

## SYSTEMATIC REVIEW

# A Systematic Evaluation of Methods Used and the Effectiveness of Health Education Interventions to Improve Knowledge, Beliefs, and Practices of Cervical Cancer Screening

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## ABSTRACT

**Introduction:** Screening of cervical cancer had decreased its morbidity and mortality in developed countries. Health education interventions are expected to enhance knowledge, attitude and practice of screening. Their success rely on designs and methods. Thus, this systematic review aims to identify the methods used and the effectiveness of health education interventions in improving knowledge, beliefs, and practices of cervical cancer screening among women of reproductive age. **Methods:** A systematic review of all published eligible studies in (PubMed, Science Direct and MEDLINE) databases from 1st of January 2016 to 31st of October 2020 was run using different keywords. A total of 14 research articles were included. The quality and risk of bias of studies was assessed by using EPHPP and the average score was given accordingly. This study was registered in PROSPERO (record #CRD42020188462). **Results:** The review combined 14 studies. Five studies were conducted in the USA, two in Hong Kong, one in Korea, one in England, one in Denmark, one in Norway, one in Turkey, one in Malaysia and one in Tanzania. Almost all interventions boosted the knowledge, attitude or screening uptake. **Conclusion:** This review showed that the most popular methods of delivering health intervention were health talk, Group discussion and pamphlet. Health education interventions was effective in improving the knowledge, attitude and screening uptake. Although, this effect differs according to methods of delivery, study background and populations. Therefore, it is better to understand the existing situation to develop the best intervention and more studies are needed to recognise barriers to screening.

**Keywords:** Health Education, Cervical Cancer, Screening

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## INTRODUCTION

Cervical cancer is a significant health issue globally. It is considered the second common cancer in the world in females below 45 years old, although it affects a large number of women over that age. It is the fourth most common cancer in female as reported by the World Health Organization (WHO). In 2018, the new cases were about 570,000 which represents 6.6% of all female cancers (1). However, it is considered one of the most preventable cancers. Prevention and screening remain the cornerstone of the reduction in its prevalence (2).

The major purpose of cervical screening is to detect pre-invasive cancers and treating them in order to prevent death from cervical cancer. There are several methods used to diagnose precancerous changes in cervical tissue such as Pap smear test, Visual Inspection of the cervix (VIA), Liquid-based cytology, HPV DNA

Testing and Colposcopy. The most cervical cancer screening test used globally is Papanicolaou (Pap) smear test (3). It was first introduced in the 1940s. This test was able to decrease the incidence and the mortality rate successfully, especially in developed countries by as much as 80% (4). However, it is less successful in developing countries as a result of lacking resources and infrastructure including medical, technical and financial as well as inadequate awareness among the females and health-care providers about cervical cancer (4).

Health education is a major factor in preventing diseases (5). Many studies show its success in improving the uptake of breast cancer screening (6, 7) or prostate cancer screening (8). The intervention programme application should be able to boost the knowledge, attitude and practice level of cervical cancer screening. There are different educational intervention methods used by females of reproductive age (19-64 yrs). Each of them has some benefits and restriction. Their success relay on the delivering methods, design and the applied theory. In order to design a potentially successful intervention in health education for the cervical cancer prevention, it would be valuable to collect information

on this subject and its effect on the level of knowledge, attitudes, and practice of participants towards cervical cancer screening. So, this systematic review helps to identify the most important methods used in developing a simple and effective health education intervention programme and the effectiveness of this programme on knowledge, beliefs, and practices of cervical cancer screening among women of reproductive age.

**MATERIALS AND METHODS**

**Protocol and registration**

The procedures for systematic review described by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) recommendations have been followed in this systematic review (9) and it was also registered with the International Prospective Register of Systematic Reviews (PROSPERO) (record #CRD42020188462).

**Data sources, search engines and key words**

Searching was done on four electronic databases: PubMed, Science Direct, EBSCOhost medical collections (MEDLINE Complete) by using the Medical Subject Headings (MeSH) and the title/abstract terms to get the results. AND/OR operators were used in the search. Search terms were ‘health education’ OR ‘intervention’ OR ‘programme’ AND ‘cervical’ AND ‘cancer’ AND ‘screening’. The articles that have been included were those published from 2016 until present and the abstract that has been written in the English language. The review was limited to starting from 2016 as articles from previous years were included in the previous reviews in one or another way (10). In addition to that updated information are needed in order to develop the new interventions which fits the present situation. Therefore, we used alternatives from MeSH words for further investigation of the articles such as neoplasm or cervical neoplasm. ((health education [tiab] OR intervention\* [tiab]) OR health programme\*[tiab])) AND ((Pap test [tiab]) AND (cervical neoplasm\* [tiab] OR cervical cancer [tiab] OR cervical tumour\* [tiab]) AND ‘screening’ [MeSH])).

