

# WITHDRAWN: Barriers and Facilitators for Cervical Cancer Screening Among Young Women: A Systematic Review

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## Research article

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## EDITORIAL NOTE:

The full text of this preprint has been withdrawn by the authors while they make corrections to the work. Therefore, the authors do not wish this work to be cited as a reference. Questions should be directed to the corresponding author.

# Abstract

## Background

Though cervical cancer is one of the leading causes of death globally, its incidence is nearly entirely preventable. Young women have been an international priority for screening. However, in both high-income and low-income countries, young women have not been screened appropriately according to country-specific guidelines.

The aim of this systematic review was to systematically characterize the existing literature on barriers and facilitators for cervical cancer screening among young women globally.

## Methods

We conducted a systematic review following PRISMA guidelines of four databases: Medline-OVID, EMBASE, CINAHL, and ClinicalTrials.Gov. Databases were examined from inception until the date of our literature searches (12/03/2020). We only examined original, peer-reviewed literature. Articles were excluded if they did not specifically discuss cervical cancer screening, were not specific to young women, or did not report outcomes or evaluation. All screening, extraction, and synthesis was completed in duplicate with two independent reviewers. Outcomes were summarized descriptively. Risk of bias for individual studies was graded using an adapted rating scale based on the Risk of Bias Instrument for Cross-Sectional Surveys of Attitudes and Practices.

## Results

Of the 2177 original database citations, we included 36 studies that met inclusion criteria. Our systematic review found that there are three large categories of barriers for young women: lack of knowledge/awareness, negative perceptions of the test, and practical barriers to testing. Facilitators included stronger relationships with healthcare providers, social norms, support from family, and self-efficacy.

## Conclusions

There are unique barriers and facilitators that affect cervical cancer screening rates in young women. Health systems worldwide should address the challenges for this population.

## Background

Cervical cancer is the second most common malignancy among women worldwide, with over 500,000 new cases and 250,000 deaths annually.<sup>1-3</sup> The disease is caused by the human papillomavirus (HPV), which is sexually transmitted.<sup>1</sup> Though cervical cancer is one of the leading causes of death globally, its incidence is nearly entirely preventable.<sup>4</sup> Cervical screening and HPV vaccination programs have significantly reduced the mortality of cervical cancer in North America and Europe through secondary prevention. Screening techniques include Papanicolaou tests (also known as Pap smears), liquid-based cytology, HPV DNA testing, and visual inspection with acetic acid.<sup>5-6</sup> Despite the proven effectiveness of cervical cancer screening, there are numerous barriers to uptake, particularly in low-income countries.<sup>7</sup>

Young women have been a particular area of research focus, due to the preventive benefits of screening from a younger age, increased likelihood of lifelong testing, and setting of new cultural norms.<sup>8-11</sup> In both high-income and low-income countries, young women have not been screened appropriately according to country-specific guidelines and in many countries, screening rates for this age-group have even dropped.<sup>12-16</sup>

As a result, numerous interventions have been posited to increase cervical cancer screening among young women.<sup>8</sup> However, there has not yet been a systematic assessment of the barriers and facilitators that determine uptake among this age-group. This information would be useful in designing targeted and efficacious interventions. The aim of this systematic review was to systematically characterize the existing literature on barriers and facilitators for cervical cancer screening among young women globally.

## Methods

The systematic review was conducted according to the standards and guidelines established in the Preferred Reporting Items for Systematic Reviews and Meta-Analysis, in addition to the fourth edition of the Joanna Briggs Institute Reviewer's Manual.<sup>17,18</sup> We conducted a systematic literature search of four databases: Medline-OVID, EMBASE, CINAHL, and ClinicalTrials.gov.

We remained broad with our search criteria in order to maximize sensitivity. Our search strategy is included in Table 1.

The age cut-off of 35 years was determined based on previous literature regarding young women and cervical cancer screening.<sup>8,12</sup>

We only examined original, peer-reviewed literature. Databases were examined from inception until the date of our literature searches (12/03/2020). Published conference posters, papers, and abstracts were eligible for inclusion. Articles were excluded if they did not specifically discuss cervical cancer screening, were not specific to young women, or did not report outcomes or evaluation. Eligibility criteria are outlined in Table 2.

