

Bridging the Gap in Cancer Prevention: Impact of a Structured Cancer Awareness and Counselling on Cancer Knowledge, Risk Perception, and Screening Awareness Among Adult Women an Observational Pre-Post-Test Study

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Received: 📅 2026 July 30

Accepted: 📅 2026 Aug 20

Published: 📅 2026 Aug 31

Abstract

Background: Cancer is a major global public health challenge, accounting for nearly 20 million new cases and 9.7 million deaths worldwide in 2022. In India, breast, cervical, and oral cancers constitute a substantial proportion of cancers among women. Despite the availability of effective preventive measures and screening programmes, awareness regarding cancer risk factors, early warning signs, hereditary cancer, genetic counselling, and screening remains inadequate, resulting in delayed diagnosis and poorer outcomes. Structured educational interventions may improve cancer literacy and encourage preventive health practices.

Objectives: To evaluate the effectiveness of a structured cancer awareness and counselling intervention in improving knowledge regarding common cancers, hereditary cancer, genetic counselling, cancer prevention, and screening among adult women aged 30–70 years.

Methods: A prospective questionnaire-based pre–post educational study was conducted among 300 women aged 30–70 years residing in urban and rural areas of Nagpur, Maharashtra, India. Participants completed a structured, validated questionnaire before and immediately after a standardized cancer awareness and counselling session covering common cancers, risk factors, warning symptoms, screening, HPV vaccination, hereditary cancer, genetic counselling, and preventive practices. Data were analysed using IBM SPSS Statistics version 29.0. Paired t-tests assessed changes in awareness scores, while Cohen's d measured effect size. Associations between baseline awareness and sociodemographic variables were analysed using one-way ANOVA.

Results: Structured counselling produced significant improvements across all awareness domains ($p < 0.001$). Mean general awareness scores increased from 3.99 ± 1.54 to 5.42 ± 0.74 , genetic awareness from 5.56 ± 1.92 to 7.10 ± 1.14 , and overall awareness from 9.55 ± 3.07 to 12.52 ± 1.47 . Large effect sizes were observed for general awareness ($d = 0.99$), genetic awareness ($d = 0.83$), and overall awareness ($d = 0.99$). Significant improvements were also observed in knowledge regarding cancer risk factors, screening methods, HPV vaccination, hereditary cancer, genetic counselling, and cancer-related misconceptions.

Conclusion: A structured cancer awareness and counselling programme significantly improved knowledge regarding common cancers, hereditary cancer, cancer prevention, and screening among adult women. Integrating such educational interventions into routine healthcare services and community-based cancer prevention programmes may strengthen early detection, promote

informed health-seeking behaviour, and support national cancer control strategies.

Keywords: Cancer Awareness, Cancer Education, Genetic Counselling, Hereditary Cancer, Cancer Screening, Breast Cancer, Cervical Cancer, Oral Cancer, Preventive Oncology, Women's Health

1. Introduction

Cancer remains one of the leading causes of morbidity and mortality worldwide and represents a major public health challenge. According to GLOBOCAN 2022, nearly 20 million new cancer cases and 9.7 million cancer-related deaths occurred globally, with the burden expected to rise because of population ageing, urbanisation, lifestyle changes, and persistent health inequalities. Low- and middle-income countries, including India, account for a disproportionate share of cancer incidence and mortality owing to limited access to preventive services, delayed diagnosis, and unequal healthcare resources [1-5]. In India, cancer has become a major non-communicable disease, with breast, cervical, and oral cancers among the most common malignancies affecting women. Although many of these cancers are preventable or highly curable when detected early, a large proportion of patients continue to present with advanced disease, resulting in poorer survival and increased healthcare costs [1-8]. The World Health Organization estimates that a substantial proportion of cancers can be prevented through lifestyle modification, vaccination, and reduction of environmental risk factors, while many others can be detected early through organised screening programmes. Nevertheless, awareness regarding cancer risk factors, warning symptoms, screening methods, and preventive practices remains inadequate in many parts of India. Cultural beliefs, misconceptions, fear of diagnosis, financial barriers, and poor health literacy continue to limit participation in screening and delay healthcare-seeking behaviour [5,8].

