Nagendiram, Archana, Bougher, Hannah, Banks, Jennifer, Hall, Leanne, and Heal, Clare (2019) ***Australian women's self-perceived barriers to participation in cervical cancer screening: a systematic review.*** **Health Promotion Journal of Australia, . (In Press)**

ABSTRACT

Background: Australia has recently introduced a new screening program for cervical cancer. There has also been a decline in participation rates for cervical screening.

Aim: To complete a systematic literature review of the factors that prevent Australian women from participating in cervical screening.

Methods: Authors searched CINAHL, Medline, SCOPUS and the Cochrane Library to obtain articles discussing Australian women's self-identified barriers to cervical screening. Quantitative studies published in peer-reviewed journals after 1991 were considered. PROSPERO Registration Number: CRD42018105028.

Results: The final search produced 1749 studies, with 13 quantitative papers included in the narrative synthesis after screening by two independent reviewers. No articles were excluded due to bias.

Discussion: Self-identified barriers to screening were categorised into personal, practitioner, test-related and logistical factors. The most commonly stated barriers included lack of time, embarrassment, fear of results, irrelevance and male health professionals. The use of HPV triage in cervical screening was not a barrier to screening however, some women regarded self-collected HPV testing as a barrier. Barriers to self-collection included desire for the general practitioner to complete the test, fear of doing the test incorrectly, wishing to include it in a general check-up and concerns about the test itself.

Conclusion: A variety of personal, practitioner, test-related and logistical barriers negatively impact the screening participation of Australian women. Further research into barriers in the Australian population, and women's attitudes towards HPV testing and self-collection is required to create effective health interventions to improve participation in cervical screening.

INTRODUCTION

Cervical cancer is a devastating but highly preventable disease for which timely screening is of vital importance. Australia's National Cervical Cancer Screening Program (NCSP) was introduced in 1991 and cervical cancer mortality in Australia has halved since its implementation. Between 2015 and 2016 the NCSP cost the government $55.5 million, proving more expensive than bowel or breast cancer screening programs. In spite of the importance of screening for this highly preventable cancer, only 56.0% of eligible Australian women were screened for cervical cancer between 2015-2016, which was less than the 58.1% screened in 2012-2013.[1] This is also lower than the average Organisation for Economic Co-operation and Development (OECD) reported screening rate of 61.6% in 2013, and substantially lower than highly screened countries such as the United States at 84.5%. Screening programs are in fact, an indicator of national health quality of care in the OECD Health Indicators and are a marker of national progress in health care.[2] Previous research has shown that the populations that are less likely to participate in screening include women from low socioeconomic backgrounds, rural areas, migrant backgrounds and Aboriginal and Torres Strait Islander heritage.[1,3]

From 1st December 2017, the Australian Government implemented a new NCSP and replaced the biannual Pap test with a five yearly Cervical Screening Test. Women are now screened for cervical cancer every five years from the age of 25 to 74 years with partial HPV genotyping and a reflex liquid based-cytology. Never-screened or under-screened women over 30 years of age will also be offered a self-collected vaginal sample for HPV.[1] The new NCSP provides an opportunity to discuss the decline in cervical screening rates in Australia.

Understanding barriers to screening participation is crucial if increasing compliance with screening participation is to be achieved. Previous literature reviews have assessed barriers to cervical screening by country, specific sub-populations or using purely qualitative studies. These reviews identified a variety of personal, cultural and institutional factors that prevented women from participating in cervical screening.[4-7] A literature review on cervical screening in countries with a national screening program, categorised barriers into two themes: the decision process behind participating in screening and any negative connotations associated with screening. Barriers that impacted a woman's decision-making process included believing screening to be irrelevant and being unsure of its value. The procedure, emotional experiences, practitioner-related factors, fear of the test or fear of a positive result caused women to have negative associations with screening.[6] Previous literature reviews also concentrated on screening barriers of migrant women.[8-10] Johnson et al. identified barriers in migrant women including fatalistic attitudes towards screening, lack of knowledge, feeling well and threat to virginity.[10] To our knowledge there are no completed or on-going literature reviews that synthesise barriers to cervical cancer screening in an Australian context.