**Study selection: inclusion and exclusion criteria**

Searching included all eligible published articles during the past 5 years ( 1st of January 2016–31st of October 2020). Inclusion criteria were: (i) Experimental studies [randomised control trials (RCTs) and cluster randomised controlled trials (CRCTs)]; (ii) study searched for cervical cancer screening knowledge, attitude and/or uptake of screening or intention of screening was included ;(iii) Participants were women in reproductive age (19-64 yrs). Exclusion criteria were that (i) studies involved other designs such as non-experimental, pre-post studies, quasi-experimental studies, protocols, systematic review, meta-analysis, qualitative, or case reports.

The type of outcome measures of this review are

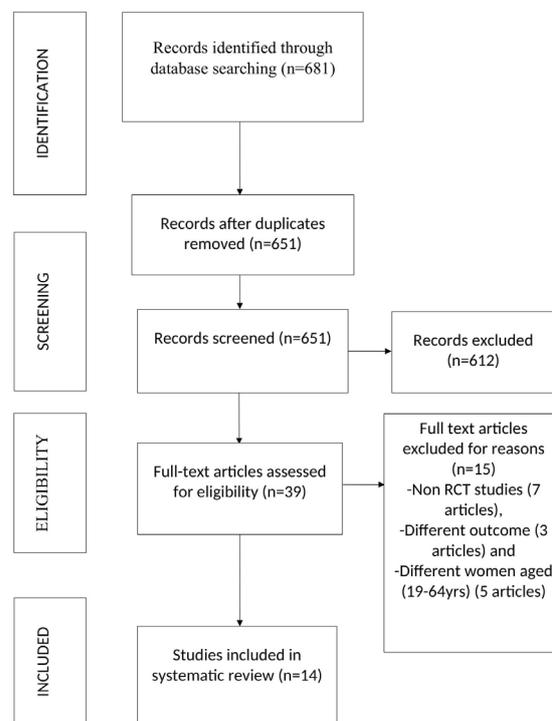
knowledge level, attitude and practice of screening, which are measured by questionnaires and the proportion of participants who perform cervical cancer screening.

**Quality assessment and risk of bias**

All the included studies have been assessed for the quality and risk of bias by using The Effective Public Health Practice Project Quality Assessment Tool for Quantitative Studies (11). This tool is used in assessing the quality of different study designs that addressing wide range of public health intervention . It consists of eight components: (A) selection bias; (B) study design; (C) confounders; (D) blinding; (E) data collection method; (F) withdrawals and dropouts (G) intervention integrity and (H) analysis. Every component was evaluated as strong, moderate or weak, resulting in an overall score of the evaluation ranging between strong (no weak individual scale rating), moderate (one weak individual scale rating) or low (two or more weak individual scale ratings) (11). Two authors reviewed the quality and bias of each study.

**RESULTS**

Figure 1 illustrated the flowchart of the systematic literature search, which was done according to the Preferred Reporting Item for Systematic Reviews (PRISMA) guidelines published in 2009. 681 published articles were detected. Out of these, 30 were eliminated because of duplicate records and for the rest 651 articles, we used the titles and abstracts to provide the decision



**Figure 1: PRISMA flow chart for cervical cancer screening articles selection and evaluation**

for selection. We excluded 612 records due to many reasons. 14 full text articles were included in this review at the end. Out of these 14, we excluded another 15 full text articles due to several causes; non RCT studies (7 articles), did not involve women aged (19-64yrs) (5 articles) and different types of outcome measures (3 articles). The eligibility of the articles was screened using the inclusion and exclusion criteria. Then we reviewed the articles regarding study designs, methods of interventions (teaching methods, assessment time and time interval of intervention), outcome measures, and results (Table I).

Finally, fourteen articles were selected, assessed and summarised in Table I. These studies were conducted in nine countries. Five studies were conducted in USA (12-16), two in Hong Kong (17, 18), one in Korea (19), one in England (20), one in Denmark (21), one in Norway (22), one in Turkey (23), one in Malaysia (24) and one in Tanzania (25). All of the articles were published in the past 5 years, from 2016 to 2020.

All of the studies were randomised controlled trial designs with participants ranging from 42 to 1100. Regarding behavioural theory's usage in health education intervention, only six published articles used it. Two of the articles used the Health Belief Model theory (19, 24), which has directed researchers to prepare an integrated and holistic health education programmes. These programmes based on the HBM model were able to achieve outcome measures successfully, two of the articles used social cognitive theory (19, 25), one used the PRECEDE-PROCEED model (23), one used Transtheoretical model (20). The other studies did not use any theories in their interventions.