Hereditary cancer is another important but often overlooked aspect of cancer prevention. Although inherited pathogenic variants account for only 5–10% of cancers, identifying individuals at increased genetic risk enables appropriate surveillance, genetic counselling, and risk-reducing interventions for affected families. However, awareness of hereditary cancer syndromes, genetic testing, and genetic counselling remains limited in the general population, particularly in resource-constrained settings [9-13]. Educational interventions have consistently been shown to improve cancer knowledge, correct misconceptions, and encourage participation in preventive healthcare. Interactive counselling delivered by trained healthcare professionals allows individuals to understand cancer risk, recognise warning symptoms, and appreciate the importance of screening and healthy lifestyle practices. While previous studies have primarily focused on individual cancers such as breast or cervical cancer, relatively few have evaluated comprehensive cancer education incorporating hereditary cancer, genetic counselling, screening, and preventive strategies within a single programme among adult women in Central India [14-36]. Therefore, the present study was undertaken to evaluate the effectiveness of a structured

cancer awareness and counselling intervention among adult women attending a tertiary cancer centre and community outreach programmes in Central India. By comparing knowledge before and immediately after the intervention, the study aimed to determine whether structured education could improve awareness regarding common cancers, hereditary cancer, genetic counselling, screening, preventive measures, and cancer-related misconceptions. The findings may help inform community-based educational initiatives and strengthen preventive oncology programmes in similar settings.

2. Materials and Methods

2.1. Study Design

A prospective questionnaire-based pre-post educational study was conducted to evaluate the effectiveness of a structured cancer awareness and counselling intervention on knowledge of common cancers, hereditary cancer, genetic counselling, cancer prevention, and screening among adult women. Participants served as their own controls by completing the same validated questionnaire before and immediately after the educational intervention.

2.2. Study Setting and Duration

The study was conducted at the National Cancer Institute (NCI), Nagpur, Maharashtra, India, and selected urban and rural outreach communities affiliated with the institute. The study was carried out between **6 April 2026 and 18 July 2026**, following approval from the Institutional Scientific Committee and the Institutional Ethics Committee.

2.3. Study Population

The study included women aged **30–70 years** residing in urban and rural areas of Nagpur and neighbouring districts. Of the **350 women initially enrolled, 300 participants** fulfilled the eligibility criteria and completed both the pre- and post-intervention assessments.

2.4. Objectives

Primary Objective

To evaluate the effectiveness of a structured cancer awareness and counselling intervention in improving knowledge regarding common cancers, hereditary cancer, cancer prevention, and screening among adult women.

2.5. Secondary Objectives

- To assess baseline awareness regarding common cancers.
- To evaluate knowledge of hereditary cancer and genetic counselling.
- To compare awareness before and after the educational intervention.
- To assess participants' perceptions regarding cancer

myths, social support, and preventive practices.

- To examine the association between sociodemographic characteristics and baseline awareness.

2.6. Eligibility Criteria

2.6.1. Inclusion Criteria

Women who:

- were aged 30–70 years
- resided in the study area
- could understand English, Hindi, or Marathi
- provided written informed consent
- completed both pre- and post-test questionnaires.

2.6.2. Exclusion Criteria

Women who:

- had a previous diagnosis of malignancy
- had severe cognitive or psychiatric illness
- were seriously ill during recruitment
- declined participation or withdrew consent.

2.6.3. Sample Size

The sample size was estimated using the standard formula for prevalence studies:

$$n = Z^2 p(1-p)/d^2$$

where $Z = 1.96$, $p = 0.50$, and $d = 0.05$.

The calculated minimum sample size was approximately 350 participants. Considering feasibility, available resources, and the exploratory nature of the study, 300 participants were included, which was considered adequate to detect meaningful changes in awareness following the intervention.

2.7. Sampling Technique

Participants were recruited using consecutive sampling. Eligible women attending the outpatient department or community outreach programmes during the study period were invited to participate until the required sample size was achieved.

2.8. Study Instrument

Data were collected using a structured questionnaire developed after an extensive review of published literature and recommendations from the World Health Organization, the Indian Council of Medical Research, and the National Cancer Registry Programme.

The questionnaire comprised four sections.