### *Study Selection and Extraction*

All steps of the systematic review were performed in duplicate. Study selection was completed by two independent, parallel reviewers (AK, SL) for both title and abstract screening as well as full-text screening. Data extraction was performed by two investigators (AK, SL), with a third (XL) resolving discrepancies. Outcomes were summarized descriptively. Risk of bias for individual studies was graded using an adapted rating scale based on the Risk of Bias Instrument for Cross-Sectional Surveys of Attitudes and Practices.<sup>19</sup>

## **Results**

### *Search Yield*

Results of the study screening process are available in the PRISMA diagram in Figure 1. Of the 2177 original database citations, 1563 records remained after duplicates were removed. After title and abstract screening, 226 were eligible for full-text evaluation. After a hand-search of relevant journals and citations, no additional studies were added. Of the 226 full-text articles, a total of 36 were included in the systematic review.

Inter-rater agreement for study screening for titles and abstracts was 94.54% with a kappa of 0.79. Inter-rater agreement for full-text screening was 96.2% with a kappa of 0.84, indicating substantial agreement.

### *Article Characteristics*

The study locations were highly diverse and featured a wide spread across Africa (8/36, 22.2%), Asia (8/36, 22.2%), North America (11/36, 30.6%), South America (2/36, 5.6%), Australia (1/36, 2.8%), Europe (6/36, 16.7%). High-income countries included the United States, Canada, Denmark, Sweden, Japan, Korea, Australia, and the United Kingdom. Low- and middle-income countries included Brazil, China, Ghana, Malaysia, Nigeria, Oman, and Saudi Arabia.

The included study designs were largely qualitative and observational. The majority (25/36, 69.4%) included either surveys or questionnaires, with the remainder including either focus groups (7/36, 19.4%) or interviews (2/36, 5.6%). All studies were graded as medium risk for bias using the Risk of Bias Instrument for Cross-Sectional Surveys of Attitudes and Practices.

The 36 studies included a total of 14362 participants, with an average sample size of 410.3 (SD 662.7) participants per study. Around half (17/36, 47.2%) of studies specifically targeted students. The average age of participants across all studies was 22.4 years (SD 4.5).

The majority of studies (31/36, 86.1%) discussed barriers and facilitators to Pap testing specifically, while one study analyzed self-sampling (1/36, 2.8%), one study targeted HPV DNA testing (1/36, 2.8%), and the remainder (4/36, 11.1%) were not specified.

Details of the included studies are provided in Table 3.

### *Analysis of Notable Barriers*

There were numerous barriers cited by the young women and adolescents regarding cervical cancer screening. The barriers can be grouped into three large groups: lack of knowledge/awareness, negative perceptions of testing, and practical barriers.

#### *i) Lack of Knowledge/Awareness*

Most notably, 26/36 (72.2%) of studies reported lack of knowledge or awareness in young women regarding cervical cancer prevention. Three studies<sup>20-22</sup> noted lack of physician recommendation, while one noted low overall health literacy of participants.<sup>23</sup>

Misinformation included beliefs that young women were not susceptible in 4/36 studies,<sup>20,24-26</sup> that screening was not necessary if not currently experiencing symptoms,<sup>27</sup> and that the Pap test was not effective/reliable for screening cervical cancer.<sup>28,29</sup> Other misconceptions

included that a male partner's circumcision prevented their need for cervical cancer screening.<sup>30</sup> In four studies, there was a fear that pelvic exams could "take one's virginity," reported in Ghana, Malaysia, and the United States.<sup>21,23,24,31</sup>

## ii) Negative Perceptions of Testing

A large number of young women had fears and anxieties regarding the screening experience. Ten studies cited a fear of pain/discomfort during Pap smears, with 13/36 studies noting embarrassment of the intimate examination. Three studies noted the invasiveness of the procedure being of particular concern.<sup>32-34</sup> Male gender of physicians was also noted to impede motivation for screening in two studies.<sup>32,35</sup>