Identifying barriers to screening will facilitate an understanding of why participation in cervical screening is decreasing in Australian women and assist in the creation of evidence-based interventions to reverse this trend. Subsequently, this review aims to ascertain the self-identified barriers that prevent Australian women from participating in cervical screening. It will assess quantitative studies that discuss what Australian women who are eligible for screening, under both versions of the NCSP, identify as barriers for cervical cancer screening. It will also present the cervical screening rates of women in the included studies. This is a timely study given the recent introduction of the new screening guidelines and will synthesise the why women decline to participate in this potentially life-saving screening program.

METHODS

This study protocol was prospectively registered with PROSPERO (Registration Number: CRD42018105028) and reported according to the 'Preferred Reporting Items for Systematic Reviews and Meta-Analyses' (PRISMA) guidelines.[11]

ELIGIBILITY CRITIERA

Reviewers determined selection criteria to assess the appropriateness of articles for inclusion in this review. Quantitative peer-reviewed articles written in English and published after the introduction of the original NCSP in 1991 were considered. Inclusion criteria included: discussion of firm barriers to cervical screening; barriers must be directly identified by Australian women and articles must be written in the context of the Australian NCSP (old or new). A 'barrier' was defined as a belief that would actively prevent an Australian woman from participating in cervical screening. Reviewers excluded articles related to the results of interventions to improve cervical cancer screening and any barriers identified through purely statistical analysis. Previous hysterectomy or no prior sexual activity were omitted as barriers, as under NCSP guidelines it is not appropriate to screen these women. Systematic reviews, letters, case reports and purely qualitative studies were excluded.

INFORMATION SOURCES

A comprehensive search was conducted of quantitative studies published on MEDLINE (Ovid), CINAHL, Scopus and the Cochrane Library on 15th May 2018. The final search of these databases was conducted on 27th July 2018. Additional articles were also identified by perusing the reference lists of included articles and excluded review articles.

SEARCH STRATEGY

Articles from SCOPUS and Cochrane Library were searched using key words, Boolean Operators and truncations. MEDLINE (Ovid) and CINAHL were searched using these methods in conjunction with the appropriate MeSH headings. Search terms included keywords for cervical screening (e.g. pap test), attitudes (e.g. opinions) and Australian location (e.g. Sydney OR Aust*). This search was conducted in assistance with a medical librarian. Full search details are outlined in Appendix 1.

STUDY SELECTION

Search results were imported into EndNote and duplicates were removed. Titles and abstracts were screened by two independent reviewers (A.N. and H.B.) to identify articles that may meet the inclusion criteria. These reviewers then independently assessed the full texts of these articles using the pre-determined selection criteria and any disagreements regarding the eligibility of studies were discussed with a third reviewer (J.B.).

DATA COLLECTION

Data was extracted by two authors (A.N. and H.B.) and tabulated. The reviewers developed a standardised extraction protocol that included study population, study methodology, recruitment strategy, participant numbers and completion rates. Reviewers also extracted barriers to screening and the calculated screening participation rate. Authors were contacted for further data when necessary.

RISK OF BIAS

The included studies were assessed using a modified version of National Heart, Lung and Blood Institute Quality Assessment Tool for observational studies.[12] Each criterion was allocated equal weighting and these studies were then graded as good, fair or poor. Any studies found to be of poor quality were interpreted with caution.

SUMMARY MEASURES

The principal summary measure was the proportion of women who identified a specific factor as a firm barrier to screening. If available, barriers were presented by screening status (e.g. well-screened, under-screened, never-screened). Results were presented with statistical significance where possible.

Authors were unable to complete a meta-analysis due to the heterogeneity of the data and the lack of a comparison group in most studies.

RESULTS

The final search across MEDLINE (Ovid), CINAHL, Scopus and Cochrane Library produced 1743 articles (Fig. 1). After duplicates were removed, 1491 papers were screened based on title and abstract. Forty-nine full texts were assessed for eligibility and thirty-two articles were excluded as they did not meet the pre-determined inclusion criteria. Two articles were excluded as a copy of their full text could not be obtained. A further two articles were excluded after discussion with the third-party reviewer (J.B.). Six articles were identified from perusing reference lists from the included articles and excluded review articles. These six articles were excluded per the inclusion criteria. A total of 13 studies were included in this review.

