematic synthesis approach the positive, negative or neutral attitudes of women related to different aspects of HPV screening or the women's (mis-)conceptions of it could be identified. The studies identified reported the women's attitudes in relation to the screening purpose,[26–31 35 37] the implications of a positive finding[26–28 37] and the personal risk of being infected.[28 31] Furthermore, acceptance of an HPV-based screening programme (table 2) was described in terms of willingness to undergo screening.[32–37]

Understanding the personal risk

One quantitative study[31] (Silver 2015) including 551 women (table 2) examined how understanding the personal risk for cervical cancer may influence decisions to undergo HPV-based screening. Approximately 90% (492/549) of participants assessed their risk of being infected with HPV as low or believed that due to their lifestyle they were not at risk of infection. These

Table 2 Results of the quantitative studies that assessed acceptance of, and/or attitudes towards, HPV-based screening

Author	Phenomena of interest	Questionnaire items used to assess acceptance and/or attitudes	Answers provided by the women (N/N total)
Gerend, 2017[32]	Acceptance	'If your doctor or healthcare provider recommended it, would you agree to have this new HPV test done instead of a Pap test?'	Yes: 55% (172*/313) No: 14% (44*/313) Undecided: 31% (97*/313)
Jayasinghe, 2016[36]	Acceptance	'I would be willing to have an HPV test to screen for cervical cancer instead of a Pap smear.'	Yes 79% (106/135)
		Willingness to screen with HPV testing at extended screening intervals	3 Yearly: 61% (82/135) 5 Yearly: 31% (41/134) 10 Yearly: 10% (14/134)
Ogilvie, 2013[34]	Acceptance	'I would be willing to have an HPV test to screen for cervical cancer instead of a Pap smear' (7-point Likert scale; >4 coded as 'intending to screen')	84% (826/981) intended to screen
Saraiya, 2018[33]	Acceptance	'Which of the following cervical cancer screening options would be acceptable to you if your doctor recommended it for you?'	HPV test alone once every 3 years: 13% (172/1309) Annual Pap test: 40% (520/1309) Pap test every 3 years: 25% (326/1309) Pap test with HPV test every 3 years: 33% (433/1309) Pap test with HPV test every 5 years: 15% (198/1309) None of the options: 15% (190/1309)
Silver, 2015[31]	Understanding the screening purpose	Screening test preference	HPV Only: 8% (43/549) Pap Only: 61% (333/549) Either: 32% (173/549)
		'If HPV test only, how much concern about not having a Pap smear?'	None: 22% (120/548) Slight: 37% (201/548) Moderate: 30% (165/548) Severe: 11% (62/548)
		'Which is more concerning'	Abnormal Pap: 27% (146/550) HPV Positive: 9% (51/550) Equally concerning: 64% (353/550)
	Understanding the personal risk	'Perceived risk of HPV'	None/Low: 90% (492/549) Moderate/High: 10% (57/549)
Smith, 2021[37]	Acceptance	'Having an HPV test instead of a Pap to screen for cervical cancer is acceptable to me'	Strongly agree/ agree: 63% (3342/5336) Neutral: 16% Disagree: 11% Don't know: 10%
		'Receiving HPV testing starting at age 30 years is acceptable to me'	Agree: 68% (3635/5336 total sample); 81% (2691/3342 women who would accept HPV screening) Disagree: 13% (682/5336 total sample); 8% (259/3342 women who would accept HPV screening) Neutral: 18% (981/5336 total sample); 11% (373/3342 women who would accept HPV screening)
		'I would be willing to have an HPV test every 4–5 years instead of a Pap every 3 years'	Agree: 54% (2858/5336 total sample); 74% (2472/3342 women who would accept HPV screening) Disagree: 21% (1096/5336 total sample); 11% (352/3342 women who would accept HPV screening) Neutral: 25% (1353/5336 total sample); 15% (506/3342 women who would accept HPV screening)
	Understanding the implication of a positive finding	'I think people would judge me for having HPV'	Agree: 33% (1775/5336) Disagree: 27% (1419/5336) Neutral: 31% (1666/5336)
		'Having HPV would not cause me any concern about cervical cancer'	Agree: 3% (181/5336) Disagree: 77% (4,112/5336) Neutral: 11% (569/5336)
		'I would feel comfortable telling my partner if I had HPV'	Agree: 64% (3391/536) Disagree: 13% (709/5336) Neutral: 14% (755/5336)
		'Being HPV positive would not affect my relationship with my partner'	Agree: 23% (1249/5336) Disagree: 38% (2003/5336) Neutral: 30% (1584/5336)
	Understanding the screening purpose	'What would concern you more?'	Abnormal Pap test result: 13% (668/5336) HPV positive test result: 13% (683/5336) Equally concerning: 72% (3855/5336)

