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The effect of the health belief model education for cervical cancer prevention, screening promotion among rural women in Chengalpattu district, Tamil Nadu (HBMECC)

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Abstract:

BACKGROUND: The objective of this interventional study is to investigate the efficacy of health belief model-based health education in screening promotion and improving awareness about cervical cancer prevention.

MATERIALS AND METHODS: A total of 370 rural married respondents were selected using a multistage random sampling method. To gather information from study participants before and after the six-month intervention period, the standard questionnaire instrument paired with a health belief model and cervical cancer knowledge assessments was employed. This quasi-experimental study incorporated health belief model-based education for 45 minutes, supplemented by audio-visual, flipchart, and interactive sessions, and regular motivation was given once every three days until the call for mass screening camps, which were held every 15 days. The data was imported into Excel and analyzed using SPSS 21. A paired test for pre- and post-intervention significance and a cross-tab test for association was utilized. At the end of the study, the percentage of all women screened was estimated.

RESULTS: The findings revealed that 37.8% of participants were between the ages of 30 and 40, 32.7% had no formal education, and 42% were housewives. The pre-and post-test mean scores for knowledge about cervical cancer and prevention differed, with a mean value difference of 4 for signs of cervical cancer, 24.32 for risk factors, 1.31 for the cervical cancer screening (Pap) test, 1.07 for vaccination, and 0.48 for attitude toward self-assessment of cervical cancer symptoms and attitude toward screening. By the end of the study, 39% of the women had been screened in a mass screening camp and from outside sources.

CONCLUSION: The health belief model, therefore, assisted in increasing the required information and addressed the perception regarding screening obstacles, consequently increasing the screening rate, and can thus be implemented as an appropriate strategy for instructing women about cervical cancer screening and prevention.

Keywords:

Cancer screening, cervical cancer, health belief models, health promotion, Pap test

Introduction

Cervical cancer is the fourth most often diagnosed and leading cause of death in women worldwide, with an expected 604,000 new cases and 342,000 deaths in 2020.[1] It is the most often diagnosed cancer in 23 countries throughout the world, with a higher prevalence in developing and undeveloped countries than in affluent countries. Women in India have a

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cumulative chance of acquiring cervical cancer of 1.6% and a cumulative risk of dying from cervical cancer of 1%. Cervical cancer accounts for 9.4% of all malignancies in India and 18.3% (123,907) of new cases in 2020.[2-4]

The WHO wants to eliminate cervical cancer by 2050, using three strategies: early diagnosis through screening, vaccine, and treatment protocols. The target for eradication, according to the standards, is to improve the screening rate of women aged 30-45 years to 75% by the year 2030.[5]

Our study focused on increasing the screening rate because screening can even help in pre-invasive cancer stages, but unfortunately, the rate of screening in rural India is lower than in urban.[6] Contributing factors for the low screening rate include a lack of awareness and knowledge about cervical cancer and prevention, where literacy levels are low, and other barriers such as socio-cultural, economical, and poor health system infrastructure.[7]

The study done by Sachan PL *et al*. revealed in the year in the year 2018, the pap smear screening test has been demonstrated to be an appropriate, convenient, and competent screening approach in low and middle-income nations such as India.[8]

Extensive research was conducted throughout the world to figure out the most effective strategy for increasing the screening rate, the approach was to address the core cause, which includes a lack of awareness about cervical cancer and its prevention through screening and immunization.

A competent health education intervention can resolve a lack of awareness and information, as well as other screening-related obstacles. Various means of health education were provided in the form of audiovisual clips, puppet shows, flip charts, and health presentations educating on the signs and symptoms of cervical cancer, the severity of cervical cancer, and the need for screening globally. However, the rate of screening was not enough, thus an effective model of health education has to be developed to raise the rate of screening for cervical cancer.[9,10]

The study done by Thulaseedharan et in the year 2018 in India, insisted the need of addressing misunderstandings such as screening is not needed in the absence of symptoms and is only required for women who have numerous sexual partners should be addressed adequately in the community. When establishing educational programs, the impact of socioeconomic status on the progression of cervical cancer should also be emphasized. Women should be enabled to access details and make decisions about their health care.[11]

Apart from raising cervical cancer and preventive knowledge, the goal of health education is to address changes in perception about disease severity, susceptibility, screening advantages, and hurdles to overcome in order to enhance screening.[12]

In 2018, Naz *et al*. did a systematic review research that recommended framework-based health education above non-framework-based health education. The study found that using the precede-procedure model, the trans theoretical model, the social marketing model, and the protection motive theory was helpful in educating for cervical cancer screening, but it strongly recommends using the health belief model, which has been shown to be more successful than the other models for cervical cancer screening promotion.[13]

