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Research Article

Effectiveness of a Mobile App CANScreen on Selected Common Cancer Screening Procedures and Preventive Measures in terms of Knowledge and Practice among Undergraduate Students

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I N F O

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A B S T R A C T

Introduction: Cancer affects all walks of life. To reduce cancer mortality, it is of extreme importance that people should be made aware, and the required prevention methods and treatment should be provided at the proper time. This study was conducted to assess the effectiveness of CANScreen app on selected common cancer screening procedures and preventive measures in terms of knowledge and practice among undergraduate students.

Method: The research approach was a quasi-experimental approach. One group pre-test post-test design was used. 126 samples were recruited through stratified random sampling. Seven tools were used for data collection. Ethical approval was taken from the institutional ethics committee and administrative approval was taken from the college authority.

Results: The mobile app CANScreen was effective in improving both knowledge and practice of undergraduate students regarding selected common cancer screening procedures and preventive measures. The mean post-test knowledge score was 22.91 and the mean post-test practice score was 45.94. There was a positive correlation (0.21) between knowledge and practice after the administration of CANScreen. There was a significant association between post-test knowledge scores and selected variables such as stream of study, year of study, and presence of healthcare professionals in the family. There was also a significant association between post-test practice scores and selected variables such as gender. 72% of the users accepted the mobile app CANScreen to a great extent.

Conclusion: Educating the young generation with similar new technology will motivate them to lead a life with the awareness of cancer screening and prevention methods.

Keywords: Cancer Screening Procedures, Cancer Prevention, Mobile App, Knowledge, Practice

Introduction

Cancer is a very common non-communicable disease, which is characterised by rapid, uncontrolled, abnormal growth in some cells in the body. In a few cases, it undergoes the process of metastasis and spreads from one part of the body to another.[1] Such uncontrolled growth is harmful to our body because besides replacing the healthy cells of our body, it also has adverse effects on our body's biochemical environment, causing weight loss and decrease in immunity, finally culminating in death. More than 200 varying types of cancers are known to us, affecting almost any part of the body.[2,3] The five most common cancers among men and women in India are breast cancer, cervical cancer, mouth and lip cancer, lung cancer, and colorectal cancer. These five top cancers account for 47.2% of all cancers.[4] Cancer is the second most common cause of mortality in India after cardiovascular disease.[5]

Background and Need of the Study

Kerala has reported the highest number of cancer cases in India, followed by Mizoram, and Haryana. The lowest number of cases have been reported in the state of Bihar. The cancer incidence rate in India was found to be 106.6 per 1 lakh people in 2016, whereas, in Kerala, it was 135.3 per 1 lakh people.[6] According to the latest studies, the mortality and disability rates caused by cancer are also more in Kerala.[7]

The lack of awareness of cancer screening and prevention among the public is making the problem more serious. Early identification of cancer will give a good prognosis and quality of life. Most of the common cancers prevalent in the country can be screened and found in their early phase.[8,9] By sensitising the young generation, we can prevent them from getting into unhealthy habits like smoking, tobacco use, alcohol addiction, substance abuse, over consumption of junk food etc.

Mobile technology is an amazing thing.[10] It's one of the most revolutionary productivity tools of all time. The investigator felt that this technology can be used to make behavioural changes in college students regarding cancer prevention and screening.[11,12] College students can educate and make their family and friends aware of the importance of prevention and screening of cancer. By educating the young generation, we can reduce the global burden of the disease to some extent in future.[13]

Objectives

The objectives of the study are:

- To develop the mobile app CANScreen regarding selected common cancer screening procedures and preventive measures
- To assess and evaluate the knowledge and practice of undergraduate students regarding selected common cancer screening procedures and preventive measures before and after the use of CANScreen
- To find the relationship between knowledge and practice of undergraduate students regarding selected common cancer screening procedures and preventive measures after the administration of CANScreen
- To determine the association between knowledge and practice of undergraduate students after the administration of mobile app CANScreen regarding selected common cancer screening procedures and preventive measures and selected variables:

(a) Gender
(b) Stream of study
(c) Year of study
(d) Religion
(e) Educational status of mother
(f) Educational status of father
(g) History of cancer in family
(h) Presence of healthcare professionals in the family
(i) Previous exposure to cancer screening education programme

- To determine the acceptability and utility of mobile app CANScreen in terms of opinion of undergraduate students

Operational Definitions

Effectiveness: Here effectiveness refers to the power of the mobile app to bring a gain in the knowledge and practice regarding common cancer screening procedures and preventive measures among undergraduate students as evidenced by their knowledge and practice scores.