### **Methodological quality assessment**

From the fourteen studies, six received strong quality score ratings (14, 17, 19, 21, 25, 26), four received moderate quality score ratings (16, 18, 22, 24) and the remaining four were scored as weak (12, 15, 20, 23) (Table II). Low ratings were mainly due to selection bias; which may occur because of low response rates and the target population was not represented accurately in the sample. Other methodological limitations were in the blinding and the analysis of data.

## **DISCUSSION**

### **Overview of health education intervention**

Different methods of health education intervention have been used in the fourteen studies such as: written (e.g. booklet and pamphlet), verbal (e.g. group discussion, health talk/lecture), both of them and text messages reminder. The responsibility of health education delivery was mainly by healthcare personnel (e.g. community health workers and trained research assistant) in all these studies.

Studies used different duration for the session in the verbal health education methods. The shortest one was half an hour (17) and the longest one was two hours (12, 19). However, many studies did not mention the duration of teaching (15, 16, 18, 20, 21, 23, 24, 26).

Regarding the assessment time, every study in the review was assessed twice, at baseline and following health education intervention given except for one study in which there were 2 phases of assessment after 3 months and 12 months of intervention (20). Different time intervals were reported from baseline to the time of evaluation. Time intervals were mentioned in seven studies as 2 months (24), 3 months (23), 6 months (18, 22), 7 months (16), 12 months (19). The longest time for evaluation reported was 18 months (14) and the shortest time was one month (21).

Three studies used self-administered questionnaires (12, 18, 19) and seven studies used interviewed questionnaires (16, 17, 20, 22, 23, 25, 26) to measure the outcome. With regards to the outcome measure, three studies evaluated more than one outcome including the effectiveness of health education intervention on improving of knowledge, Perception and attitude and increasing practice towards cervical cancer screening (12, 16, 24).

Some studies measured two outcomes as knowledge and attitude towards cervical cancer screening (26), while other studies measured only one outcome as knowledge (18), attitude (21, 23) or practice (15, 25) towards cervical cancer screening. Two studies measure cost effectiveness as a secondary outcome (16, 25) or psychosocial wellbeing (18).

The current review revealed that the combination of more than one method was more effective in increasing cervical cancer screening. This was shown when combining community cancer education with navigation services (19), using multimodal (letter/email/telephone) outreach strategy (14) and combination of counselling and leaflet were more effective than leaflet only (18). Multimedia was proven to be effective in improving cervical cancer knowledge and attitudes among study participants (15, 17, 26), but there was no significant difference in screening uptake between intervention and control groups. Perhaps other health education approaches and studies are required to identify the barriers to screening uptake.

A promotora-led education (A promotora is a lay Hispanic/Latino community member who gives basic health education in the community after getting a specialized training) was as well effective in increasing the knowledge and intention to be screened for cervical cancer (16, 26). This was similar to a study in the USA which revealed the effectiveness of promotora-led