Figure 1: PRISMA Flow Chart

STUDY CHARACTERISTICS

The included articles all utilised cross-sectional surveys for their study methodology. Dieng et al. and Sultana et al. surveyed women from the general Australian population. The remaining studies concentrated on the following subgroups of the population: women who have sex with women (WSW)[13], migrant women[14-17], older women[18], bone marrow transplant (BMT) survivors[19], rurality[20] and women with a history of mental illness[21] or sexual assault[22]. (Table 1)

Table 1: Study characteristics table

RISK OF BIAS

Using the Quality Assessment Tool, five studies were found to be good quality and eight studies were found to be fair quality. No studies were deemed to be of poor quality. (Table 2)

Table 2: Quality Assessment Tool

RESULTS OF INDIVIDUAL STUDIES

Table 3: Results Table (Barriers to Cervical Screening)

Personal Barriers

Seven of the thirteen studies reported that women's personal beliefs prevented participation in regular cervical screening. Identified personal beliefs included: perceiving screening to be irrelevant, a lack of knowledge about screening, fear of the test and fear of results. [13,15,16,18-20,23]

Five studies reported that women believed cervical screening was irrelevant to them.[15,16,19,20,23] Two studies stated that migrant women believed screening to be unnecessary.[15,16] Thai immigrants believed screening was unnecessary in unmarried women,[16] while women from former Yugoslavia believed screening was unnecessary in an absence of symptoms, due to age and having had only one sexual partner[15]. A study of women who have had a previous allogenic BMT reported their belief that they did not require regular cervical screening.[19]

A lack of knowledge about screening was identified as another barrier to participation in cervical screening in three studies.[13,16,23] Sultana et al. reported that under-screened women were unsure when they required screening,[23] while Thai migrants described that they were unsure of benefits of screening and were unsure how to participate[16].

Three studies described fear of an abnormal result as a barrier to cervical screening.[15,16,18] Migrants from former Yugoslavia[15] and Thailand[16] identified that fear of cancer prevented them from participating in screening. Under-screened women between 40 to 70 years of age were reported to have identified fear of the result as preventing them from participating in screening. This barrier was less prevalent in well-screened older women.[18]

Feeling well was identified by two studies as another contributing barrier to cervical screening participation.[16,20] Girgis et al. identified across under-screened women in urban, rural and remote regions.[20] It was also identified as a barrier by Thai migrant women.[16]

Practitioner Barriers

The health professional performing the test were identified by nine of the fourteen studies as a possible barrier to screening. Barriers included comfort level with the practitioner and preferences for gender or language.[13,15-17,19-21,23] Selecting the correct practitioner was deemed a barrier by under-screened WSW[13] and women from former Yugoslavia[15].

Male health professionals were found to affect women's participation in cervical screening across five of the thirteen studies.[15-17,20,21] One paper found that a male doctor was the most frequently identified barrier in both adequately-screened and under-screened women across rural, regional and remote populations.[20] A study by Owen et al. reported that women with mental health issues also perceived a male general practitioner as a barrier to participating in cervical screening.[21] This barrier was similarly noted by Kelaher et al. in culturally and linguistically diverse (CALD) populations, who reported that male health professionals negatively impacted their screening participation. The findings of this study stated that never-screened women are less likely to agree to screening with a male doctor.[17] An additional study found that Thai immigrants prioritised cervical screening with a female general practitioner.[16] Two of the four studies on CALD women reported the language barrier between themselves and the practitioner as a factor that preventing their screening participation.[15,17] CALD women have an increased willingness to travel a greater distance to have cervical screening performed by a general practitioner that spoke their own language. These women also stated that preferred the presence of an interpreter if the health professional did not speak their language. Never-screened women from CALD communities are more likely to identify language as a barrier than well-screened CALD women in Australia.[17]

Knowing the general practitioner personally was included as a barrier by one study. Regularly screened women from urban, rural and remote regions all stated knowing the doctor on a personal basis was a barrier to cervical screening. This was also observed in under-screened women from urban and remote areas.[20]