Stigma around cervical cancer was noted in 4 studies,<sup>23,30,33,36</sup> with two of the studies reporting stigma around the general act of visiting a gynecologist's office.<sup>23,33</sup> Confidentiality was a concern noted in three studies,<sup>37-39</sup> with two specifically noting privacy from parents.<sup>37,39</sup>

Two studies discussed fear of side effects or complications from screening.<sup>36,40</sup> Five studies discussed fear regarding potential diagnosis of cancer as a barrier to screening.<sup>34,38,39,41,42</sup>

## iii) Practical Barriers to Testing

There were a number of logistical barriers noted to accessing cervical cancer screening.

Six studies discussed low accessibility to services.<sup>22,23,26,32,37,41</sup> Participants reported difficulties in finding a consistent healthcare provider, especially after moving away for work or school.<sup>26,32</sup> Difficulties were also noted in rural areas with only a single provider<sup>24</sup> or locations with reduced access to female physicians.<sup>32</sup>

Transportation was noted as a barrier in two studies.<sup>39,43</sup> Cost of screening services and financial constraints were noted as a barrier in six studies,<sup>20,21,24,37-39</sup> with two studies located in lower income countries (Ghana, Malaysia) and the remainder in the United States.

Time constraints were cited in three studies.<sup>20,24,26</sup> One study noted that participants preferred to schedule their appointments according to their menstrual cycle, which posed further limitations.<sup>26</sup>

## *Analysis of Notable Facilitators*

Many studies discussed facilitators and interventions that encouraged young women to undergo cervical cancer screening. Increased knowledge and awareness were noted in twelve studies.<sup>24,26,28,30,33,34,36,39,42,44-46</sup> Specific points of knowledge included severity of disease,<sup>24,30</sup> as well as the understanding that the test could allow successful prevention and treatment of cancer.<sup>28</sup> High self-efficacy and perceived control/empowerment about health was a facilitator in three studies.<sup>43,47,48</sup>

Trusting and longitudinal relationships with their healthcare providers were noted as facilitators in four studies,<sup>25,32,39,42</sup> as was choice of healthcare provider specifically<sup>25</sup> or testing by a female physician.<sup>32</sup> Hobbs et al<sup>39</sup> specifically noted that physicians who were able to communicate well and put patients at ease acted as a facilitator. Alternative methods of screening such as self-sampling were noted as a facilitator of cervical cancer screening to avoid perceived invasiveness.<sup>34,49</sup>

Social norms and public perceptions, including if friends and family members received testing, was noted as a facilitator.<sup>20,29,33,37,46,48</sup> A diagnosis of cervical cancer in the family was noted as a motivation for undergoing screening,<sup>33</sup> as well as support or encouragement from one's mother specifically.<sup>37</sup> Media coverage was noted to encourage participation in cervical cancer screening, particularly if involving celebrities or public figures.<sup>26,34</sup>

Facilitators to improve the logistical barriers of cervical cancer were analyzed. Five studies noted either telephone or written reminders would be helpful for patients.<sup>25,32,39,42,43</sup> To address the time constraints of patients, Black et al<sup>32</sup> and Blomberg et al<sup>25</sup> noted that cervical screening could be linked with appointments for prescription renewals or other examinations. In addition, Blomberg et al<sup>25</sup> suggested flexibility in time and location of screening, including options such as screening available on college campuses. Shorter wait-times, expanded clinic hours, and having someone pick up the phone when patients book appointments were noted as practical options by Hobbs et al<sup>39</sup>. Cost-free services, provision of babysitting services, and arranged transportation were also suggested.<sup>25,35,39</sup>

## **Discussion**

## Main Findings

Our study is the first systematic review of barriers and facilitators to cervical cancer screening specifically for young women and adolescents under the age of 35. While there have been calls to action regarding this topic, it has been difficult to characterize the breadth of young women's perspectives regarding screening. Our 36 included studies had a diverse spread of country locations across low-, middle- and high-income countries in addition to a range of study populations. Barriers encompassed three groups: lack of knowledge/awareness, negative perceptions of the test, and practical barriers to testing. Facilitators included stronger relationships with healthcare providers, social norms, support from family, and self-efficacy.