**Table 1: Literature summary of the included studies**

Author/Year/Country	Subject/Study location/Sample size	Theory (if any)	Study design	Health education Intervention Methods	Outcome measures	Result	Conclusion
Carolyn Y. Fang et al., 2017	Korean American women (705) (N=347) in the intervention and the control group (N=358). They were recruited from 22 churches located in southeastern Pennsylvania and New Jersey.	Health Belief Model (HBM) and Social Cognitive Theory (SCT)	A Randomised Trial of a Community-Based Intervention	Intervention Methods; -Meeting in small groups and received a single educational session with navigation services -A follow-up reminder letter for screening was sent six and 12 months after the educational session. -Intervention delivered by bilingual community health educators (CHEs). -Time; 2-hour session -Assessment time; Baseline (T1) and evaluation (T2) -Time interval; 12 months -Self report questionnaires -Control group: 2-hour education session	Cervical cancer screening (receipt of a Pap test)	The intervention program contributed to significantly higher screening rates than the control program (Odds Ratio [OR] = 25.9, 95% CI=10.1-66.1, p<0.001).	A multi-component intervention combining community cancer education with navigation services yielded significant increases in cervical cancer screening rates among under-screened Korean American women.
Hae-Ra Han et al., 2017	A cluster-randomised trial at 23 ethnic churches in the Baltimore, Maryland–Washington, DC, and metropolitan area enrolled 560 women.	No theory	A cluster-randomised trial	Intervention Methods; -Individually tailored cancer-screening brochure -Health literacy training in a 1.5- to 2-hour-long group meeting -Monthly telephone counseling with navigation assistance -A copy of the DVD and guidebook Intervention delivered by CHW Time; 1.5- to 2-hour Assessment time; Baseline (T1) and evaluation (T2) Time interval; 6 months Self-report questionnaires Control group: Publicly available educational brochures related to breast and cervical cancer.	-Receipt of an age-appropriate cancer screening test, health literacy, -cancer knowledge, -Perceptions about cancer screening.	-The odds of receiving a Papanicolaou test were 13.3 (95% CI=7.9, 22.3) times higher. -Intervention effects also included increases in health literacy and positive perceptions about cancer screening.	A health literacy-focused CHW intervention successfully promoted cancer-screening behaviors and related cognitive and attitudinal outcomes in Korean American women.
H Kitchen-er et al., 2018	Eligible women in three Greater Manchester Primary Care Trusts (PCTs), Trafford, Salford, and Manchester in North West England. A total of 276 general practices were cluster randomised for women in a ratio of 1:1 to receive a PIL (pre-invitation leaflet) prior to their standard invitation.	Transtheoretical model	A cluster randomised trial	Two-phase conducted: Intervention Methods; -Phase 1, received a pre-invitation leaflet and, separately, access to online booking. -In Phase 2, non-attenders at six months were randomised to one of: vaginal self-sample kits sent unrequested or offered; timed appointments; nurse navigator; or the choice between nurse navigator or self-sample kits.  -Intervention delivered by /// -Time; /// -Assessment time; Baseline (T1) and evaluation (T2) -Time interval; 3 and 12 months following the invitation for Phase 1 and Phase 2, respectively. -Interviewed questionnaires -Control group: usual care practices in the NHS Cervical Screening Programme.	Increase cervical screening uptake	-Phase 1: Neither pre-invitation leaflet nor online booking increased screening uptake by three months (18.8% pre-invitation leaflet vs. 19.2% control and 17.8% online booking vs. 17.2% control). Uptake was higher amongst human papillomavirus vaccinees at three months (OR 2.07, 95% CI 1.69–2.53, p<0.001).  -Phase 2 Sending self-sample kits increased uptake at 12 months (OR 1.51, 95% CI 1.20–1.91, p=0.001), as did timed appointments (OR 1.41, 95% CI 1.14–1.74, p=0.001).  -The offer of a nurse navigator, a self-sample kits on request, and choice between timed appointments and nurse navigator were ineffective.	Amongst non-attenders, self-sample kits sent and timed appointments achieved an uplift in screening over the short term; longer term impact is less certain. Prior human papillomavirus vaccination was associated with increased screening uptake.
Beti Thompson et al., 2019	160 Latinas was conducted in this study. It took place in the Lower Yakima Valley of Washington State.	No theory	A pilot randomised controlled trial (RCT)	Intervention Methods; Three arms were developed: a fotonovela, (an illustrated booklet written in Spanish and English, a radionovela (is a scripted conversation between the same characters) and a digital story. -Intervention delivered by provider focus groups (N=2), led by the Principal Investigator (BT), A trained Project Coordinator -Time; /// -Assessment time; Baseline (T1) and evaluation (T2) -Time interval; After the intervention -Interviewed questionnaires -Control group: received a fact sheet on the need for a flu vaccine injection (flu shot)	-Knowledge about cervical cancer and HPV -Intention to obtain cervical screening.	-Women in all three treatment arms significantly increased knowledge about cervical cancer compared to control arm (p=0.02). -Knowledge about cervical cancer screening also increased in the active arms compared to control (p=0.0003). -Knowledge of HPV risk also increased relative to the control (p=0.0001). -There were no significant differences between the intervention arms in increased knowledge of cervical cancer or cervical cancer screening (p=0.57 and 0.16 respectively).	This study supported the use of small media interventions in narrative education form as effective in increasing knowledge and intention to be screened for cervical cancer. The three culturally relevant interventions, built on qualitative data, were all successful in increasing knowledge.
Romli Ret al., 2020	This controlled community trial involved 210 women from the districts of Alor Setar and Sungai Petani, Malaysia. 105 women from each district were recruited.	Health belief model	RCT	Intervention Methods; -Educational talk, -Demo video, -Experience sharing, -Pamphlet distribution, -Text message reminders. Intervention delivered by /// -Time ; A 30-minute educational talk on cervical cancer and Pap smear test A 5-minute video on Pap smear test procedures. -Assessment time ; Baseline (T1) and evaluation (T2) -Time interval ; /// -Interviewed questionnaires -Control group: educational talk alone.	-Knowledge and attitude towards cervical cancer and Pap smear, and uptake of Pap smear test.	-Knowledge on cervical cancer and Pap smear, and attitude towards Pap smear among women in both intervention and control group improved significantly. -The uptake of Pap smear in the intervention group increased significantly from 48.0% at Baseline to 68.0% (P<0.001), and from 68.0% to 79.0% (P<0.001). A significant increase in Pap smear uptake was also seen in the control group from 63.0% at Baseline to 76.0% (P=0.003).	Educational talk alone was effective in improving knowledge on cervical cancer and Pap smear, attitude towards the test, and the actual uptake of the test. However, text reminders were more effective than having an educational talk alone in increasing uptake of Pap smear test among participants.