Mobile app CANScreen: In this study, mobile app CANScreen refers to the mobile-based self-learning material for achieving knowledge and practice regarding the selected common cancer screening procedures and preventive measures.CANScreen App Link: https://play.google.com/store/apps/details?id=com.cancer.bharti.canscreen (press Control key and click on the hyperlink to open the CANScreenapp)

Selected Common Cancer Screening Procedures and Preventive Measures: In this study, common cancer screening procedures and preventive measures refer to the screening procedures and preventive measures for cancer of mouth, carcinoma breast, cancer of cervix, cancer of colorectum, and testicular cancer.

Knowledge: The word knowledge, in the present study, implies the number of correct responses of the participants to the items of structured knowledge questionnaire regarding CANScreen on selected common cancer screening procedures and preventive measures as evidenced by the knowledge scores. Knowledge is further categorised as poor (0-10), fair (11-20), and good (21-30) based on the scores.

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Practice: In this study, practice refers to self-expressed practice and the ability of undergraduate students to respond to the items in the practice check lists regarding CANScreen on selected common cancer screening procedures and preventive measures as evidenced by the practice scores. Practice is further categorised as poor (0-20), fair (21-40), and good (41-60) based on the scores.

Undergraduate Students: In this study, undergraduate students refers to those who are studying in degree college in arts, science, or commerce stream.[14]

Method

Design and Setting

The conceptual framework of the study was based on the health belief model (HBM). The study used a quantitative research method. The research design was quasi-experimental one group pre-test post-test design. On day 1, the investigator administered the tool for pre-test to assess the knowledge and practice of undergraduate students regarding selected common cancer screening procedures and preventive measures followed by the administration of the mobile app CANScreen regarding selected common cancer screening procedures and preventive measures. On day 8, the investigator administered the tool for post-test to assess the knowledge and practice of undergraduate students regarding selected common cancer screening procedures and preventive measures. The dependent variables of the study were knowledge and practice of undergraduate students regarding selected common cancer screening procedures and preventive measures.[15] The independent variable in the study was CANScreen. Attribute variables of the present study were gender, stream of study, year of study, religion, educational status of mother and father, history of cancer in the family, presence of healthcare professionals in the family and previous exposure to cancer screening education. The setting of the present study is selected arts and science colleges of Palakkad district, Kerala state, India. The total study duration was 3 weeks.

Sample and Sampling Technique

Inclusion Criteria

- Undergraduate students of the selected undergraduate colleges of Palakkad District, Kerala
- Undergraduate students who were willing to participate
- Undergraduate students who were available during data collection
- Undergraduate students who were Android mobile phone users

Exclusion Criteria

- Undergraduate students who were not willing to participate
- Undergraduate students who did not have Android mobile phones

Table 1.Sample Distributions

Stream of the Study	Year of the Study	Gender	Sample Distribution (N = 126)		
Arts	First year	Male	7	14	42
		Female	7		
	Second year	Male	7	14	
		Female	7		
	Third year	Male	7	14	
		Female	7		
Commerce	First year	Male	7	14	42
		Female	7		
	Second year	Male	7	14	
		Female	7		
	Third year	Male	7	14	
		Female	7		
Science	First year	Male	7	14	42
		Female	7		
	Second year	Male	7	14	
		Female	7		
	Third Year	Male	7	14	
		Female	7		
Total					126 students

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Table 1 shows the sample distribution details. The sample of the present study consisted of 126 undergraduate students of selected arts and science colleges in Palakkad district, Kerala state, India. In this study, stratified random sampling was used to select the subjects depending on the sample selection criteria.

Equal numbers of samples were selected from arts, science, and commerce streams. Samples were also equally selected from the first, second, and third years.