The study conducted by Zomordi G, *et al*. in 2022 to assess the effect of education based on the theory of planned behavior on the intention of vaccination against human papillomavirus in female students suggests a significant change in attitude towards vaccination within one month of intervention, but in this case, the vaccination was addressed rather than screening, and the study itself suggests the limitation of socio-cultural background with different study populations.[14]

The study performed by Samami E, *et al*. on the effect of educational intervention based on the health belief model on the knowledge, attitude, and function of women about Pap smear tests at Iranian health centers in the year 2021 revealed that the health belief model plays a significant role in changing attitudes toward susceptibility, severity, and screening.[15]

Based on the above background, rural women were given health belief model-based education with regular intervals of motivation as an intervention to assess the effect of the promotion of screening and cervical cancer knowledge about prevention.

Materials and Methods

Study setting and design

A pre-and post-test interventional research study were conducted among 370 rural married women in the Chengalpattu district of Tamilnadu, India.

Study participants and sampling

The inclusion criteria for enrolling individuals were married women aged 30 or older with no history of cervical cancer and a willingness to engage in the trial. Prior to data collection, the individuals provided informed permission after being told about the study's goal and confidentiality in their native language. The sample size was calculated using the intervention-based

sample size formula. The sample size was determined using the intervention-based sample size formula.

$$n = 2(z_{\alpha/2} + z_{\beta})^2 * P(1-P) \Big/ (p1-p2)^2$$

Where, $P = \frac{(p1+p2)}{2}$

1. $z_{\alpha/2}$ Error value of 0.05 and 0.80 of z_{β} error was considered to get a satisfactory sample size for the study.
2. The value of p1 = 39% was obtained from the previous study, thereby applying the intervention formula, considering p2 = 50% (p2 = 50%) as the statistical value for maximum variability among population proportions. Furthermore, 5% was included to rule out the dropouts or non-respondents. Therefore, the estimated sample size, n = 370, was calculated.

A multistage sampling procedure was used to recruit the individuals. Two blocks were picked at random from a total of eight from the Chengalpattu district, namely a. Maduranthagam, and b. Acharapakkam. Then, a list of villages from the chosen two blocks was created, and the population proportion to size approach was used to choose one village from each block. The sample frame was created using information acquired from panchayat offices and utilized to generate a list of married women. The next stage was to choose every third lady on the list using a procedure known as "systematic random sampling," until the sample of 370 women was attained. The sampling process is explained in Figure 1.

Data collection tools and technique

A questionnaire with four domains was used to collect information. The first two dealt with socio-demographic characteristics; the third and fourth domains were a synthesis of two different questionnaires, notably 1. The cervical cancer awareness tool kit version 2.1, developed by UCL Health Behavior Research, and 2. CPC-28 (Creencias, Papanicolaou, Cancer-28), was developed following the guidelines by Robert de Vellis.

The questionnaire was assessed on a one-to-two and three-point scale, with awareness-related questions scored on a one-to-two scale (Yes or No) in CAM (Cervical Cancer Awareness Measure Tool Kit version 2.1) and health belief model-based questions scored on a three-point Likert scale. CPC-28 (Creencias, Papanicolaou, and Cancer-28).

The Cronbach's alpha and intermediate coefficient values for validity and reliability of the CAM tool were 0.7 and 0.8, respectively, and 0.75 and 0.83 for the CPC-28.

Despite the fact that the questionnaire was standardized, a pilot study was conducted to assess the tool's suitability for the specified research location, and any necessary revisions were made. An 8% sample of 30 married women was chosen for the pilot research.

Pre-data was collected over three months in February, March, and April 2022, and intervention was implemented through health belief model-based education. During the health education, they were shown an 8-minute film, as well as an interactive session using a flip chart in their native language; the entire session lasted 45 minutes. The motivation was supplied every three days until the call for the next mass screening was announced, which was held every 15 days until the sixth month of the study period. At regular intervals, 12 such camps were held