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**Table I: Literature summary of the included studies**

Author/ Year/ Country	Subject/ Study location/ Sample size	Theory (if any)	Study design	Health education Intervention Methods	Outcome measures	Result	Conclusion
Peitzmeier SM et al.,2016	1,100 patients at an urban federally qualified health centre overdue for Pap testing	No theory	A randomised trial.	Intervention Methods; -Letter outreach, -Email outreach, -Telephone outreach, -Multimodal (letter/email/telephone) outreach. -Intervention delivered by /// -Time ; over a period of 3 months each at approximately 1-month intervals -Assessment time ; Baseline (T1) and evaluation (T2) -Time interval ; 18 months -Interviewed questionnaires -Control group : usual care	Effectiveness of various outreach methods in engaging patients who are overdue for cervical cancer screening.	Compared to patients receiving usual care, patients in the multimodal (36 vs. 21 %, AOR 2.3, 95 % CI 1.4, 3.6) and telephone (29 vs. 21 %, AOR 1.7, 95 % CI 1.1, 2.8) outreach groups were significantly more likely to receive cervical cancer screening during the follow-up period. Intervention effects were similar among older and younger patients. Telephone, multimodal, and letter outreach resulted in significantly lower median time to screening among patients who did screen (119, 122, and 157 days, respectively) in those groups as compared to the usual care group (270 days).	In an urban primary care setting, a multimodal outreach strategy was most effective at increasing the proportion of overdue patients who undergo cervical screening and decreasing time to screening.
Cho Lee Wong et al.,2019	Forty-two South Asian women were recruited at six ethnic minority associations in Hong Kong	No theory	A pilot randomised wait-list controlled trial	Intervention Methods; -A structured PowerPoint slide with a video clip -A monthly telephone follow-up once a month for three months -provision of navigation assistance in accessing screening services. -An information booklet to recap -Intervention delivered by CHW -Time ; A 30-min -Assessment time ; Baseline (T1) and evaluation (T2) -Time interval ; 3 months -Interviewed questionnaires -Control group: usual care received the intervention as described above after data collection at post-intervention.	Cervical screening uptake	-We demonstrated that the intervention was feasible as evidenced by the high consent rate and low withdrawal and attrition rates. -The intervention arm showed a statistically significant improvement in perceived benefits (p = 0.001) and perceived barriers (p = 0.02). -However, no significant difference was noted in screening uptake and screening intention between arms.	Our findings support the feasibility of CHW-led multimedia intervention and provide preliminary evidence of its effectiveness on enhancing the cervical cancer screening beliefs among South Asian women.
Hestbech MS et al.,2016	A random sample of women from the birth cohorts 1993, 1994 and 1995 drawn from the general population in Denmark	No theory	A Randomised survey study	Intervention Methods; Four different information modules about benefits and harms of cervical screening: No information; non-numerical information; and two numerical information modules. Moreover, we provided HPV-vaccinated women in one of the arms with numerical information about benefits and harms in two steps: firstly, information without consideration of HPV vaccination and subsequently information conditional on HPV vaccination. -Intervention delivered by /// -Time ; /// -Assessment time ; Baseline (T1) and evaluation (T2) -Time interval ; 1 month - A web-based questionnaire and information intervention questionnaires -Control group : usual care	Self-reported intention to participate in cervical screening	A significantly lower proportion intended to participate in screening in the two groups of women receiving numerical information compared to controls with absolute differences of 10.5 (95% CI: 3.3-17.6) and 7.7 (95% CI: 0.4-14.9) percentage points, respectively. Among HPV-vaccinated women, we found a significantly lower intention to participate in screening after numerical information specific to vaccinated women (OR of 0.38).	Women were less likely to participate in cervical screening when they received numerical information about benefits and harms compared to non-numerical or no information. Specifically, numerical information about the potential impact of the reduced risk of cervical cancer among HPV-vaccinated women reduced the intention to participate among vaccinated women.
Koç Z et al., 2019	Qualitative and quantitative study was conducted at a community training centre in north Turkey. A total of 156 Turkish women who were without cancer participated in this study.	The PRE-CEDE-PRO-CEED model	RCT	Intervention Methods; Three educational training session every other month. -Intervention delivered by 5 experts (1 gynecologist and 4 nurse educators) -Time ; 60 minutes -Assessment time ; Baseline (T1) and evaluation (T2) -Time interval ; 3 months - A semi-structured interview form was used during the qualitative data collection. -The SF-36 Health Status Questionnaire, Health Belief Model Scale for Cervical Cancer and Pap Smear Test, and Healthy Lifestyle Behavior Scale III were used during quantitative data collection -Control group : usual care	Effect of education about cervical cancer and human papillomavirus on the healthy lifestyle, behavior, and beliefs of Turkish women who were without cancer,	The sub-dimension scores of the Health Belief Model Scale for Cervical Cancer and Pap Smear Test were found to be higher among women in the study group (cervical cancer seriousness, P = .001; health motivation, P = .001) as compared with the control group after the education program.	The post-education health motivation of women in the study group was improved, the women's perceptions of obstacles to Papanicolaou testing decreased, and through increased knowledge and awareness, the rate of Papanicolaou testing increased
Ngu S.F. et al., 2017	Data from 121 women (52 in leaflet group; 69 in counselling group) were analyzed in Hong Kong	No theory	RCT	Intervention Methods; Received a written factsheet (leaflet)  -Intervention delivered by a trained research assistant -Time ; /// -Assessment time ; 6 months -Time interval ; -Self-administered questionnaires -Control group : usual care self-administered questionnaires -Counselling The counselling group received the same factsheet as the leaflet group and one-to-one didactic presentation	-Knowledge of cervical screening and HPV. -Psychosocial well-being (cervical cancer worry, anxiety and depression, screening-related anxieties, HPV-related shame)	The counselling group had a significantly higher score in knowledge of cervical screening and HPV compared with leaflet group (mean score 4.65 ± 0.19 versus 3.71 ± 0.23, p = 0.002) at post-educational intervention, but there was no significant difference (mean score 4.14 ± 0.22 versus 3.58 ± 0.24, p = 0.084) at 6 months. There was no significant difference in the psychosocial well-being between the two groups at all time points. Irrespective of the two educational interventions, cervical cancer worry and anxiety decreased over time.	-Combination of counselling and leaflet were more effective than leaflet only in improving women's knowledge on cervical screening and HPV soon after educational interventions but the benefit was not apparent after 6 months.