Description of the Intervention

Mobile App CANScreen

Mobile app CANScreen on selected common cancer screening procedures and preventive measures includes the following information:

1. Statistics and cancer burden of India
2. Mouth cancer
- Definition of cancer of oral cavity
- Risk factors of cancer of oral cavity
- Early signs and warning signs of cancer of oral cavity
- Screening procedures for cancer of oral cavity
- Preventive measures for cancer of oral cavity
3. Cancer of breast
- Definition of cancer of breast
- Risk factors of cancer of breast
- Early signs and warning signs of cancer of breast
- Screening procedures for cancer of breast
- Preventive measures for cancer of breast
4. Cancer of cervix
- Definition of cancer of cervix
- Risk factors of cancer of cervix
- Early signs and warning signs of cancer of cervix
- Screening procedures for cancer of cervix
- Preventive measures for cancer of cervix
5. Colorectal cancer
- Definition of colorectal cancer
- Risk factors of colorectal cancer
- Early signs and warning signs of colorectal cancer
- Screening procedures for colorectal cancer
- Preventive measures for colorectal cancer
6. Testicular cancer
- Definition of testicular cancer
- Risk factors of testicular cancer
- Early signs and warning signs of testicular cancer
- Screening procedures for testicular cancer
- Preventive measures for testicular cancer

Data Collection Tool and Techniques

Table 2 shows the details of the tools used in the study. Total 7 tools were used to collect data from the sample. In order to establish the reliability of the tool, test and retest method for knowledge structured questionnaire, Cronbach's alpha was used. Content validity of tools established by a total of 11 experts from the following fields: oncology nursing education (3), oncology nursing practice (3), medical oncology (2), surgical oncology (1), radiation oncology (1), and preventive oncology (1). The present study was conducted in the above setting after getting formal written permission from the college authority. Ethical approval was taken from the institutional ethics committee. The investigator got written informed consent from the samples after explaining the purpose of the study. Confidentiality and anonymity were maintained throughout the study.

Table 2.Details of the Tool

Tool No.	Name of the Tool
Tool 1	Demographic data performa
Tool 2	Structured knowledge questionnaire
Tool 3	Practice checklist for mouth cancer and colorectal cancer screening
Tool 4	BSE (Breast self-examination) practice checklist
Tool 5	Practice checklist for cervical cancer screening
Tool 6	TSE (Testicular self-examination) practice checklist
Tool 7	Opinnionaire to assess utility and acceptability of mobile app CANScreen

Data Analysis

Descriptive and inferential statistics were used to analyse the obtained data. The data findings have been organised and presented under six sections.

Results

Section I: Sample Characteristics

Table 3 shows the sample characteristics. Samples were equally distributed among both genders. 63 (50%) undergraduates were male and 63 (50%) were female. Majority of the participants (58, 46.04%) belonged to the Hindu religion. Mothers and fathers of most of the participants (52, 41.2% and 48, 38.10% respectively) had an educational qualification of + 2/PDC.

Section II: Evaluation of Effectiveness of Mobile App CANScreen in Terms of Knowledge of Undergraduate Students

Table 4 shows that the mean post-test knowledge score of undergraduate students on selected common cancer screening procedures and preventive measures (22.91) is higher than their mean pre-test knowledge score (5.94) with a mean difference of 16.97. The standard deviation of post-test knowledge score (2.44) is lower than the standard deviation of pre-test knowledge score (3.22)

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suggesting an equal homogenous grasping of knowledge after the administration of CANScreen. The calculated "t" value (41.39), higher than the table t value (2.62) for df 125, was found to be statistically significant at 0.01 level of significance. Thus it is established that there was a significant difference in the mean pre-test and post-test knowledge scores of undergraduates. Hence null hypothesis H01 (the mean post-test knowledge score of undergraduate students will not be significantly higher than their mean pre-test knowledge score after the administration of mobile app CANScreen on selected common cancer screening procedures and preventive measures as measured by structured knowledge questionnaire at 0.01 level of significance) was rejected and research hypothesis H1 (the mean post-test knowledge score of undergraduate students will be significantly higher than their mean pre-test knowledge score after the administration of mobile app CANScreen on selected common cancer screening procedures and preventive measures as measured by structured knowledge questionnaire at 0.01 level of significance) was accepted.

Table 3.Frequency and Percentage Distributions of Undergraduate Students by Sample Characteristics

n = 126

Demographic Variables	Frequency	Percentage
Gender		
Male	63	50
Female	63	50
Religion		
Hindu	58	46.04
Muslim	42	33.33
Christian	26	20.63
Educational status of mother		
Up to 5th standard	04	3.17
6th-10th standard	17	13.49
11th-12th standard	52	41.27
Graduation	36	28.57
Postgraduation & above	17	13.49
Educational status of father		
Up to 5th standard	06	4.75
6th-10th standard	21	16.67
11th-12th standard	48	38.10
Graduation	32	25.40
Postgraduation & above	19	15.08
History of cancer in family		
Yes	13	10.31
No	96	76.62
Don't know	17	13.33
Presence of healthcare professionals in the family		
Yes	22	17.46
No	104	82.54
Previous exposure to cancer screening & prevention education		
Yes	28	22.22
No	98	77.78