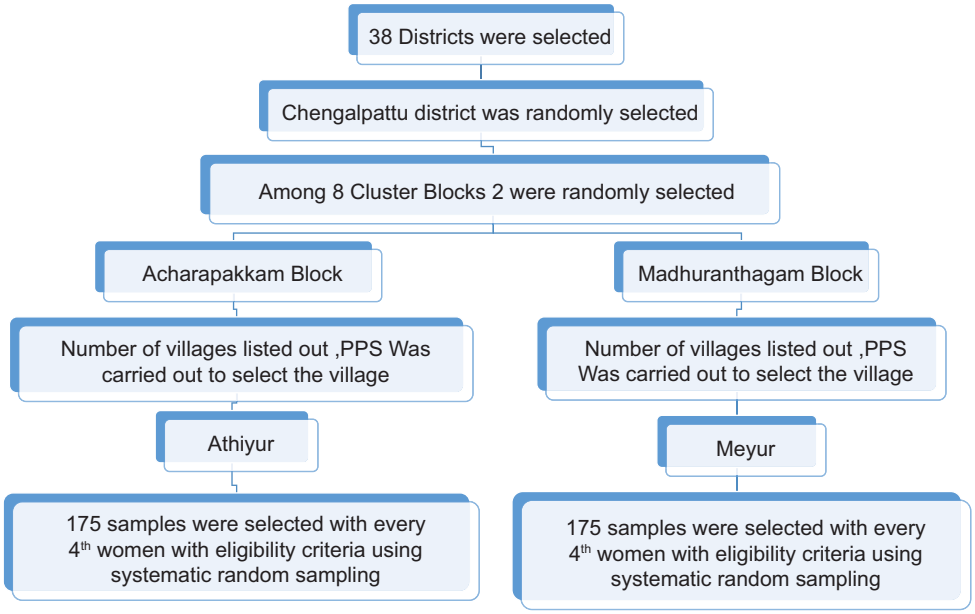

Figure 1: Consort form for sampling method

for them, and they were screened for cancer. The last mass screening camp was conducted in October 2022.

Post data was obtained from individuals attending the screening camp. Data were also gathered from women who did not attend the screening camp but were screened elsewhere (outside hospitals, private clinics, primary health care centers, and so on), as well as from those who were never screened during the study period by visiting the houses.

The video and interaction explain the health belief model-based education includes the key contributors to changing beliefs related to cervical cancer prevention and screening, with individual's perceived susceptibility in addressing individual ideology on threat or fear about cervical cancer and their beliefs about the severity of disease (perceived severity); benefits of exhibiting particular positive action include screening (pap test) and vaccination perceived obstacles constraining to action include knowledge, economic, social-cultural, and personal exposure to the action (cues to action).

The data were coded with numbers and placed into an excel file before being entered into the SPSS-21 version. The data was analyzed and presented in tabular and visual forms. For the socio-demographic characteristics and total women screened at the end of the study, as well as categorical data, percentages were calculated, and a crosstab test was performed for marital-obstetric history and knowledge about cervical cancer, attributed to warning signs and risk factors of greater than or equal to 3, and less than 2, was classified as "Yes" and "No."

The mean and standard deviation of continuous data were calculated. A paired *t*-test was performed to compare before and after intervention data, with a *P* value of less than 0.05 considered significant.

Ethical considerations

The Ethical clearance was obtained and the study was approved by the Institutional Ethical committee (IEC: 1682/IEC/2019).

Results

The study sample consisted primarily of women aged 30–39 years, with 139 responders (37.8%). Only 78 (21%) of the 370 women in the study received a graduate degree, while 121 (32.7%) were illiterate.

Housewives were the majority with 155 (42%) participants, and the middle class was the most common socioeconomic class, with 96 (26%) participants, and 52 (14%) women reported being upper class [Table 1].

Table 1: Socio-Demographic Features of the Subjects

Variables	Attributes	*n* (%)
Age	30-39	139 (37.8)
	40-49	120 (32.4)
	50-60	111 (30)
Education	Illiterate	121 (32.7)
	Primary	80 (21.6)
	Secondary	91 (24.7)
	Graduate	78 (21)
Occupation	Unskilled	81 (22)
	Semi -Skilled	67 (18)
	Skilled	67 (18)
	House wife	155 (42)
Social Class	Upper class	52 (14)
	Upper middle class	67 (18)
	Middle class	96 (26)
	Lower middle class	74 (20)
	Lower class	81 (22)

Out of 170 (46%) women who had been married for more than 15 years, 55 (15%) were aware of warning signals and 61 (16%) were aware of risk factors for cervical cancer.

Among the many methods of contraception used, 88 (24%) women used condoms; 44 (11.9%) participants had contributed to the understanding of warning signs; and 48 (12.9%) women acknowledged the risk factor of cervical cancer.

In terms of age of marriage, 120 (32.4%) women married between the ages of 26 and 35 were recorded, 42 (11.3%) of whom were acquainted with warning signals and 23 (6.2%) were aware of risk factors for cervical cancer.