Continued

Table 2 Continued

Author	Phenomena of interest	Questionnaire items used to assess acceptance and/or attitudes	Answers provided by the women (N/N total)
Thompson, 2020[35]	Acceptance	Willingness to receive the HPV test instead of the Pap test (5-point Likert scale)	Willing: 55% (447/812) Not willing: 45% (365/812)
	Understanding the screening purpose	'What worries you more'	Abnormal HPV test: 11% (90/812) Abnormal pap test: 14% (114/812) Equally worrying: 60% (489/812) Neither: 15% (119/812)
		HPV test benefit: Less time at doctor's office	Yes: 74% (597/812) No: 26% (215/812)
		HPV test benefit: Less frequent discomfort	Yes: 70% (571/812) No: 30% (241/812)

*These numbers were calculated from the percentage and total number (N total * percentage).
HPV, Human Papillomavirus; n, number.

women felt therefore that HPV-based screening has little or no benefit for them. In the qualitative study of Patel *et al*[28] (table 3) some women claimed that an HPV test was not necessary due to their 'safe and conservative' lifestyle—for example, living in a monogamous relationship for years, living a strict religious life or having only one sexual partner.

Understanding the implication of a positive finding

HPV being a sexually transmitted infection also impacts women's attitudes towards HPV-based screening[26–28 37]. In three qualitative studies (including 191 women[26–28]), some women (actual numbers not reported) were sceptical about an HPV-based screening strategy as an HPV infection is usually sexually transmitted (table 3). These women felt that testing for such an infection could lead to stigmatisation and that the test would convey negative messages to their partners, such as mistrust and infidelity. Particularly among women from cultures with strict Muslim or Catholic religious beliefs, being tested for a sexually transmitted infection has been associated with a wide range of issues, including fears of being accused of indecent behaviour by their families (table 3).[26–28]

The results of the quantitative study of Smith *et al*[37] revealed that 38% (2003/5336) of the included women feared that a positive test result would affect their relationship, and 33% (1775/5336) were concerned about their 'public perception', whereas 23% (1249/5336) and 27% (1419/5536) did not think that these issues would occur .

Understanding the screening purpose

Three studies including 5677 women revealed that, particularly, women who were aware of the screening purpose (ie, the association between an HPV infection and the risk of cervical cancer) had anxiety and distress when being confronted with a positive finding (tables 2 and 3).[26 27 37] For example, most women (77%, 4112/5336) from the quantitative study of Smith *et al*[37] stated that they were stressed after receiving a positive HPV test result.

In Australia, where an HPV-based screening strategy was implemented in 2017,[6] women who were better informed—that is, women who justified their attitudes in accordance with current evidence, particularly appreciated the early cancer prevention strategy and the option of prolonged screening intervals.[29 30] Some women also stated that the introduction of HPV-based screening might increase the uptake of the HPV vaccination.[29] Negative attitudes in these studies included concerns about the prolonged screening intervals and the older age recommended for the very first screening (25 years) compared with cytology-based screening.[29 30] Furthermore, three other studies revealed that for the majority of women, an abnormal HPV test result would be as concerning as an abnormal cytology result (60%,[35] 489/812; 64%,[31] 353/550; 72%,[37] 3855/5336).

Overall the results of the qualitative studies[26 28 29] indicated that women would be more open-minded about HPV-based screening if they—and also the people around them—were better informed about the benefits and harms of screening and if the offered screening test had been used more often.