Finally, inadequate health promotion by the health professional was reported by three studies as a barrier to screening.[13,19,23] BMT survivors were not informed by their treating physicians that they required cervical screening. [19] Brown et al. stated that WSW were incorrectly informed they were ineligible for cervical screening by their doctor. [13]

Logistical Barriers

Logistical considerations including lack of time, distance, transport, cost and forgetting to be screened prevented women from participating in screening.[13,15-21,23] A lack of time was reported as a barrier in four studies by older women[18], BMT survivors[19] and CALD women[15,16]. One study identified long distances from practitioner as a barrier to screening in well-screened women from rural and remote areas. This study also stated that in under-screened populations, distance was quoted as a barrier by women from urban, rural and remote areas. [20]

Issues with transport was a reported barrier for screening in two studies and it contributed to reduced screening participation in both CALD women and the general population.[17,23] One study listed other logistical barriers including cost and not receiving a reminder letter.[23]

Test-related Barriers

The cervical screening test itself remains a barrier to screening participation, with six studies stating embarrassment or discomfort as a barrier.[13-16,18,21-23] Under-screened women[23], migrant women[14-16] and women with a history of mental health issues[21] reported that cervical screening was embarrassing. Pain was also identified as a barrier by two studies.[16,18] Pain or discomfort was reported as a barrier by older women[18] and migrant women[15,16].

Previous adverse experiences were listed in two studies as a barrier to screening, by women with a history of sexual assault[22] and women with mental health issues[21].

Table 4: Results table (Barriers to HPV Testing)

HPV Testing

Only one study assessed women's opinion of primary HPV testing and most women preferred HPV primary testing. Those that did not prefer HPV testing stated low perceived risk and not being sexually active as barriers to screening.[24]

Two of the included studies assessed women's experiences with self-collected vaginal samples for HPV testing.[23,25] Mullins et al. stated that under-screened and never-screened women prefer self-collection in comparison to well-screened women. Barriers to self-collection included desiring the general practitioner to complete the test, fear of doing it incorrectly, wishing to include it with other tests being performed by the doctor and concerns about the tests' reliability and accuracy.[25] Sultana et al. identified that 89.2% of women preferred to perform a self-collected vaginal sample at home, 1.2% preferred to perform a self-collected vaginal sample at the clinic and 6% stated they would prefer a health professional to perform the test. The women who declined the self-collection reported they did not perform the test as they believed health professionals should complete it, were not sexually active and considered it to be not as reliable as a Pap test. Women who intended to complete the self-collected vaginal sample reported they did not as they forgot, did not have the time, believed it to be uncomfortable and were afraid of the result. [23]

Participation Rates

The age-standardised Australian screening participation rate for 2015-2016 was 56.0%.[1] A lower screening rate was seen in older women[18], BMT survivors[19] and certain migrant groups[17].

DISCUSSION

This systematic review assessed 13 papers that identified Australian women's self-perceived barriers to cervical screening.

There was a lack of consensus across the studies as to which factors significantly impeded a woman's participation in cervical screening. Lack of time, embarrassment, perceived irrelevance, fear of results and a male provider were identified in four or more studies as barriers to screening. Study bias may not be the primary reason for the lack of consensus between studies, as of these studies three were identified as good quality and five were fair quality studies and thus heterogeneity between the studied sub-groups may be underlying factor. [13-16,18-21,23] Literature reviews and research projects completed in overseas countries also have identified these factors as barriers to screening.[6,26] Tanner-Smith et al. identified that most barriers are due to cervical screening inducing negative emotions during the test itself or while awaiting results.[27]

Chorley et al. deconstructed the thought process surrounding screening into two main themes, the positive value of screening against its perceived emotional and physical threat.[6] A woman's negative association with cervical screening provides the barrier and prevents her participation in screening. The five studies that analysed barriers by screening status revealed that under-screened or never-screened women are more likely to identify barriers to screening than their well-screened counterparts.[13,17,18,20,23] For instance, Sultana et al. observed that well-screened women are less likely to identify lack of time as a barrier to screening (24.6%), in comparison to under-screened women (14.9%).[23] As per the Health Belief Model, a woman's likelihood to participate in screening is dependent on her perceived benefits against barriers to behaviour change.[28] This suggests that well-screened women may have greater understanding of the benefits of screening and that may outweigh inhibitions towards screening. Hence, well-targeted educational interventions may play a key role in empowering under-screened women to improve their screening behaviour.[29] The potential of education intervention in screening rates was demonstrated by O'Brien et al. These researchers showed at six months after the intervention, 71% of under-screened women (p=0.004) participated in cervical screening in comparison to 22% of the control group (p=0.004).[30]