A previous family history of cervical cancer was reported by 22 (6%) participants, with risk variables known to 17 (4.3%) and warning signs known to 15 (4%) participants [Table 2].

Acceptance to susceptibility for the disease was enhanced with a mean value from 5.5 to 7.5 (*P* value = 0.003). In terms of severity, there was a significant change in perceived illness with a mean value change from 6.9 to 7.5 (*P* value = .001.).

The perceived advantage for screening at regular intervals has been accepted which can be noticed from the 7.9 mean value change to 9.5(*P* value = 0.002) and the perceived barriers towards the screening were addressed and that can be noticed from the mean value decreasing from 18.3 to 14.9 (*P* value = 0.002) [Table 3].

There was also progress in the mean scores of knowledge between the pre-and-posttests among the study participants, with a mean score difference of 4 for signs of cervical cancer, 24.32 for risk factors for cervical cancer,

Table 2: Cross tab distribution between the obstetrics history and cervical cancer knowledge on warning signs and risk factors

Obstetric History	Warning Signs of Cervical Cancer (*n*=370)						Risk Factors of Cervical Cancer (*n*=370)					
	Yes		No		Total		Yes		No		Total	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Duration of Married Years												
10-May	20	5.4	70	19	90	24	46	12	44	12	90	24
15-Nov	40	11	70	19	110	30	51	14	59	16	110	30
≥15	55	15	115	31	170	46	61	16	109	29	170	46
Usage of Any Contraceptive Methods												
Copper -T	40	10.9	35	9.4	75	20.3	38	10.2	37	10	75	20
Family planning procedure	30	8.1	32	8.7	62	16.8	33	8.9	31	8.3	64	17
Oral Contraceptive pills	13	3.5	12	3.2	25	6.7	12	3.2	10	2.7	22	6
Condom	44	11.9	40	10.8	84	22.7	48	13	40	108	88	24
Nil	64	17.3	60	16.2	124	33.5	61	16.5	60	16.2	121	33
Parity												
Nullipara	13	3.5	12	3.2	25	6.7	14	3.8	11	3	25	6.8
≤3	80	22	115	31	195	53	90	24	105	28	195	53
>3	70	19	80	22	150	41	75	20	75	20	150	40
Age at marriage												
16-25 years	38	10.2	142	38.3	180	48.7	24	6.4	156	42.1	180	48.7
26-35 years	42	11.3	78	21	120	32.4	23	6.2	97	26.2	120	32.4
36 and above	30	8.1	40	10.8	70	18.9	15	4	55	14.8	70	18.9
Age at first child birth												
16-25 years	40	11.6	120	34.8	160	46.4	34	9.9	126	36.5	160	46.4
26-35 years	44	12.8	71	20.5	115	33.3	39	11	76	22	115	33.3
36 and above	29	8.4	41	11.9	70	20.3	23	6.7	47	13.6	70	20.3
Family History of Cervical Cancer												
Present	15	4.05	7	1.95	22	6	17	4.6	5	1.4	22	6
Absent	112	30	236	64	348	94	104	28	244	66	348	94

Table 3: Health Belief Model Factors - Pre and Post Measures

Perceived Factors	Before Intervention		After Intervention		*t*-test	*P*
	Mean	SD*	Mean	SD		
Perceived susceptibility	5.5	2.6	7.51	2.1	2.182	0.003**
Perceived Severity	6.9	1.8	7.5	1.6	10.30	0.001**
Perceived Benefits	7.9	1.6	9.5	2.1	3.98	0.002**
Perceived Barrier	18.3	2.1	14.9	2.3	4.89	0.001**
Clues to Action	6.5	2.1	7.2	2.6	5.65	0.002**

*SD=Standard Deviation

1.31 for the cervical cancer screening (Pap) test, 1.07 for vaccination, and 0.48 for attitude toward self-assessment of cervical cancer symptoms.

Finally, as claimed by study participants, a screening rate of 39% was attained in several sessions of mass screening camps as well as from other outside sources (Primary health centers, Private hospitals, and Clinics) [Table 4].