Acceptance of HPV-based screening

Acceptance rates of HPV-based screening strategies were reported in six quantitative studies[32–37] (table 2) and varied between 13%[33] (172/1309) and 84%[34] (826/981). Reasons for these variations were often related to the screening options offered. While in five studies, more than half of the participants were willing to receive an HPV test (as a 'stand-alone' test) instead of a Pap test (55%,[35] 447/812; 55%,[32] 172/313; 63%,[37] 3343/5336; 79%,[36] 157/199; 84%,[34] 826/981), one study[33] reported a much lower acceptance rate (13%, 172/1309). However, not every woman accepting an HPV test as a stand-alone test would also accept other changes related to the screening procedure.[37] A delayed starting age

Table 3 Results of the qualitative studies that assessed attitudes towards HPV-based screening

Reference	Phenomena of interest	Positive attitude (reported frequencies)	Negative attitude (reported frequencies)	Neutral attitude (reported frequencies)	Reasons/answers provided by women
Dodd, 2020[29]	Understanding the screening purpose	▶ Experiencing less anxiety, stress and discomfort due to screening less often (*NR*) ▶ Positive views justified with the new technology being more sensitive and more accurate *(NR)*	▶ Concern that cancer might be missed in between screens because of the extended screening interval (*NR*)	▶ Believed the new HPV-based screening programme could help increase uptake of the HPV vaccination (*some women*) ▶ Changes would have minimal impact on their screening behaviour (*most women*)	▶ 'Well the fact that if it's done every 5 years as opposed to 2 then obviously having to go for less testing, means less anxiety and less stress so on that basis that's good(…)'
McCaffery, 2003[26]	Understanding the implication of a positive finding; understanding the screening purpose	▶ Some would benefit from early detection and psychological benefits of being reassured following testing overtakes negative aspects (*some women*)	▶ Many would feel anger, distress, anxiety, if tested positive for HPV (*many*) ▶ Many fear that being tested might communicate mistrust and infidelity (*many*)	▶ Many think that clear and accurate information is critical as the response to HPV-based screening (*many*)	▶ 'My family would see no point to it as you only have one partner' ▶ 'Being single, my family will be suspicious (if I go for HPV testing)'
McCaffery, 2006[27]	Understanding the implication of a positive finding; understanding the screening purpose	▶ Would cause few problems, if tested positive for HPV (*some women in relationships*) ▶ Feel reassured by additional testing (*some women*)	▶ The majority would feel distress, anxiety and be upset, if tested positive for HPV (*general response*) ▶ Women would feel anxiety about disclosing their HPV positivity to partner, family or friends (*NR*)	▶ Understanding that HPV is an extremely common infection appeared to reduce the stigma (*some women*)	▶ 'A normal thing for many women to have.' ▶ 'I had this association in my head, an old Catholic thing that (…) promiscuity and cell changes would go together.'
Nagendiram, 2020[30]	Understanding the screening purpose	▶ HPV can be detected before abnormal cells become detectable by a Pap smear (*some women*) ▶ Reduced screening would make life easier, as the screening procedure was described as 'uncomfortable' (*some women*)	▶ Fear of missing cancer because of increased screening intervals, as clinicians may not always get a 'clear swab' (*NR*) ▶ Fear of missing cancer caused by 'things other than HPV' (*NR*) ▶ Concerned because of personal experiences (*NR*)	▶ Faith in the doctors (*several women*) ▶ Participants were more receptive towards the new guidelines after being provided with some information—for example, about the slow progression of cervical cancer (*participants*)	▶ 'Well I like the idea of not having to go back every 2 years and not be in that uncomfortable position.' ▶ 'A friend of mine got cervical cancer when she was 21… If they didn't catch it early, she'd be dead.'
Patel, 2018[28]	Understanding the personal risk; understanding the implication of a positive finding; understanding the screening purpose	▶ Would handle it in very pragmatic terms, if tested positive for HPV (*many woman who had not received a positive HPV result*)	▶ Would feel emotions of shock, fear, embarrassment, when tested positive for HPV (*the majority of women*) ▶ Some do not perceive themselves at risk for having a sexually transmitted infection, therefore don't feel the need to be tested for HPV (*some women in relationships*)	▶ Some would be willing to accept HPV-based screening as a test for cancer (*some women*) ▶ Some thought that normalising HPV-based screening and providing more information would reduce the stigma attached to it (*some women*)	▶ 'Yeah, I think some people would not feel comfortable being tested for a sexually transmitted disease, you know having a smear test is not linked with that as far as people are aware, all they're going for is a routine smear test.'