Our results support the current literature base regarding the uptake of cervical cancer screening in young women. Young women face unique barriers and facilitators in comparison to older groups, necessitating age-specific interventions. Our studies highlighted age-specific barriers such as concern about privacy from parents, transportation difficulties, and continuity of care after moving away for school. In addition, as this is typically the first invasive procedure that young women undergo, there were concerns about pain, discomfort, and the intimacy of the pelvic exam. The young women who participated in these studies had helpful suggestions regarding age-specific interventions, such as emailed reminders in comparison to written reminders, or screening provided on college campuses. Our literature also aligns with the greater research base regarding young people and low preventative service use in general, as many young people do not have a consistent family physician.<sup>50,51</sup>

When comparing results internationally, we noticed that many themes were universally represented across income levels. There were accessibility concerns, cost concerns, and knowledge gaps in both lower and higher income countries. However, it is important to note that screening rates differ across the globe, and even within the same country for lower income and minority populations. As financial constraints were cited as a frequent barrier in our included studies, it is not surprising that women from lower socioeconomic backgrounds have lower screening rates.<sup>52,53</sup> In addition, women from minority populations may have more strained relationships with the health system due to discrimination, lack of cultural competence, and the historic failure of medical systems to be equitable towards minority groups.<sup>54,55</sup> This is particularly relevant to cervical screening, as the patient's individual relationship with the health system was noted as an important barrier or facilitator towards screening. To increase cervical screening rates, it is important that we improve health system interactions overall to be more equitable.

Additionally, we noted that cultural barriers were discussed in several studies, including sex-negative beliefs.<sup>23,30,34,36</sup> Several studies highlighted a fear of hymen breakage with the pelvic exam, which has the societal stigma against virginity loss.<sup>21,23,24,31</sup> This concept was not only studied in Asia and Africa, but also included two studies from the United States.<sup>23,31</sup> It is important to educate about the concept of virginity as a social construct and improve sexual education for girls. In higher-income countries, language barriers, health literacy, and cultural beliefs were also noted as barriers among recent immigrants. Recent literature has shown that the "healthy immigrant effect" tends to taper off after several decades in a new country, with immigrants at higher risk of poor health outcomes and underuse of health services.<sup>56,57</sup> Specific to cervical cancer, immigrant and minority populations in developed countries are at higher risk, often due to low screening rates.<sup>58,59</sup> Thus, interventions that target cervical screening uptake should have an intersectional approach in addressing these issues, rather than a "one size fits all" approach.

## Strengths and Limitations

Strengths of our review include our systematic search of four databases using broad search criteria to maximize findings. Studies were not excluded by basis of date of publication, country of origin, or language of origin. To capture the full breadth of explored research, conference abstracts were included. Our two parallel reviewers had high inter-rater agreement. We also included age ranges up to 35 years, based on what has been completed in previous literature. Limitations include that this review included qualitative studies that may have been limited by selection and publication bias, particularly for lower-income countries that may not be well-represented in academic research. In addition, cervical cancer screening guidelines (e.g. age to start screening) may differ depending on country, which may limit generalizability of results. Survey and interview results may also be compromised by reporting bias, if study participants are potentially embarrassed to discuss barriers or facilitators. More rigorous and systematic research with an equity-focused lens is recommended to generalize results to different populations and obtain higher quality information.

## Next Steps and Implications for Care

Further research is required to characterize which interventions are the most effective for different age groups, including a diverse range of ethnicities, sexual orientations, educational backgrounds, and income levels. Moreover, we were surprised that none of the studies specifically targeted the beliefs of non-heterosexual or non-cisnormative participants, as this has been documented as a growing public

health concern and source of misinformation.<sup>62–65</sup> Studies regarding transgender men were eligible for study inclusion, but yielded no search results based on our protocol. Further specific investigation is required to understand this topic, from both the perspective of the patient and the physician.