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Table 4.Mean, Mean Difference (MD), Standard Deviation Difference (SD_d), Standard Error of Mean Difference (SEMD), and "t" Value of the Pre-test and Post-test Knowledge Score of Undergraduate Students

n = 126

Test	Mean	SD	MD	SD_d	SE_{MD}	"t" value
Pre-test	5.94	3.22	16.97	4.56	0.41	41.39*
Post-test	22.91	2.44				

*t value for df (125) level = 2.62, p< 0.01 significant at 0.01 level

Table 5.Frequency and Percentage Distribution of Pre-test and Post-test Knowledge Scores of Undergraduate Students according to their Categories of Knowledge Scores

n = 126

Knowledge Score Categories with Class Interval	Pre-test		Post-test	
	Frequency	Percentage	Frequency	Percentage
Poor knowledge (0-10)	107	84.92	00	00
Fair knowledge (11-20)	19	15.08	23	18.25
Good knowledge (21-30)	00	00	103	81.75

Maximum possible score was 30

Table 5 shows that the frequency interval of pre-test knowledge scores started from class interval 0-10 with the highest frequency of 107, whereas, the post-test knowledge scores started from class interval 11-20 and the highest frequency (103) was in the class interval 21-30. This suggests the majority of the undergraduate students' scores were under the good category after the intervention.

As shown in Figure 1, the maximum gain (64.88%) percentage score was in the area of screening procedures and prevention of carcinoma breast, followed by 62.60% in the area of screening procedures and prevention of colorectal cancer. The least gain percentage score (45.40%) was seen in screening procedures and prevention of testicular cancer. Thus there was gain in all domains of knowledge, indicating the effectiveness of CANScreen.

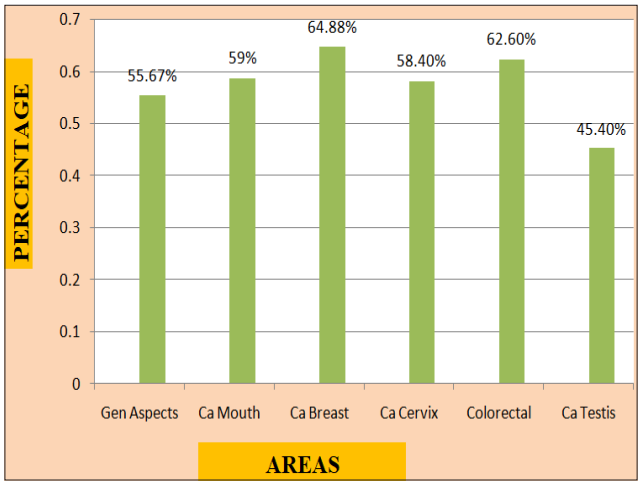

Figure 1.Areawise Gain Mean Percentage of Knowledge Scores of Sample

Section III: Evaluation of Effectiveness of Mobile App CANScreen in terms of Practice of Undergraduate Students

Table 6 shows that the mean post-test practice score of undergraduate students on selected common cancer screening procedures and preventive measures (45.94) was higher than their mean pre-test practice score (12.76) with a mean difference of 33.18. The standard deviation of post-test practice score (3.23) was lower than the standard deviation of pre-test practice score (3.86) suggesting an equal homogenous grasping of practice after the administration of CANScreen.

The calculated "t" value (72.13), higher than the table t value (2.62) for df 125, was found to be statistically significant at 0.01 level of significance.

Thus it was established that there was a significant difference in the mean pre-test and post-test practice scores of undergraduates.

Hence null hypothesis H02 (the mean post-test practice score of undergraduate students will not be significantly higher than their mean pre-test practice score after the administration of mobile app CANScreen on selected common cancer screening procedures and preventive measures as measured by practice checklist at 0.01 level of significance) was rejected and research hypothesis H2 (the mean post-test practice score of undergraduate students will be significantly higher than their mean pre-test practice score after the administration of mobile app CANScreen on selected common cancer screening procedures and preventive measures as measured by practice checklist at 0.01 level of significance) was accepted.