HPV, human papillomavirus; NR, not reported.

at 30 years would have been accepted by 81% (2691/3343) while prolonged screening intervals of 4 to 5 years either on their own or in combination with the delayed starting age at 30 years would have been accepted by 74% (2472/3343) of women.[37] Similar results were found in the study of Jayasinghe *et al*.[36] While an HPV test alone was accepted by 79% (106/135) of women, a lower proportion of women agreed with longer screening intervals of 3 years (ie, 61% (82/135), 5 years (31%), and 10 years (11%).

When different screening options were suggested,[33] 40% (520/1309) would accept an annual Pap test, 25% (326/1309) a Pap test every

Table 4 Methodological quality of the included qualitative studies using the MMAT.[24]

	Is a clear research question defined?	Are the data fitting the research questions?	Is the qualitative approach appropriate?	Are data collection methods appropriate?	Are findings adequately derived from data?	Is the interpretation of results sufficiently substantiated by data?	Is there sufficient coherence between data sources, collection, analysis and interpretation?
Dodd, 2020[29]	Yes	Yes	Yes	Yes*	Yes†	No‡	Yes
McCaffery, 2003[26]	Yes	Yes	Yes	Yes§	Yes†	Yes	Yes
McCaffery, 2006[27]	Yes	Yes	Yes	Yes¶	Yes†	Yes	Yes
Nagendiram, 2020[30]	Yes	Yes	Yes	Yes*	Yes**	Yes	Yes
Patel, 2018[28]	Yes	Yes	Yes	Yes[a]	Yes†	Yes	Yes

*Semistructured interviews.
†Framework analyses.
‡No information on frequencies of the attitudes were provided.
§Focus group discussion.
¶In-depth interviews.
**Thematic analyses.
MMAT, Mixed Methods Appraisal Tool.

3 years, and 13% (172/1309) an HPV test alone every 3 years.

Methodological quality

Overall, the methodological quality was high in the five qualitative studies[26–30] (according to the MMAT,[24] see table 4). Both data collection and data analyses, including interpretation, were sufficiently described. The methods used—that is, in-depth interviews, focus group discussions, and framework analysis to derive findings from the data, were appropriate. In contrast, the quantitative studies showed some methodological flaws. In two[31 37] of the quantitative studies (see table 5) the study samples were not clearly described (both referred to another study), and 'non-response" bias could not be excluded in one[37] of the studies (only 38% of the original study population participated). Three studies[32 33 35] recruited their participants through a US online panel that provides financial rewards for study participation, so selection bias was probably due to registration to the panel that was mandatory for study participation. In two of the studies,[31 34] only women attending cervical cancer screening were recruited, which resulted in the exclusion of non-attenders. The methods used for data collection and analyses in the six quantitative studies addressing women's acceptance of HPV-based screening[32–37] were clearly described and appropriate (online questionnaires). However, the questions the participants were asked might be susceptible to response bias.[38]

DISCUSSION

Main results

We identified three categories of patients' understanding reflecting their attitudes towards HPV-based

Table 5 Methodological quality of the included quantitative studies using the MMAT.[24]

	Is a clear research question defined?	Are the data fitting the research questions?	Is the sampling strategy relevant to address research question?	Is the sample representative of the target population?	Are the measurements appropriate?	Is the risk of non-response bias low?	Are the statistical analysis appropriate to answer the research question?
Gerend, 2017[32]	Yes	Yes	Yes*	Cannot tell†	Yes‡	Cannot tell	Yes
Jayasinghe, 2016[36]	Yes	Yes	Yes§	No	Yes‡	Yes	Yes
Ogilvie, 2013[34]	Yes	Yes	Yes§	No¶	Yes‡	Yes	Yes
Saraiya, 2018[33]	Yes	Yes	Yes*	Cannot tell†	Yes‡	Cannot tell	Yes
Silver, 2015[31]	Yes	Cannot tell	No§	No¶	Yes‡	Yes	Yes
Smith, 2021[37]	Yes	Yes	Yes§	Cannot tell	Yes‡	No**	Yes
Thompson, 2020[35]	Yes	Yes	Yes*	Cannot tell†	Yes‡	Yes	Yes