Our results were encouraging regarding potential solutions for improving cervical cancer screening uptake. While some barriers such as fear of cancer diagnosis or longstanding cultural beliefs are difficult to address, other barriers offer feasible solutions. Younger women may have less control in their lives regarding transportation and scheduling, particularly when coordinating with parents, babysitting siblings, or school schedules. It was remarkable how many small changes, such as written reminders, pamphlets, or linking screening with other appointments, were noted to act as facilitators. In addition, multiple misconceptions about cervical cancer screening still persist, such as the belief that screening is only required if a patient is experiencing symptoms. Our studies suggested the effectiveness of awareness campaigns that are specifically aimed at younger people. Campaigns targeting the parents of younger girls, particularly mothers, may also be important as studies noted that parental support was a facilitator for screening.

Through addressing the above barriers and facilitators, health systems worldwide can hopefully address the much-touted goal of zero preventable deaths from cervical cancer. Young women who undergo screening are more likely to continue the practice as a lifelong habit as well as later recommend the practice to their children and peers.<sup>8–11</sup> They are also more likely to espouse positive beliefs about the health system, sex-positive beliefs, and regain empowerment regarding their health.<sup>60,61</sup> As such, every young woman who is screened offers a chance of strengthening a community around women's health.

## Conclusion

Our comprehensive systematic review found that there are three large categories of barriers for young women: lack of knowledge/awareness, negative perceptions of the test, and practical barriers to testing. Facilitators included stronger relationships with healthcare providers, social norms, support from family, and self-efficacy. Health systems worldwide should address the above barriers and facilitators to increase cervical cancer screening rates in young women.

## Declarations

*Ethics approval and consent to participate:* Not applicable

*Consent for publication:* Not applicable

*Availability of data and materials:* The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

*Competing interests:* None

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*Authors' contributions:* The authors contributed substantially to the review design (AK, MS, SL), background searches (AK, SL, XL, MY), search strategy (AK, MS, SL), data collection (AK, SL), screening (AK, SL), analysis (AK, SL, XL, MY), and manuscript writeup (AK, MS, SL, XL, MY).

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## Tables

Table 1: Search Strategy.

**Database: Ovid MEDLINE: Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE® Daily and Ovid MEDLINE®**

1946 - March 11 2020

*Adapted for EMBASE and CINAHL*

#	Searches
1	VAGINAL SMEARS/
2	(vagina* AND smear*).ti,ab
3	(pap AND test). ti,ab
4	cytology.ti,ab
5	(pap AND smear). ti,ab
6	(cervical adj2 (smear OR screen*)).ti,ab
7	(papanicolaou adj2 (smear OR test*)).ti,ab
8	1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7
9	(youth* or adolescen* or (young adj2 (adult* or person* or individual* or people* or population* or wom#n)) or youngster* or college* or university*).ti,ab. or adolescent/ or young adult/
10	(barrier* OR facilitator* OR perception* OR perspective* OR utilization* OR view*).ti,ab.

Table 2: Eligibility Criteria

<p><u>Population:</u> Young women (defined as 35 years of age or under) of any country worldwide</p> <p><u>Intervention:</u> Any assessment of patient-reported barriers and facilitators related to cervical cancer screening</p> <p><u>Comparator:</u> N/A</p> <p><u>Outcomes:</u> Any outcome reported in the literature (qualitative or quantitative) _</p>
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Table 3: Details of Included Studies