- Section I: Sociodemographic characteristics (age, education, occupation, marital status, and family history of cancer).
- Section II: General cancer awareness, including common cancers, risk factors, warning signs, screening methods, HPV vaccination, and preventive practices.
- Section III: Hereditary cancer awareness, including inherited cancer susceptibility, hereditary cancer syndromes, genetic counselling, genetic testing, family risk assessment, and confidentiality of genetic information.
- Section IV: Cancer myths and social attitudes, including misconceptions regarding cancer transmission, stigma, and social support for individuals diagnosed with cancer.

2.9. Questionnaire Validation

The questionnaire was reviewed for content validity by experts in preventive oncology, oncology, epidemiology, and public health. Following revision, it was approved by the Institutional Scientific Committee. A pilot study involving 30 participants was conducted to evaluate clarity, comprehensibility, and feasibility. Feedback obtained during the pilot study was incorporated before administration of the final questionnaire. The validated questionnaire was available in English, Hindi, and Marathi.

2.10. Educational Intervention

Following completion of the baseline questionnaire, participants attended a standardized structured educational session delivered by trained healthcare professionals.

The intervention included:

- common cancers affecting women
- modifiable risk factors
- early warning signs
- breast, cervical, and oral cancer screening
- breast self-examination
- HPV vaccination
- hereditary cancer
- genetic counselling
- healthy lifestyle practices
- cancer myths and misconceptions
- available screening services.

The session incorporated PowerPoint presentations, audio-visual materials, interactive discussions, and opportunities for participants to ask questions. Immediately after completion of the session, participants completed the same questionnaire.

2.11. Data Collection Procedure

After obtaining written informed consent, participants completed the baseline questionnaire before attending the educational session. The identical questionnaire was administered immediately after the intervention to assess changes in awareness. Completed questionnaires were checked for completeness before data entry.

2.12. Outcome Measures

Primary Outcome

- Change in overall cancer awareness score after the educational intervention.
- Secondary Outcomes
- Change in general cancer awareness.
- Change in hereditary cancer awareness.
- Improvement in knowledge regarding cancer screening.
- Improvement in awareness of HPV vaccination.
- Improvement in awareness of genetic counselling.
- Changes in perceptions regarding cancer myths and social support.

2.13. Ethical Considerations

The study protocol was approved by the Institutional Scientific Committee and the Institutional Ethics Committee of the National Cancer Institute, Nagpur, before commencement of

the study. Written informed consent was obtained from all participants. Participation was voluntary, confidentiality was maintained, and all data were anonymized before analysis. The study was conducted in accordance with the principles of the Declaration of Helsinki.

3. Statistical Analysis

Data were entered into Microsoft Excel and analysed using IBM SPSS Statistics version 29.0 (IBM Corp., Armonk, NY, USA). Continuous variables are presented as mean $\pm$ standard deviation (SD), whereas categorical variables are expressed as frequencies and percentages. Associations

between baseline awareness scores and sociodemographic variables were evaluated using one-way analysis of variance (ANOVA). Changes in awareness scores before and after the intervention were analysed using the paired Student's t-test. Effect sizes were calculated using Cohen's d. A two-sided p-value <0.05 was considered statistically significant.

3.1. Participant Characteristics

A total of 300 adult women aged 30–70 years participated in the study. All participants completed both the pre-intervention and post-intervention questionnaires, therefore, no participant was excluded from the final analysis.

Variable	n (%)
Age (years)	
30–40	20 (6.7)
40–50	102 (34.0)
50–60	105 (35.0)
≥60	73 (24.3)
Educational status	
Up to XII	102 (34.0)
Diploma	3 (1.0)
Graduate	116 (38.7)
Postgraduate	79 (26.3)
Occupation	
Housewife	218 (72.7)
Working	82 (27.3)
Family history of cancer	
Yes	76 (25.3)
No	224 (74.7)
Marital status	
Married	293 (97.7)
Unmarried	7 (2.3)

Table 1: Sociodemographic Characteristics of the Study Participants (N = 300)

Legend: Distribution of study participants according to age, educational qualification, occupation, family history of cancer, and marital status.

The largest proportion of participants belonged to the 50–60-year age group (35.0%), followed by 40–50 years (34.0%). Most participants had completed graduation

(38.7%), whereas 26.3% were postgraduates. Nearly three-fourths (72.7%) were homemakers, and one-fourth (27.3%) were employed. A family history of cancer was reported by 25.3% of participants. Almost all participants were married (97.7%).