Authors assessed three papers on HPV screening, with one assessing primary HPV testing[24] and two on self-sampled HPV testing[23,25]. The small number of studies addressing Australian women's attitudes to HPV testing and self-sampling exhibits the need for further research. One good quality study stated that HPV testing is not a barrier to screening, which is reassuring considering the new NCSP uses primary HPV testing.[24] Two fair quality studies assessed women's attitudes towards self-sampled HPV testing and produced conflicting results as to whether women preferred self-sampling or practitioner collecting. Nevertheless, self-sampling still presents similar barriers to conventional cervical screening such as lack of time, discomfort and fear of results.[23,25] However, the increased preference for self-sampling in never-screened (62.1%, p<0.001) and under-screened women (64.8%, p<0.001)[25] could predict promising results for the use of self-sampling in these populations in the new NCSP. Self-sampling could potentially improve cervical screening participation rates, as a Swedish study showed that women were more likely to return a home self-sample HPV test (29.8%) than make an appointment for cervical screening after a reminder letter (26.2%).[31] The primary appeal of the self-sample HPV test is the convenience of completing it at home (88% preference) rather than the medical clinic (1.2% preference).[23] However, under the new NCSP eligible women are to complete the self-sample HPV test at the medical clinic.[1] Hence, it is difficult to predict the success of this initiative. Also, the evaluated studies did not assess the barriers to seeking further medical follow-up after receiving a positive result from a self-sampled HPV test although, previous meta-analysis showed that self-screened women had a high compliance rate to further follow-up (82.2%, 95% CI = 65.8–94.4%).[32]

The screening participation rates in the included studies were mostly comparable to the Australian screening rate except in older women[18], BMT survivors[19] and certain migrants groups[17]. Self-reported screening rates are to be interpreted with caution due to a small sample of the target population and the inaccuracies associated with self-reported data. Furthermore, this review includes papers written since 1991 where the calculated participation rates of the older studies may not be reflective of the current Australian population.

Reduced screening participation in these populations may be due to their specific barriers to screening. Migrant women are more likely place increased importance on a bilingual health practitioner. This is seen in the results of Kelaher et al., as 36.4% of women stated that they would travel a long distance to see a general practitioner who spoke their language and 45.8% of these women preferred an interpreter to be present if the practitioner did not speak their language.[17] Adunlin et al. reviewed factors that prevented American immigrants from participating in breast and cervical screening which also echoed that limited English proficiency and lack of translation were barriers in these women.[8] While under-screened BMT survivors reported a belief that screening was unnecessary (29.4%) and not being informed that they required screening by their doctor (45.6%) as barriers to screening.[19] This is concerning due to the increased susceptibility of these immunosuppressed patients to cervical cancer.

LIMITATIONS

There were several limitations the authors faced when conducting this systematic review. Firstly, while all studies assessed women in the Australian population, 11 studies concentrated on sub-groups within the populations such as migrants, older women, WSW and women with mental health issues.[13-18,21] The varying cultural and personal beliefs in these subpopulations lead each group to generate unique barriers to screening and add to heterogeneity across results. In addition, none of the included studies assessed barriers to cervical screening in Aboriginal and Torres Strait Islander women, even though they are an important under-screened population in Australia.[1]

There were also inconsistencies in the presentation of results, as the studies had no universal system to classify barriers to screening. Kelaher et al. utilised the Transtheoretical Model[17] to classify barriers while Brown et al.[13] and Fernbach[15] listed barriers by the steps in the screening process. Girgis et al.[20] only reported the top three barriers for each group and the authors were contacted for the full dataset, but it was unavailable. Furthermore, the breadth of barriers studied were reliant on author's survey or interview design, Cheek et al.[14] only assessed embarrassment and discomfort whereas, Sultana et al.[23] analysed 16 different barriers to screening. In addition, only Cockburn et al clearly stated the extent to which a barrier affected screening participation.[18] In the remaining studies, authors had to assume that the investigated barriers were significant barriers to screening.