*Participants were recruited through an online panel.
†Population was preselected for, for example, age, sex, ethnicity and region. Still, there was no chance of involving women who had, for example, no affinity with computers.
‡Questionnaires; the questions the participants were asked were susceptible to bias.[38]
§Population originally recruited for another study question (in a larger trial).
¶The original study sample consisted only of women who participated in cervical cancer screening. Non-attenders were not involved.
**<50% of the eligible women from the original study population participated (38%).[37]
MMAT, Mixed Methods Appraisal Tool;

screening. First, we found that some women underestimate their risk of being infected with HPV. While it is true that women who have never been sexually active rarely develop cervical cancer, any woman who has had at least one sexual partner is potentially at risk for HPV infection and cervical cancer[39] and therefore should be screened regularly. Second, we found that some women fear negative consequences when receiving a positive test result. The qualitative studies showed that particularly women living in a conservative social environment experienced negative feelings and undesired reactions from their partners when confronted with a positive HPV test. Lastly, we found that especially women who understand the screening purpose and the underlying biological context are likely to accept the implementation of HPV-based screening. However, anxiety and distress related to a positive finding (concerning the presence of HPV and the risk of progressive cellular changes) were also reported in these samples.

The results from studies dealing with the overall acceptance of primary HPV-based screening varied. While in the USA the acceptance rates ranged between 13% and 55%, in Canada and Australia acceptance rates were higher, ranging from 63% to 84%. Particularly in countries with low(er) acceptance rates more thought should be put into the promotion and education of vaccine uptake for the prevention of HPV infections. Our systematic review also reveals that women who are not well informed about the benefits and harms of HPV-based cervical cancer screening expressed concerns about prolonged screening intervals. We therefore believe that women may be less concerned about new HPV-based screening guidelines and strategies if their implementation is guided by educational efforts that include the harms and benefits of extended screening intervals and that provide data on the diagnostic accuracy of self-sampled smears.[40 41]

Implications for practice

Negative attitudes reported in qualitative studies were often based on 'wrong' personal risk estimations of acquiring a sexually transmitted disease and the fear of testing positive for such a disease. Thus, an education strategy addressing both men and women is mandatory to increase acceptance.[42 43] This strategy should include the risk factors for an HPV infection,[44] the aetiology and risks of the infection—for example, HPV is a common[45] and 'longlasting' virus which could be acquired years ago and recurrent infections are possible.[46] This strategy should further explain changes in the screening procedure, including longer screening intervals and delayed age at first screening, and their consequences for the detection of cervical cancer.

Additionally, our systematic review revealed that for the majority of women in three of the included studies, an abnormal HPV test result would be as concerning as an abnormal cytology result.[31 35 37] It seems that many women do not understand the meaning of an abnormal Pap test, which detects precancerous lesions, and the meaning of a positive HPV test, which refers to an increased risk of developing precancerous lesions.[4 5] Therefore, information about the meaning of a positive HPV test and the prevalence of HPV among the population should also be included in education strategies.

Strength and limitations of this systematic review

This is the first systematic review synthesising women's attitudes towards cervical cancer screening in Western countries, using both qualitative and quantitative data. It also provides a thorough overview of the complexities involved in women's decision-making regarding cervical cancer screening. The available study pool allowed us to summarise a wide range of attitudes of women from different countries of the Western world (USA, Canada, Europe/UK and Australia) and from mostly multicultural backgrounds. Although the study samples varied (particularly in ethnicity, religion and age), the attitudes towards HPV-based screening were similar—except for women who were better educated—regarding the benefits and risks of HPV-based screening.

We explored heterogeneity by summarising the women's attitudes using thematic synthesis,[25] which allowed us to provide broader categories reflecting different views. The proportion of women providing an answer to the respective questions was not consistently reported by the study authors. Furthermore, it remains unknown whether 'older' studies[26 27] adequately reflect the attitudes of the current screening populations—who may be more 'informed' by using different media. We considered only studies from high-income countries (Human Development Index >0.88) with organised screening programmes which are mostly, but not necessarily, linked to general gynaecological care.[19 20]

CONCLUSIONS

Our findings suggest that introducing HPV-based screening as a cervical cancer screening strategy requires women-centred education focusing on the aetiology and risk factors of cervical cancer. Broader knowledge of the benefits of an HPV-based screening strategy might further reduce psychological distress (eg, stigmatisation) associated with testing for an infection that is often sexually transmitted.

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