3.2. General Cancer Awareness

Awareness about Cancer		Aware	Not Aware	Total
1. Your Opinion about cancer: Curable/Preventable/Both /Neither?	PRE	103	197	300
	POST	219	81	300
2. What are the common types of cancer you know in women?	PRE	211	89	300
	POST	300	0	300

3. Which of the following do you think are risk factors? Tobacco/Alcohol/Poor diet/Lack of physical activity/ Pollution /Obesity/Infections (HPV, Hepatitis)	PRE	256	44	300
	POST	299	1	300
4. Which symptoms do you associate with cancer? Unexplained weight loss /Lump/swelling /Persistent cough /Change in bowel habits /Non-healing ulcers/ Persistent Vaginal bleeding & discharge	PRE	255	45	300
	POST	300	0	300
5. Are you 1 of the following screening methods? Mammography /Pap smear /Oral cancer screening	PRE	240	60	300
	POST	270	30	300
6. Have you heard about vaccine which prevent cancer? (Yes/No)	PRE	132	168	300
	POST	239	61	300

Table 2: General Cancer Awareness Before and After the Educational Intervention

Legend: Comparison of participants' awareness regarding common cancers, risk factors, warning symptoms, screening methods, and preventive vaccination before and after structured cancer awareness and counselling.

Marked improvements in general cancer awareness were observed following the educational intervention. Awareness that cancer is preventable and/or curable increased from 34.3% before counselling to 73.0% after counselling. Knowledge regarding common cancers affecting women

increased from 70.3% to 100%. Recognition of important cancer risk factors improved from 85.3% to 99.7%, while awareness regarding warning symptoms increased from 85.0% to 100%. Awareness of available cancer screening methods increased from 80.0% before counselling to 90.0% after counselling. Knowledge regarding cancer-preventive vaccination also improved substantially from 44.0% to 79.7% following the intervention.

3.3. Genetic Cancer Awareness

		Aware	Not Aware	Total
7. Some cancers occur due to inherited gene changes. ☐ True ☐ False	PRE	92	208	300
	POST	260	40	300
8. Having a hereditary cancer gene means a person will definitely develop cancer. ☐ True ☐ False	PRE	113	187	300
	POST	218	82	300
9. Hereditary cancer risk genes can be inherited from either parent. ☐ True ☐ False	PRE	101	199	300
	POST	264	36	300
10. Multiple family members with related cancers may suggest inherited risk. ☐ True ☐ False	PRE	114	186	300
	POST	253	47	300
11. Genetic counselling is recommended before and after genetic testing. ☐ True ☐ False	PRE	96	204	300
	POST	209	91	300
12. Genetic testing is required for all cancer patients. ☐ True ☐ False	PRE	184	116	300
	POST	235	65	300
13. Genetic test results may be important for other family members. ☐ True ☐ False	PRE	216	84	300
	POST	287	13	300
14. Knowledge of hereditary risk about cancer can guide screening and prevention. ☐ True ☐ False	PRE	10	290	300
	POST	234	66	300
15. Genetic information should be kept confidential like other medical data. ☐ True ☐ False	PRE	158	142	300
	POST	207	93	300

Table 3: Genetic Cancer Awareness Before and After the Educational Intervention

Legend: Comparison of participants' knowledge regarding hereditary cancer, genetic counselling, inheritance patterns, and genetic testing before and after counselling.

Baseline knowledge regarding hereditary cancer was generally limited. Following the educational intervention,

significant improvements were observed across all domains. Awareness that certain cancers may occur due to inherited genetic alterations increased from 30.7% to 86.7%. Correct understanding that hereditary cancer genes can be inherited from either parent increased from 33.7% to 88.0%. Knowledge that multiple affected family

members may indicate hereditary cancer increased from 38.0% to 84.3%, while awareness regarding the importance of genetic counselling before and after testing improved from 32.0% to 69.7%. Recognition that genetic test results may be relevant for family members increased from 72.0% to 95.7%. Knowledge regarding hereditary cancer risk guiding screening and prevention demonstrated the

greatest improvement, increasing from only 3.3% before counselling to 78.0% after counselling. Awareness regarding confidentiality of genetic information also increased from 52.7% to 69.0%.