Eight of the studies did not analyse their barriers by screening status. This may be due to author preference or underpowered studies. Particular barriers analysed by screening status reported by Brown et al. were not included as they were statistically insignificant.[13]

The lack of sample size calculation and low participation rates provided the main sources of bias in the studies. All thirteen studies were cross-sectional surveys which have a higher risk of bias than other methodologies.[33] Seven studies used convenience sampling[13,17-22], two used snowball recruitment[15,16] and four used random sampling[14,23-25]. Convenience sampling and snowball recruitment are less randomised than other sampling approaches and are subject to volunteer bias.[33] This may result in a sample that is not wholly representative of the population under investigation.

Due to the review design, only published studies were assessed by authors. Certain barriers and demographic sub-populations were investigated more in published studies. For example, cervical screening in migrant women appears to be more widely researched than other populations.[14-17] The lack of studies available on the general Australian population could be due to null results leading to the study not being published or a lack of research itself. Hence, this literature review is subject to publication bias.

CLINICAL IMPLICATIONS

The reported reduction in screening participation and the introduction of the new guidelines provide an ideal opportunity to discuss barriers to cervical screening in Australia and highlight the timeliness of this review. Moreover, it is important for clinicians to understand whether the introduction of primary HPV testing and self-collected sampling will affect women's screening behaviours as Australia transitions to the new NCSP. General practitioners should offer opportunistic patient education and screening for women eligible to screening and facilitate conversations with under-screened women to overcome the barriers that prevent their participation in the NCSP. Clinicians should also be offered education regarding screening guidelines in specific subgroups as 9% of WSW[13] and 45.6% of BMT survivors[19] were provided incorrect information. Increased clinician knowledge and education interventions may lead to improved screening participation in Australian women and this could contribute to a further reduction in the incidence of cervical cancer in Australia.

POLICY IMPLICATIONS

In the new NCSP, policymakers have acknowledged the need for targeted approaches to certain subpopulations such as Aboriginal and Torres Strait Islander women, immune-deficient women and women who have experienced sexual abuse. They have also stated the need for further research and the development of appropriate screening strategies in these groups.[34] This systematic review has further identified other underscreened subpopulations that policymakers should consider when developing targeted screening strategies. These health interventions should also target under-screened populations including WSW, older women and migrant groups. The creation of health interventions to increased cervical screening in under-screened populations are key in reducing cervical cancer mortality, as fifty percent of cervical cancer occurs in never screened women.[34]

RESEARCH IMPLICATIONS

This review mainly concentrated on women's barriers to cervical screening as per the previous NCSP, as only three studies evaluated barriers to HPV testing.[23-25] Additionally, the reviewed articles often concentrated on specific groups within the general Australian population and many articles reviewed were over ten years old and. Subsequently, authors recommend new research that investigate women's barriers to cervical screening under the new NCSP, particularly primary HPV testing. As only 56% of eligible women participated in screening, there is a need to analyse barriers to cervical screening in both the general Australian population and its under-screened populations.[1] Furthermore, researchers should design and assess the efficacy of health interventions, such as education programs and media campaigns, to improve Australian women's participation in the NCSP.

CONCLUSION

Australian women do not participate in cervical screening due to a variety of personal, practitioner, logistical and test-related barriers. The most common barriers to screening are a lack of time, embarrassment, fear of results, believing the test to be irrelevant and preference for a female provider. It may be beneficial for health professionals to develop health promotion programs and interventions that target these barriers to improve the cervical screening rates in Australia. Secondly, research into women's attitudes towards HPV testing and self-sampling should be conducted considering the new cervical screening guidelines. Additional research into barriers to cervical screening in the general Australian population should also be conducted.