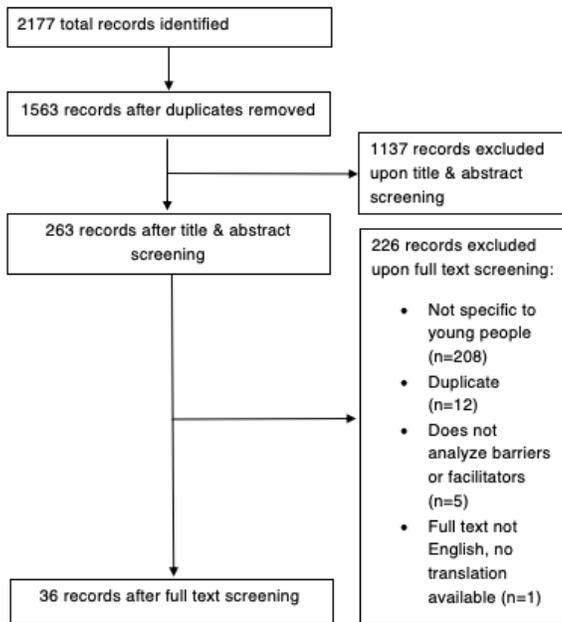
Author name, Year, Country	Study Design; graded Risk of Bias	Sample Size; Population Details	Average age (SD)	Type of Screening	Barriers	Facilitators
Abotchie & Shokar, 2009; Ghana <sup>24</sup>	Cross-sectional survey; medium risk	157 university students	NR (age range 20-35, most between 21-25)	Pap smear	Low knowledge, low awareness, concern regarding partner disapproval, cost, time constraints, embarrassment, perceived not susceptible, fear of virginity loss	Knowledge of benefits of screening, perception of severity of disease
Agboeze, Nwali & Ezeani, 2018; Nigeria <sup>41</sup>	Cross-sectional survey; medium risk	234 female students	22 (SD 3)	Pap smear	Low awareness, low accessibility, fear of cancer diagnosis	NR
(Abstract only)						
Akujobi, Ikechebelu, Onunkwo & Onyiaorah, 2008; Nigeria <sup>66</sup>	Cross-sectional survey; medium risk	220 third and fourth year female science students	23.8 (SD NR)	Pap smear	Lack of knowledge, lack of awareness about importance of screening, lack of awareness about where services are attainable	NR
(Abstract only)						
Al-Naggar, Low & Isa, 2010; Malaysia <sup>21</sup>	Cross-sectional survey; medium risk	287 female university students	20.9 (SD 1.89)	Pap smear	Fear of intimate nature of examination, HCP did not recommend/educate, lack of awareness of screening sites, cost, fear of virginity loss, embarrassment, fear of pain and discomfort	NR
Al-Shaikh et al., 2014; Saudi Arabia <sup>40</sup>	Cross-sectional survey; medium risk	1400 students studying health fields	20.4 (SD 1.3)	Pap smear	Lack of awareness, perception of low sensitivity of test, misconception of serious complications of test	NR
Albuquerque et al., 2014; Brazil <sup>67</sup>	Cross-sectional survey; medium risk	493 women, young women (<20) n=64	35.4 (SD NR)	Pap smear	Low knowledge and awareness	NR
Alwahaibi, Alramadhani, Alzaabi, Alsalami, 2017; Oman <sup>28</sup>	Cross-sectional survey; medium risk	494: 204 patients, 133 staff, 157 students	NR (students all age 20-30)	Pap smear	Low knowledge, lack of awareness, physician gender, uncertainty of reliability of Pap smears	Belief of test allowing successful prevention and treatment for cancer
Annan, Oppong, Asante & Nuworza, 2019; Ghana <sup>44</sup>	Cross-sectional survey; medium risk	200 female university students	20.4 (SD 1.96)	Unspecified	NR	Cervical cancer knowledge, perceived susceptibility, perceived deadliness, perceived benefits of screening
Ayinde, Omigbodun, Ilesanmi, 2004; Nigeria <sup>45</sup>	Cross-sectional survey; medium risk	421 undergraduate students	23.6 (SD 3.6)	Pap smear	Lack of awareness	Increased knowledge and awareness
Biggaard,	Qualitative	Sample size	NR (age	Pap smear	Lack of knowledge,	NR