3.4. Association Between Baseline Awareness and Sociodemographic Characteristics

Age group (years)	N	Mean $\pm$ SD	F-value	p-value
30–40	20	8.25 $\pm$ 3.80	1.917	0.127
40–50	102	9.83 $\pm$ 3.10		
50–60	105	9.74 $\pm$ 2.76		
≥ 60	73	9.22 $\pm$ 3.20		
Total	300	9.55 $\pm$ 3.07		

Table 4: Association Between Age and Baseline Overall Awareness Score

Legend: Baseline overall awareness scores according to age group.

Mean baseline awareness scores ranged from 8.25 $\pm$ 3.80

among women aged 30–40 years to 9.83 $\pm$ 3.10 among those aged 40–50 years. However, no statistically significant association was observed between age group and baseline awareness ($F = 1.917$, $p = 0.127$).

Educational qualification	N	Mean $\pm$ SD	F-value	p-value
Diploma	3	7.33 $\pm$ 4.73	15.16	<0.001
Up to XII	102	8.05 $\pm$ 3.24		
Graduate	116	10.27 $\pm$ 2.47		
Postgraduate	79	10.51 $\pm$ 2.86		
Total	300	9.55 $\pm$ 3.07		

Table 5: Association Between Educational Qualification and Baseline Overall Awareness Score

Legend: Comparison of baseline awareness scores according to educational status.

Educational qualification demonstrated a significant association with baseline awareness. Postgraduate

participants had the highest mean awareness score (10.51 $\pm$ 2.86), followed by graduates (10.27 $\pm$ 2.47), whereas women educated up to higher secondary level had lower awareness scores (8.05 $\pm$ 3.24). The association was highly significant ($F = 15.16$, $p < 0.001$).

Occupation	n	Mean $\pm$ SD	F-value	p-value
Housewife	218	9.01 $\pm$ 2.92	26.45	<0.001
Working	82	10.98 $\pm$ 3.03		
Total	300	9.55 $\pm$ 3.07		

Table 6: Association Between Occupation and Baseline Awareness Score

Legend: Comparison of awareness scores between homemakers and employed women.

Working women demonstrated significantly higher baseline awareness (10.98 $\pm$ 3.03) than homemakers (9.01 $\pm$ 2.92). This difference was statistically significant ($F = 26.45$, $p < 0.001$).

Family history of cancer	n	Mean $\pm$ SD	F-value	p-value
No	224	9.38 $\pm$ 3.05	2.49	0.120
Yes	76	10.03 $\pm$ 3.11		
Total	300	9.55 $\pm$ 3.07		

Table 7: Association Between Family History of Cancer and Baseline Awareness Score

Legend: Baseline awareness according to family history of cancer.

Participants reporting a family history of cancer had slightly higher awareness scores (10.03 ± 3.11) than those without a family history (9.38 ± 3.05), however, the difference was not statistically significant ($F = 2.49$, $p = 0.120$).

Marital status	n	Mean $\pm$ SD	F-value	p-value
Unmarried	7	12.00 ± 2.24	4.619	0.032
Married	293	9.49 ± 3.07		
Total	300	9.55 ± 3.07		

Table 8: Association Between Marital Status and Baseline Awareness Score

Legend: Comparison of awareness scores according to marital status.

4.619, $p = 0.032$). However, interpretation should be made cautiously because the unmarried group consisted of only seven participants.

Unmarried women demonstrated higher baseline awareness scores (12.00 ± 2.24) compared with married women (9.49 ± 3.07). This difference reached statistical significance ($F =$

Effect of the Educational Intervention

Awareness domain	Pre-test Mean $\pm$ SD	Post-test Mean $\pm$ SD	Mean Difference	T-value	P-value
General awareness	3.99 ± 1.54	5.42 ± 0.74	1.43	17.08	<0.001
Genetic awareness	5.56 ± 1.92	7.10 ± 1.14	1.54	14.32	<0.001
Overall awareness	9.55 ± 3.07	12.52 ± 1.47	2.98	17.07	<0.001

Table 9: Comparison of Awareness Scores Before and After Structured Cancer Awareness and Counselling

Legend: Comparison of general, genetic, and overall awareness scores before and after the educational intervention.