Discussion

The current study shows the knowledge regarding warning signs and risk factors for cervical cancer surged after the educational intervention, remarkably accomplishing the statement that health education made a difference in the level of knowledge about cancer. The research study done in Malaysia in the year 2021[15] and concluded that educated women possessed a good level of knowledge about risk factors for cervical cancer compared to illiterate or scantily educated women. A study conducted in southern India, Pondicherry also found a similar level of knowledge about cervical cancer and its association with education.[16]

The educational program was given in the rural parts of Nigeria as an intervention to promote screening in cervical cancer prevention for a research study. Pre and post-intervention measures show an increase in screening rate of about 4%,[17] which is significant; however, there should be a drastic increase in screening rate among rural communities with low literacy to prevent cervical cancer incidence.[6] Acknowledging the beliefs and barriers to cervical cancer screening and prevention is the most important step forward in reducing cervical cancer incidence. Even with adequate knowledge and awareness, certain factors prevent women from participating in screening procedures and other preventive measures.[18]

The study was done by. K V, Mcquatters *et al*. in the year 2020 and Devarapalli P in the year 2018 reveal

Table 4: Assessment of Knowledge Factors Pre and Post intervention

Factors	Before Intervention Mean Value	After Intervention Mean Value	Mean difference	CI with 95%
Knowledge about the Warning signs of cervical Cancer	4.01	8.01	4	3.51-4.11
Risk factors of cervical cancer	15.35	39.67	24.32	23.91-24.49
Knowledge about cervical cancer screening and Pap test	1.23	2.54	1.31	1.26-1.34
Knowledge regarding the Vaccination for cervical cancer	1.02	2.09	1.07	1.02-1.11
Attitude towards self Assessment of cervical Cancer symptoms	1.11	1.59	0.48	0.41-0.51
Attitude towards vaccination	0.14	1.54	1.4	1.36-1.43
Attitude towards screening	1.01	2.06	1.05	1.01-1.09

defending the barriers and enhancing the facilitators is an essential stride in cervical cancer prevention and screening promotion Apart from health literacy barriers, which include cultural, social, financial, and psychosocial factors.[19,20] The current study demonstrates a shift in views regarding barriers and benefits with a large range of variation in the mean difference between pre and post-intervention, indicating that acceptance of susceptibility is increasing.

An Iranian study used a similar style of health education intervention, with roughly 81.4% knowledge gain, which was higher than our study due to the Iranian study's clear convenience sampling approach.[21]

The study conducted by Thulaseedharan and Zomordi *et al*., when integrated with other theoretical models such as the theory of planned behavior, and cognitive behavioral therapy, the health belief model of health education intervention program was proven to be even more effective in encouraging cervical cancer screening and prevention.[11,14]

In our current study, 39% of women were screened after receiving health education, which is lower than a similar study conducted in Turkey by Bal *et al*. in the year 2020, which reported 70% after the intervention of health belief model-based education. The reason for this is that the method of sampling used in our study was a multistage sampling method and a large sample size, whereas, in the previous study mentioned, the sample size was small and convenient sampling was used.[22]

The recent systematic review done in the year 2018 with more than 15000 participants from various countries under the title Educational Interventions for Cervical Cancer Screening Behavior of Women, also recommends health education with audio-visual format along with tailored monitoring can help in the change of behavior towards screening, where our current study used the health belief model education with audio-visual film with 8 minutes resulted in yielding 39% of screening rate.[23]

Strengths and limitations of the study

The strength of the study involves the health belief model of health education narrated in addressing the obstacles, and severity by practical approach through audio–visual format and health talk for easy interpretation and empathetic consideration by the women participants.

The planned sampling method and sample size are reckoned to be the core strength of the study. A lot of effort were taken, when participants who neglected themselves for the study after the description Thulaseedharan JV, Frie KG, Sankaranarayanan R. Challenges of health promotion and education strategies to prevent cervical cancer in India: A systematic review. J Educ Health Promot 2019;8:216. of the study, were replaced continuously with those who were willing to participate, to achieve the calculated sample size. Limitation includes factors constrained to the time period or duration of the study. If the study will be a continuous process similar to the program the screening rate can be further increased, handling the women participants empathetically while addressing them with a brief about the study, health education, and taking questionnaires The research may be scaled up further by integrating it with other comprehensive structured models such as social marketing and the precede-follow model to produce a targeted health promotion public health program.

Future research should include family-based integrated therapy as part of the intervention to address health belief-related barriers.

Conclusion

Almost one-third of the rural women were screened. The current study found that the health belief model educational method for cervical cancer prevention and promotion is successful in addressing cancer-related variables. The study showed that modifying ideas and perceptions about screening obstacles was the best technique in health promotion and screening activities. It is also apparent that many of the study participants volunteered to have a cervical cancer screening test following the intervention. The study demonstrated that health belief model-based health education is effective in cancer screening programs.

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The institutional ethical committee approved the code of ethics with reference (IEC: 1682/IEC/2019).

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Conflicts of interest
There are no conflicts of interest.

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