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Table 1: Study Characteristics†

Study	Study population	Recruitment	Participant numbers	Completion rate
Brown, 2003[13]	WSW	Convenience sampling	409	80%
Cheek, 1999[14]	Vietnamese migrants	Random sampling	199	29%
Cockburn, 1992[18]	40-70y	Convenience sampling	437	57%
Dieng, 2013[24]	18-70y	Random sampling	1279	81.4%
Dyer, 2016[19]	BMT survivors	Convenience sampling	441	76%
Fernbach, 2002[15]	Migrants from former Yugoslavia	Snowball recruitment	221	-
Girgis, 1999[20]	Rural Remote Urban	Convenience sampling	Urban 265 Rural 238 Remote 230	Urban 78% Rural 83% Remote 81%
Harsanyi, 2003[22]	Sexual assault survivors	Convenience sampling	78	-
Jirojwong, 2001[16]	Thai migrants	Snowball recruitment	145	96%
Kelaher, 1999[17]	Chinese migrants German migrants Greek migrants Muslim migrants South Sea Islanders	Convenience sampling	234	-
Mullins, 2014[25]	18-69y	Random sampling	2526	67.40%
Owen, 2002[21]	Acute psychiatric inpatients	Convenience sampling	100	87%
Sultana, 2015[23]	Never/Underscreened	Random sampling	872	25%

† Location and study design were not included in this table as all studies were cross-sectional studies completed in Australia

Table 2: Quality Assessment Tool. Modified from National Heart, Lung and Blood Institute Tool for Observational Studies.

	Quality Assessment Point†														
Study	1	2	3	4	5	6	7‡	8	9	10‡	11	12‡	13‡	14‡	OUTCOME
Brown 2003[13]	Y	Y	Y	Y	N	Y		Y	Y		N				GOOD
Cheek 1999[14]	Y	Y	N	Y	N	Y		N	Y		N				FAIR
Cockburn 1992[18]	Y	Y	Y	Y	N	Y		Y	Y		Y				GOOD
Dieng 2013[24]	Y	Y	Y	Y	N	Y		Y	Y		N				GOOD
Dyer 2016[19]	Y	Y	Y	Y	N	Y		N	Y		N				FAIR
Fernbach 2002[15]	Y	Y	N	Y	N	Y		N	Y		N				FAIR
Girgis 1999[20]	Y	Y	Y	Y	N	Y		Y	Y		N				GOOD
Harsanyi 2003[22]	Y	Y	N	Y	N	Y		N	Y		N				FAIR
Jirojwong 2001[16]	Y	Y	Y	Y	N	Y		N	Y		N				FAIR
Kelaher 1999[17]	Y	Y	N	Y	N	Y		Y	Y		N				FAIR
Mullins 2014[25]	Y	Y	Y	Y	N	Y		N	Y		N				FAIR
Owen 2002[21]	Y	Y	Y	Y	N	Y		N	Y		N				GOOD
Sultana 2015[23]	Y	Y	N	Y	N	Y		Y	Y		N				FAIR

†- (1) Defined research question (2) clear study population (3)[50 % participation rate (4) uniform inclusion and exclusion criteria (5) sample size justification (6) exposure of interest measured before outcome (7) sufficient time frame between exposure and outcome (8) examination of different levels of exposure in relation to outcome (9) defined and evenly applied exposure methods (10) exposure assessed more than once over time (11) defined and consistently applied outcome measure (12) blinding of assessors (13) loss of follow-up less than 20 % (14) key potential confounding variables measured and adjusted statistically for impact between exposure and outcome

‡- Questions 7, 10, 12, 13, 14 were not applicable to the included studies and not used to assess bias.

Table 3: Barriers and screening participation for cervical screening

Study	Study population	Screening participation (%)	Barrier	Total %	Well %	Under %	Never %	P value
Brown 2003[13]	WSW	Well-screened: 66	Deciding to have a pap test		21	34		<0.05
		Underscreened: 22	Choosing a practitioner		25	46		<0.001
		Never-screened: 12	Making the appointment		14	38		<0.001
			Informed irrelevant		6	14	18	<0.05
Cheek 1999[14]	Vietnamese migrants	Well-screened: 75	Uncomfortable/embarrassing	36-48			68	
Cockburn 1992[18]	40-70 years old	Underscreened: 41	Embarrassment		6	34		<0.001
			Fear of results		2	9		<0.001
			Pain		2	3		<0.001
			Lack of time		15	30		<0.001
Dyer 2016[19]	BMT survivors	Well-screened: 47.5	Lack of time	11.8				
		Underscreened: 52.5	Cost	2.9				
			Do not require	29.4				
			Not informed by doctor	45.6				
Fernbach 2002[15]	Migrants from former Yugoslavia	Well-screened: 77	Uncomfortable	20				
			Embarrassment	13				
			Fear of results	11				
			Lack of time	6				
			Do not require	5				
			Language preference	4				
			Gender preference	2				
Girgis 1999[20]	Urban	Well-screened: 74	Gender preference		31	46		0.05
			Personal relationship with dr		28	34		0.05
			Transport/childcare		23	-		0.05
			Distance		-	35		0.05
			Asymptomatic		-	35		0.05