The educational intervention produced significant improvements across all awareness domains. The mean general awareness score increased from 3.99 ± 1.54 before counselling to 5.42 ± 0.74 after counselling (mean

difference 1.43, $t = 17.08$, $p < 0.001$). Similarly, the mean genetic awareness score improved from 5.56 ± 1.92 to 7.10 ± 1.14 (mean difference 1.54, $t = 14.32$, $p < 0.001$). Overall awareness increased significantly from 9.55 ± 3.07 to 12.52 ± 1.47 , representing a mean improvement of 2.98 points ($t = 17.07$, $p < 0.001$). These findings indicate that structured counselling significantly enhanced participants' cancer-related knowledge.

Domain	Cohen's d	Interpretation
General awareness	0.99	Large
Genetic awareness	0.83	Large
Overall awareness	0.99	Large

Table 10: Effect Size of The Educational Intervention

Legend: Cohen's d effect sizes demonstrating the practical significance of the educational intervention.

Large effect sizes were observed across all awareness domains. Cohen's d values were 0.99 for general awareness,

0.83 for genetic awareness, and 0.99 for overall awareness, indicating that the educational intervention produced not only statistically significant but also clinically meaningful improvements in participants' knowledge.

Variable	Response	Pren (%)	Post n (%)	p-value*
Do you think cancer patients should be socially supported?	Yes	260 (86.7)	299	<0.001
	No	40 (13.3)	1 (0.3)	
Do you believe myths (e.g., cancer spreads by contact)?	No	238 (79.3)	291 (97.0)	<0.001
	Yes	62 (20.7)	9 (3.0)	

Table 11: Awareness Regarding Social Support for Cancer Patients and Cancer Myths Before and After Counselling

Legend: Changes in participants' perceptions regarding social support for cancer patients and common cancer myths following structured counselling.

Following the intervention, the proportion of participants who believed that cancer patients should receive social support increased significantly from 86.7% to 99.7% ($p < 0.001$).

Similarly, correct rejection of common cancer myths increased from 79.3% before counselling to 97.0% after counselling ($p < 0.001$), demonstrating substantial improvement in participants' attitudes and understanding following the educational programme.

4. Summary of Results

Among the 300 participants, structured cancer awareness and counselling resulted in significant improvements in general cancer awareness, hereditary cancer knowledge, awareness of screening methods, and understanding of cancer prevention. Educational qualification and occupation were significantly associated with baseline awareness, whereas age and family history of cancer were not. The intervention produced statistically significant improvements in all awareness domains with large effect sizes, highlighting the effectiveness of structured educational counselling in enhancing cancer-related knowledge among adult women.

5. Discussion

The present prospective pre-post educational study demonstrated that a structured cancer awareness and counselling intervention significantly improved knowledge regarding common cancers, hereditary cancer, genetic counselling, cancer screening, HPV vaccination, and cancer prevention among adult women. Significant improvements were observed in general, genetic, and overall awareness scores, with large effect sizes indicating that the intervention achieved both statistical and practical significance. These findings highlight the value of structured educational programmes as an effective strategy for improving cancer literacy, particularly in low- and middle-income countries where delayed diagnosis and poor awareness remain major barriers to cancer control [1,8]. Baseline awareness regarding cancer prevention, screening, hereditary cancer, and HPV vaccination was suboptimal despite the relatively educated study population. Similar observations have been reported from India and other low- and middle-income countries, where limited health literacy, cultural beliefs, fear