Mortensen, Kvernrod, 2018; Denmark <sup>68</sup>	focus groups (cross-sectional); medium risk	not reported in abstract; HPV vaccinated women	range: 23-29)		perceived not susceptible (test not relevant to them)	
(Abstract only)						
Binka, Nyarko & Doku, 2015; Ghana <sup>69</sup>	Cross-sectional survey; medium risk	410 female students	NR (83% <29 years; 17% >30)	Unspecified	Lack of awareness	NR
Black, McCulloch, Martin & Kan, 2011; Canada <sup>32</sup>	Cross-sectional focus groups; medium risk	80 women	NR (98% between age 20-29)	Pap smear	Discontinuity of care from HCP after moving away for work/ school, difficulty finding female HCP, fear of discomfort and invasiveness of test, lack of awareness, lack of time	Reminders, email from HCP, linking testing to renewal appointment for oral contraceptives, assistance with finding HCP, longitudinal relationship with HCP or clinic, education, testing by female HCP, increased convenience (e.g. clinic on campus)
Blomberg et al., 2011; Sweden <sup>25</sup>	Cross-sectional focus groups; medium risk	138 women from Stockholm cervical cancer screening registry	30 (SD 0)	Pap smear	Fear of pain and discomfort	Letter of invitation, flexibility in timing and location, choice of HCP, having test done with other exams, social marketing on importance of screening, cost-free testing
Blomberg et al., 2011; Sweden <sup>70</sup>	Cross-sectional focus groups; medium risk	38 women from Cervical Cancer Screening administrative registry	30 (SD 0)	Pap smear	Lack of knowledge, lack of awareness, perceived not susceptible	Existing relationship with clinic
Byrd, Peterson, Chavez & Heckert, 2004; United States <sup>31</sup>	Cross-sectional survey; medium risk	200 women	21 (SD NR)	Pap smear	Embarrassment, pain, embarrassment, fear of virginity loss, lack of awareness of where to be tested, fear of partner disapproval, misconception (only women who have had babies) need to be tested, fear of testing perceived as sexual activity	NR
Duffet-Leger, Letourneau & Croll, 2008; Canada <sup>48</sup>	Cross-sectional survey; medium risk	1041 university students	20.7 (SD 1.77)	Pap smear	NR	Beliefs/behaviours of friends and family, sense of empowerment about getting Pap test
Head & Cohen, 2012; United States <sup>37</sup>	Cross-sectional individual and group interviews; medium risk	19 women	NR (median age of 20)	Pap smear	Negative past experiences, limited choice in HCP, fear of parental disapproval, cost, low accessibility, lack of privacy in small community (e.g. running into someone they know at the clinic)	Encouragement/support from mother
Hobbs, 2000; United States <sup>39</sup>	Qualitative focus groups; medium risk	15 sexually active adolescents	18.7 (SD NR)	Pap smear	Lack of knowledge, fear of pain, embarrassment, fear of result, fear of unknown, perceived invincibility, HCP characteristics, fear of parents finding out, cost, lack of time, transportation	Education, trusting relationship with HCP, HCPs able to communicate well and put patients at ease, assured confidentiality, school programs, shorter wait times, telephone/email
(Abstract only)						