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**Table I: Literature summary of the included studies**

Author/Year/Country	Subject/Study location/Sample size	Theory (if any)	Study design	Health education Intervention Methods	Outcome measures	Result	Conclusion
Lunberg S1 et al.,2016	In Norway, we randomised 1087 women overdue for screening to receive at three centres: a midwife clinic, a public health-care centre and a general practitioner centre.	No theory	Randomised controlled trial	Intervention Methods; -Invitations with scheduled appointments or Letters were sent 2-4 weeks before the scheduled appointments. -Intervention delivered by /// -Time ; ///  -Assessment time ; Baseline (T1) and evaluation (T2) -Time interval ; 6 months -Interviewed questionnaires -Control group: Standard open reminders.	The primary outcome was participation at 6 months of follow-up. Secondary outcomes were participation at 1 and 3 months.	At 6 months, 20% of the 510 women in the control group and 37% of the 526 women in the intervention group had participated in screening, excluding 51 women in total from analysis due to participation just before invitation and therefore not yet visible in the central records. The RR for participation at 6 months was 1.9 (95% CI 1.5 to 2.3). There was no significant heterogeneity between centres or age groups. Participation increased among women both with (RR 1.7; 95% CI 1.4 to 2.1) and without (RR 3.5; 95% CI 1.3 to 9.2) previous participation. The RRs for participation at 1 and 3 months were 4.0 (95% CI 2.6 to 6.2) and 2.7 (95% CI 2.1 to 3.5), respectively.	Scheduled appointments increased screening participation consistently across all target ages and screening centres
Beti Thompson et al.,2018	A total of 443 Latinas participated who were non-adherent with Pap test screening guidelines (i.e. more than 3 years since their last Pap test) in the Lower Yakima Valley of Washington State	Social cognitive theory	RCT	Intervention Methods; Participants randomised to 1. the low-intensity intervention (video) arm 2. Women in the high intensity arm received (a promotora-led educational session in their home +video ) -Intervention delivered by promotora (lay health worker) -Time ; /// -Assessment time ; Baseline (T1) and evaluation (T2) -Time interval ; 7 months -Interviewed questionnaires -Control group : usual care	Completion of a Pap test within 7 months after randomisation-Change in knowledge and attitudes about cervical cancer risk factors and Pap testing -Cost-effectiveness analysis, comparing the 3 arms.	A total of 443 Latinas participated. At seven months post-randomisation, significantly more women in the high intensity arm received a pap test (53.4% compared to the low intensity arm (38.7%), and the usual care arm (34.0%); p<0.001 and p<0.01, respectively. The ICER for high intensity women over the control group amounted to \$4.24. Twelve women had positive Pap tests encompassing diagnoses of Atypical Squamous Cells of Unknown Significance to invasive cancer; these women were navigated for follow-up care.	A culturally appropriate in-home promotora-led educational intervention was successful in increasing cervical cancer screening in Latinas.
Linde et al., 2017	The total sample size will be 700 with 350 women in each study arm conducted at three health facilities in Tanzania—one in the Dar es Salaam Region and two in the Kilimanjaro Region	No theory	A non-blinded, multicentre, parallel-group, randomised controlled trial.	Intervention Methods; Two types of SMS intervention (1) educational text messages, and (2) SMS reminders for the follow-up appointment -Intervention delivered by a web-based SMS operating system -Time ; 15 text messages that will be sent to the intervention group over a period of 10 months -Assessment time ; Baseline (T1) and evaluation (T2) -Time interval ; 14 months -Interviewed questionnaires -Control group :standard care	Primary outcome to assess the effect of an SMS intervention on Tanzanian HPV-positive women's attendance for cervical cancer screening follow-up appointments at 14 months compared to standard care is attendance rate for follow-up. Secondary objectives are cost-effectiveness, measured through incremental ratios, and knowledge of cervical cancer by a 16-item true/false scale questionnaire at baseline and follow-up. Barriers against implementing the intervention will be assessed in a mixed-methods sub-population study.		This study may provide information on the potential effects, costs, and barriers in implementing an SMS intervention targeting a group of women who are followed up after testing positive for HR HPV and are, therefore, at increased risk of developing cervical cancer. This can guide decision-makers on the effective use of mobile technology in a low-income setting. Trial status: recruiting.
Armando Valdez et al.,2018	Low-income Latinas who had not had a Pap test in the prior two years were recruited from three Federally Qualified Health Centres. The study accrued 943 Latinas at community clinics in Los Angeles, San Jose and Fresno, CA who were there for non-study related appointments.	No theory	A randomised controlled trial design	Intervention Methods; Education program through an interactive, multimedia kiosk in either English or Spanish based on their language preference and age group -Intervention delivered by bilingual-bicultural, female research assistants -Time ; The average dose received by women was 24 min in English and 28 min in Spanish -Assessment time; Baseline (T1) and evaluation (T2) -Time interval; 6 months -Interviewed questionnaires -Control group : usual care	Self-reported cervical cancer screening	-The intervention group demonstrated greater knowledge (p<.0001) and more favorable attitudes at follow-up: fewer intervention group women never thought of getting a Pap test (46% vs. 54%, p=0.050 or agreed that its fate whether a woman gets cervical cancer or not (24% vs. 31%, p=0.043). The groups did not differ significantly on the proportion who had obtained or made an appointment for a Pap test at follow-up (51% vs. 48%, p = 0.35). Both groups reported high levels of self-efficacy regarding Pap screening at post-intervention.	A one-time interactive, multimedia educational intervention improved cervical cancer knowledge and attitudes among low-income Latinas, but had no effect on cervical cancer screening behavior. Exposure of the control group to the pretest conducted on the multimedia kiosk may have influenced their screening behavior.

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**Table II: Results of quality assessment of studies using the EPHPP Quality Assessment Tool for Quantitative Studies**