of diagnosis, financial constraints, and inadequate access to preventive services continue to reduce participation in cancer screening programmes. [22,23]. The present findings reinforce the need for systematic educational interventions alongside organised screening initiatives. One of the most important findings of this study was the significant improvement in overall cancer awareness following a single structured educational session. Participants demonstrated better understanding of common cancers affecting women, modifiable risk factors, warning signs, available screening methods, and preventive practices. Similar improvements have been reported following community-based educational interventions, where interactive counselling was more effective than passive educational materials because participants could ask questions, clarify misconceptions, and actively engage with healthcare professionals. [21,23,36]. Awareness regarding cancer screening also improved significantly after the intervention. Knowledge of breast, cervical, and oral cancer screening increased substantially, supporting evidence that educational programmes can enhance understanding of early detection strategies and encourage future participation in screening. Early diagnosis remains one of the most effective approaches for reducing cancer-related mortality because cancers detected at an earlier stage are associated with improved survival and lower treatment costs [6,8,23,28]. Although this study assessed awareness rather than actual screening awareness, improving knowledge is an essential first step towards increasing participation in organised screening programmes. An important strength of the intervention was its inclusion of hereditary cancer and genetic counselling. Baseline awareness regarding inherited cancer susceptibility, hereditary cancer syndromes, and genetic counselling was limited, but significant improvements were observed following the educational session. These findings are clinically relevant because inherited pathogenic variants account for approximately 5–10% of cancers, and identifying high-risk individuals enables personalised surveillance, cascade testing of family members, and implementation of risk-reducing strategies [10,13,25,27]. Similar deficiencies in public awareness have been reported internationally, highlighting the need to integrate genetic education into routine cancer prevention programmes.

Knowledge regarding HPV vaccination also improved considerably after counselling. Participants demonstrated better understanding of the relationship between persistent

HPV infection and cervical cancer, the preventive role of vaccination, and the importance of primary prevention. These findings are consistent with previous studies demonstrating that educational interventions improve acceptance of HPV vaccination and support implementation of the WHO Global Strategy for Cervical Cancer Elimination [7,14,15,24]. Given the continuing burden of cervical cancer in India, integrating HPV education into community awareness programmes may substantially improve vaccine acceptance and future screening awareness. Beyond improving factual knowledge, the intervention positively influenced participants' attitudes towards cancer. Misconceptions regarding cancer transmission decreased significantly, while support for individuals affected by cancer increased after counselling. Reducing stigma is an important component of cancer control because fear, misconceptions, and fatalistic beliefs frequently delay healthcare-seeking behaviour and discourage participation in screening programmes. Similar improvements in cancer-related attitudes following structured educational interventions have been reported in previous community-based studies [36,37].

The study also identified important sociodemographic factors associated with baseline awareness. Women with higher educational attainment and those who were employed demonstrated significantly greater baseline knowledge than less educated participants and homemakers. These findings agree with previous studies showing that education improves health literacy and access to reliable health information [21,22,36]. In contrast, age and family history of cancer were not significantly associated with awareness, suggesting that previous exposure to health education may be more influential than demographic characteristics alone.

The large effect sizes observed in this study demonstrate that the intervention produced clinically meaningful improvements rather than merely statistically significant differences. Assessment of both statistical significance and effect size strengthens the interpretation of the findings and supports the effectiveness of structured educational interventions in improving cancer awareness. The findings have important implications for cancer prevention programmes in India. Although national initiatives recommend screening for common cancers, their effectiveness depends largely on public awareness and acceptance. Incorporating structured educational sessions into primary healthcare services, tertiary hospitals, preventive oncology clinics, community outreach programmes, and women's health initiatives could substantially strengthen early detection efforts. In addition, frontline healthcare workers, including Accredited Social Health Activists (ASHAs), Auxiliary Nurse Midwives (ANMs), community health officers, and primary care physicians, can play an important role in delivering culturally appropriate cancer education at the community level [22]. A notable strength of this study is its comprehensive educational approach. Unlike many previous studies that focused on a single cancer, the intervention simultaneously addressed breast, cervical, and oral cancers, hereditary cancer, genetic counselling, HPV vaccination, lifestyle modification, screening, and cancer myths. This broader approach reflects

the evolving concept of preventive oncology, which integrates behavioural risk reduction, vaccination, organised screening, and genetic risk assessment to improve cancer prevention [10,16,25,33]. Nevertheless, several limitations should be considered. The study was conducted at a single tertiary cancer centre using consecutive sampling, which may limit generalisability. Knowledge was assessed immediately after the intervention, therefore, long-term retention of information and changes in health-seeking behaviour could not be evaluated. The absence of a control group and reliance on self-reported responses may also have introduced bias. Future multicentre longitudinal studies should assess sustained knowledge retention, participation in cancer screening, HPV vaccination awareness and acceptance, and referral for genetic counselling following structured educational interventions.