						reminders, provision of babysitting or transportation, expanded clinic hours, having someone answer the phone when patients book appointments
Hoque 2013, South Africa <sup>27</sup>	Questionnaire; medium risk	169 full-time undergraduate students	20.81 (SD 1.7)	Pap smear	Low knowledge, fear of procedure, not currently experiencing symptoms	NR
Hoque 2014, South Africa <sup>49</sup>	Questionnaire; medium risk	440 university students	20.39 (SD 1.71)	Pap smear	Low knowledge	High self-efficacy
(Abstract only)						
Jayasinghe 2016, Australia <sup>46</sup>	Online survey; medium risk	149 women	23.2 (SD 2.1)	HPV DNA testing	Repetitive screening frequency	Public perceptions, national guidelines, gynecologist beliefs
Jubelirer 1996, United States <sup>38</sup>	Questionnaire; medium risk	279 tenth-grade girls	15.3 (SD NR)	Pap smear	Embarrassment, pain, fear of cancer, confidentiality, cost	NR
Kahn 1999, United States <sup>42</sup>	Semi-structured interview; medium risk	15 adolescents	18.7 (SD 1.9)	Pap smear	Pain, embarrassment, fear of cancer, denial, poor HCP relationship, low knowledge, misinformation	Education, better HCP relationships, telephone and written reminders
Kahn 2001, United States <sup>45</sup>	Questionnaire; medium risk	490 adolescents and young girls at pap smear follow-up clinics	18.2 (SD NR)	Pap smear	Pain, inconsistent HCP, embarrassment, lack of HFP communication, lack of time, lack of transportation	Reminders, perceived control, perceived susceptibility
Kaneko 2018, Japan <sup>35</sup>	Online survey; medium risk	700 unmarried women	26.0 (SD NR)	Pap smear	Male physician	Free coupon for screening, perceived susceptibility
Kim 2014, Korea <sup>71</sup>	Questionnaire; medium risk	303 unmarried female university students	22.4 (SD 2.0)	Pap smear	Low knowledge/awareness	NR
(Abstract only)						
Kim 2019, Korea <sup>29</sup>	Online questionnaire; medium risk	124 unmarried university students	NR	Pap smear	Unsure of effectiveness, low awareness	Subjective norm
(Abstract only)						
Langille 2006, Canada <sup>22</sup>	Questionnaire; medium risk	1090 high school adolescents	16.6 (SD 0.1)	Pap smear	Lack of discussion with HCP, no physician, rural area	Education from HCP
Lee 2017,	Focus group;	16 young	26 (SD	Pap smear	Low knowledge, culture-	NR

United States <sup>23</sup>	medium risk	korean immigrant women	NR)		specific barriers, low accessibility to healthcare, embarrassment, fear of virginity loss, stigma around visiting gynecologist clinic, language barriers, low health literacy	
Lorenzi 2019, Brazil <sup>49</sup>	Survey; medium risk	33 women with abnormal pap smears	NR (aged <29)	Self-sampling	Embarrassment, pain	Easy to use, easy to understand, practicality
Najem 1996, United States <sup>20</sup>	Survey; medium risk	3343 inner city high school girls	NR (aged 13 and up)	Pap smear	HCP did not recommend, lack of awareness, cost, unaware of location, perceived not susceptible, time constraints, believed test was not accurate, embarrassment, time constraint	Family role models
Ogbonna 2017, United Kingdom <sup>30</sup>	Survey; medium risk	186 UK university students from Sub-Saharan Africa	NR (majority between age 18-24)	Pap smear	Low knowledge, misconceptions (such as around circumcision), cultural barriers, stigma	Perception of deadliness
Okoeki 2016, United Kingdom <sup>34</sup>	Semi-structured interviews, focus group; medium risk	24 young women	NR (age range 25-34)	Pap smear	Low awareness, embarrassment, anxiety, association with sex, intimate, cultural barriers, fear of cancer, invasiveness	Education on sensitivity, education, alternative screening methods (self-sampling)
Oshima 2013, Japan <sup>33</sup>	Focus group; medium risk	15 university students	NR (age 20-22)	Pap smear	Lack of knowledge, misconceptions, lack of motivation, reluctance to visit gynecologist (embarrassment, stigma, invasiveness)	Media information, norms of family and friends, diagnosis within their family, education
Pan 2014, China <sup>36</sup>	Survey; medium risk	1878 medical students	20.8 (SD 1.3)	Unspecified	Side effects, inadequate information, low knowledge, stigma around premarital sex	High knowledge
Waller 2012, United Kingdom <sup>26</sup>	Interview, focus group; medium risk	27 young women	NR (age range between 25-34 for young women)	Unspecified	Lack of access to HCP (mobility, lack of consistency), fewer reminders, time constraints, lack of peer pressure, low perceived low perceptibility, menstrual cycle timing, low knowledge, pain, uncomfortable comments, apathy	Awareness, media coverage

## Figures



**Figure 1**

PRISMA Diagram

## Supplementary Files

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