Study authors and date	Selection bias	Study design	Confounders	Blinding Data	collection methods	Withdrawals and dropouts	Intervention integrity	Analysis	Overall quality score
Carolyn Y. Fang et al., 2017	strong	strong	moderate	strong	strong	strong	strong	strong	strong
Hae-Ra Han et al., 2017	strong	strong	weak	strong	strong	strong	strong	weak	weak
H Kitchener et al., 2018	moderate	strong	weak	moderate	strong	strong	moderate	weak	weak
Beti Thompson et al., 2019	strong	strong	strong	strong	strong	strong	strong	strong	strong
Romli R et al., 2020	moderate	strong	moderate	weak	strong	moderate	strong	strong	moderate
Peitzmeier SM et al., 2016	strong	strong	moderate	moderate	strong	strong	strong	strong	strong
Cho Lee Wong et al., 2019	strong	strong	moderate	strong	strong	strong	strong	strong	strong
Hestbech MS et al., 2016	strong	strong	moderate	moderate	moderate	moderate	moderate	moderate	strong
Koz Z et al., 2019	strong	strong	moderate	weak	strong	strong	strong	weak	weak
Ngu S.F. et al., 2017	strong	strong	strong	strong	strong	strong	strong	weak	moderate
Lunnberg S1 et al., 2016	strong	strong	moderate	strong	strong	strong	strong	moderate	moderate
Beti Thompson et al., 2018	strong	strong	moderate	strong	strong	strong	strong	moderate	moderate
Linde et al., 2017	strong	strong	strong	strong	strong	strong	strong	strong	strong
Armando Valdez et al., 2018	strong	strong	weak	strong	strong	strong	strong	weak	weak

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education in increasing knowledge and self-efficacy (29). However, combining a promotora-led educational session in home with video was more successful in increasing the screening among participants (16).

This review revealed that it is better to avoid numerical information about benefits and harms of cervical screening as it reduced the intention to participate in. In addition to that, numerical information about the effect of decreasing the risk of cervical cancer among HPV-vaccinated women reduced the intention to participate compared to those who are non-vaccinated. This may suggest that provide them with numerically information about the new premises of cervical screening is important to their decision whether or not to attend screening (21). However, increasing screening participation consistently across all target ages and screening centres can be done by making scheduled appointments (22).

Education programmes based on the health belief model were effective in improving the outcome measures (19, 24). This was similar to the results of other previous studies which use the health belief model in their studies and revealed its effectiveness in increasing the uptake of cervical cancer screening and intention to screening (30, 31).

A study pinpoints to the importance of SMS intervention in increasing attendance for follow up of cervical cancer screening (25). This is in line with the findings of previous study which revealed the effect of text messages

in increasing cervical cancer screening (32). However, combining educational talk with a text messages is more effective than having an educational talk alone (24). This study pinpoints the effective use of mobile technology in a low-income setting. Mostly all health education interventions in cervical cancer appeared to be effective in increasing the knowledge, attitude and uptake of cervical cancer screening.

**Methods of delivery of health education intervention**

Different methods were used in the fourteen studies. Most of the studies used more than one type of intervention; small group discussions (5 studies), presentation of booklets and pamphlets (8 studies) and health talks (3 studies). These methods are explained in more details:

**Group Meeting and discussion**

Many studies in this review used this method for health education intervention (12, 15, 19, 21, 22). A great variation in the outcomes were noticed between experimental and control group. The discussion among groups was able to increase the knowledge of participants and induce behaviour modification. Small group sessions were conducted which allowed the women to ask and get answers directly from the person who had the answer. In addition to that, if the educator detected any incorrect beliefs, the educator could address that fallacy instantly and provide the correct information. Therefore, it is considered more effective and convincing than just giving them brochures or pamphlets to read (33).

### ***Pamphlets, Brochure and booklet***

This is considered the most commonly used method in the review for the health education intervention (12, 15-18, 20, 24, 26). It has been used in combination with other methods for educating communities, leading to more continuous and more interesting teaching. Moreover, it improved the outcome of the study significantly. Although this method was not commonly used alone in the intervention, it was useful for a long-term plan to spotlight the awareness and attract the attention to specific issues if it was placed in planned places to be notified.

### ***Health talk / Lecture***

This method was used in three studies (16, 23, 24). It is less costly and commonly used worldwide reaching fairly large number of people simultaneously. Questions can be asked during the health talk making it more effective for improving the knowledge and delivering information to its targeted population

### ***Other methods used***

Script on radio and digital story (26), using reminding text message (19, 24, 25) or video presentation (17, 24).

### **Strength and limitation**

The comprehensive searching to get too many studies with different effective health education intervention methods is the main strength of this review. While including articles that only published in English language is considered as a limitation of this review.

### **CONCLUSION**

In conclusions, health education intervention methods such as educational pamphlet and booklets, health talk, group discussion and question and answer session were most popular methods used. It also finds that reminding letters and text messages are able to achieve a significant improvement in the screening rates. In addition to that, findings in this review contribute to the literature supporting health education interventions in boosting women's knowledge, beliefs and attending level of cervical cancer screening programmes. However, the effectiveness varies with study setting, populations and the methods of delivery. Hence, it is better to understand the present situation and the behavioural intervention with its dynamic nature to develop best intervention as well as more studies are needed to recognise barriers and obstacles to the screening.

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