Overall, the present study demonstrates that a structured cancer awareness and counselling programme is an effective, low-cost strategy for improving cancer literacy among adult women. By enhancing awareness of common cancers, hereditary cancer, genetic counselling, screening, HPV vaccination, and preventive practices, such interventions have the potential to strengthen national cancer control programmes, promote early diagnosis, and ultimately reduce cancer-related morbidity and mortality [6,18,21,29].

6. Strengths of the Study

This study has several strengths. It employed a prospective pre-post design to evaluate the effectiveness of a structured cancer awareness and counselling intervention among 300 adult women from both urban and rural communities. The questionnaire was developed through an extensive literature review, validated by experts, pilot-tested, and administered in English, Hindi, and Marathi to ensure accessibility. Unlike many previous studies that focused on a single cancer, this intervention comprehensively addressed breast, cervical, and oral cancers, hereditary cancer, genetic counselling, HPV vaccination, screening, cancer myths, and preventive practices. The large effect sizes observed across all awareness domains further demonstrate the practical effectiveness of the educational intervention.

7. Limitations

The study has certain limitations. It was conducted at a single tertiary cancer centre using consecutive sampling, which may limit the generalisability of the findings. Knowledge was assessed immediately after the intervention, therefore, long-term retention of knowledge and changes in preventive behaviours could not be evaluated. The absence of a control group and reliance on self-reported responses may have introduced bias. Future multicentre longitudinal studies with follow-up assessment of screening participation and behavioural outcomes are required to confirm the long-term impact of structured educational interventions.

8. Public Health Implications

Cancer awareness remains a cornerstone of cancer prevention and early detection. The findings of this study demonstrate that a structured educational intervention

can substantially improve knowledge regarding common cancers, hereditary cancer, cancer screening, HPV vaccination, and preventive practices among adult women. Integrating similar educational programmes into primary healthcare services, preventive oncology clinics, community outreach activities, and national cancer control programmes may improve cancer literacy, promote timely healthcare-seeking behaviour, increase participation in screening programmes, and contribute to earlier diagnosis and better outcomes. Training frontline healthcare workers, including ASHAs, ANMs, community health officers, and primary care physicians, to deliver standardised cancer education may further strengthen community-based cancer prevention efforts.

9. Recommendations

Based on the findings of this study, the following recommendations are proposed.

1. Structured cancer awareness and counselling programmes should be integrated into routine primary healthcare and community outreach services.
2. Educational initiatives should include information on hereditary cancer, genetic counselling, HPV vaccination, and evidence-based cancer screening.
3. Culturally appropriate educational materials should be developed in regional languages to improve health literacy across diverse populations.
4. Future multicentre longitudinal studies should evaluate long-term knowledge retention, behavioural change, screening participation, HPV vaccination uptake, and referral for genetic counselling.

10. Conclusion

The present study demonstrated that a structured cancer awareness and counselling intervention significantly improved knowledge regarding common cancers, hereditary cancer, cancer risk factors, warning signs, screening methods, HPV vaccination, and preventive practices among adult women. Significant improvements were observed across all awareness domains, with large effect sizes indicating meaningful educational benefit. Higher educational attainment and employment were associated with greater baseline awareness, whereas age and family history of cancer showed no significant association. These findings suggest that structured educational interventions can effectively address important gaps in cancer literacy and support informed decision-making regarding cancer prevention and early detection. Given the increasing burden of cancer in India, integrating structured cancer education into routine healthcare services, community outreach programmes, and national cancer control initiatives may enhance awareness, encourage timely participation in screening programmes, facilitate appropriate referral for genetic counselling, and ultimately contribute to reducing cancer-related morbidity and mortality.

Acknowledgement

The authors express their sincere gratitude to The Management of the National Cancer Institute, Nagpur, Maharashtra, India, for granting permission and extending

institutional support to conduct this study. The author gratefully acknowledges Ms. Devyani Joshi, Social Worker, for her assistance in participant coordination and implementation of the educational programme. The author also sincerely thanks the members of the Institutional Scientific Committee and the Institutional Ethics Committee for their valuable guidance during the planning and conduct of the study. Special appreciation is extended to all the women who voluntarily participated in this study. Their cooperation, time, and willingness to contribute made this research possible.

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