	Rural	Well-screened: 76	Gender preference		28	44		0.05
			Personal relationship with dr		27	-		0.05
			Distance		26	32		0.05
			Asymptomatic		-	26		0.05
	Remote	Well-screened: 71	Gender preference		34	39		0.05
			Personal relationship with dr		28	32		0.05
			Distance		27	27		0.05
			Asymptomatic		-	27		0.05
Harsanyi 2003[22]	Sexual assault survivors	Well-screened: 67	Fear of test			26		
			Previous negative experience			35		
Jirojwong 2001[16]	Thai migrants	Well-screened: 44	Gender preference	61.4				
			Asymptomatic	56.6				
			Pain	45.5				
			Unsure of benefits	41.4				
			Unmarried	41.4				
			Embarrassment	40.0				
			Fear of result	37.9				
			Fear of test	37.9				
			Unsure how to organise	29.0				
			Lack of time	20.0				
			Afraid of speculum	17.2				
			Too complicated	8.3				
Kelaher 1999[17]	Chinese migrants	Well-screened: 49	Language preference	36.4	31.4		62.5	<0.05
	German migrants		Gender preference	78.5				
	Greek migrants		Transport	27.1				
	Muslim migrants		No interpreter	45.8	34.5		68.8	0.01
	South Sea Islanders							
Owen 2002[21]	Acute psychiatric inpatients	Well-screened: 76	Embarrassment	18				
		Under-screened: 16	Previous negative experience	12				
		Never-screened: 8	Transport	4				
			History of sexual assault	8				

Sultana 2015[23]	Never/under-screened	Screened <5y: 31 Under-screened: 39 Never-screened: 21	Irrelevant	7.8	3.3	6.8	13.9
			Unsure when needed	3.4	5.7	0.7	6.9
			Not sexually active	6.0	4.1	3.9	11.8
			Embarrassment	17.5	18.9	16.0	19.4
			Pain/uncomfortable	10.5	10.7	12.1	6.9
			Previous negative experience	5.8	3.3	9.3	0
			Not comfortable to ask dr	4.5	3.3	4.3	5.6
			Dr has not suggested	3.8	1.6	5.3	2.8
			Lack of time	13.6	24.6	14.9	2.1
			Choosing practitioner	6.0	9.0	7.1	1.4
			Travel	1.1	0.8	1.8	0
			Cost	1.0	0.8	1.4	0
			No reminder letter	4.9	10.7	3.6	2.8
			Accuracy	0.2	0	0.4	0

Table 4: Barriers, test preference and screening participation for studies on HPV testing

Study	Study population	Test type	Screening participation (%)	Testing preference (%)	Barriers (%)	
Dieng 2013[24]	18-70 years old	Primary HPV test	Well-screened: 66 Underscreened: 32	HPV test: 85	Low perceived risk Not sexually active	18 35
Mullins 2014[25]	18-69 years old	Self-collected vaginal sample	Well-screened: 75.8 Under-screened: 14.1 Never-screened:10.1	Self-collected HPV: 34.0 Practitioner: 57.4	Prefer health professional Incorrect technique Prefer to include with other tests Accuracy/reliability	53.4 28.9 8.7 1.5
Sultana 2015[23]	Never/under-screened	Self-collected vaginal sample	Screened <5y: 31 Under-screened: 39 Never-screened: 21	Self-collected HPV: 89.2 Practitioner: 6	*Completed test* Prefer health professional Not sexually active Reliability *Intended to complete* Forgot to complete Lack of time Perceived discomfort Fear of results	 17 10 6 63 21 10 5