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Table 6.Mean, Mean Difference (MD), Standard Deviation Difference (SDd), Standard Error of Mean Difference (SEMD), and "t" Value of the Pre-test and Post-test Practice Score of Undergraduate Students

n = 126

Test	Mean	SD	MD	SD_d	SE_{MD}	"t" Value
Pre-test	12.76	3.86	33.18	5.18	0.46	72.13*
Post-test	45.94	3.23				

*t value for df (125) level = 2.62, p< 0.01 significant at 0.01 level

Table 7.Frequency and Percentage Distribution of Pre-test and Post-test Practice Scores of Undergraduate Students according to their Categories of Practice Scores

n = 126

Practice Score Categories with Class Interval	Pre-test		Post-test	
	Frequency	Percentage	Frequency	Percentage
Poor practice (0-20)	121	96.03	00	00
Fair practice (21-40)	05	3.97	04	3.17
Good practice (41-60)	00	00	122	96.83

Maximum possible score was 60

Table 8.Areawise Mean Practice Score, Mean Percentage and Mean Gain Percentage of Pre-test and Post-test Practice Scores of Undergraduate Students

n= 126

Gender	Area	Max Score	Pre-test		Post-test		Gain in Score	
			Mean Score	Mean %	Mean Score	Mean %	Mean Score	Mean %
Female	Screening practices and prevention of carcinoma mouth & colorectal cancer	20	5.6	28	19.47	97.35	13.87	69.35
	Screening practicesand prevention of carcinoma breast	30	1.8	6	29.87	99.57	28.07	93.57
	Screening practices and prevention of carcinoma cervix	10	2.13	21.3	9.73	97.30	7.6	76
Male	Screening practices and prevention of carcinom amouth and colorectal cancer	20	5.87	29.35	17.13	85.65	11.26	56.30
	Screening procedures and prevention of testicular cancer	20	0.73	3.65	16.33	81.65	15.60	78

Table 7 shows that the frequency interval of pre-test practice scores started from class interval 0-20 with the highest frequency of 121, whereas, post-test practice scores started from class interval 21-40 and the highest frequency (122) was in the class interval 41-60. This suggests that the majority of the undergraduate students' practice scores were under the good category after the intervention.

Table 8 shows that among females, the maximum gain (93.57%) percentage score was in the area of screening practices and prevention of carcinoma breast, followed by the area of screening practices and prevention of cervical cancer (76%), whereas, among males, the highest gain percentage score (78%) was in the area of screening practices and prevention of testicular cancer, followed by the area of screening practices and prevention of colorectal and oral cancer (56.30%). Thus there is gain in all domains of practice, indicating the effectiveness of CANScreen.

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Section IV: Relationship between Post-test Knowledge Scores and Post-test Practice Scores of Undergraduate Students

Table 9 shows that there was a positive correlation (0.21) between post-test knowledge and practice scores of undergraduate students on selected common cancer screening procedures and preventive measures, which was found more than the table"r" value (0.174) at df 124 at 0.05 level. Hence the null hypothesis H03 (there will not be any significant relationship between the mean post-test knowledge score and mean post-test practice score of undergraduate students after the administration of mobile app CANScreen on selected common cancer screening procedures and preventive measures as measured by structured knowledge questionnaire and practice checklists at 0.05 level of significance) was rejected and research hypothesis H3 (there will be a significant relationship between the mean post-test knowledge score and mean post-test practice score of undergraduate students after the administration of mobile app CANScreen on selected common cancer screening procedures and preventive measures as measured by structured knowledge questionnaire and practice checklists at 0.05 level of significance) was accepted. The positive relation shows that as the knowledge score increases, it enhances the practice score as well.

Section VA: Association of the Post-test Knowledge Scores of Undergraduate Students with selected Variables

Table 10 shows that the computed chi-square values between post-test knowledge scores of undergraduate students and their selected demographic variables like stream of study, year of study, and presence of healthcare professionals in the family were found statistically significant, but factors like gender, religion, educational status of mother and father, history of cancer in the family, and previous exposure to cancer screen education were found statistically not significant with post-test knowledge scores of the undergraduate students. This indicates that knowledge is not dependent on selected variables except stream of study, year of study, and presence of healthcare professionals in the family. Hence the investigator partially failed to reject the null hypothesis H04 (there will not be any significant association between the mean post-test knowledge score of undergraduate students and selected variables after administration of CANScreen on selected common cancer screening procedures and preventive measures as measured by structured knowledge questionnaire at 0.05 level of significance in terms of selected variables). The knowledge was independent and not influenced by majority of the selected variables.

Table 9.Karl Pearson Coefficient of Correlation between Post-test Knowledge Scores and Post-test Practice Scores of Undergraduate Students regarding Selected Common Cancer Screening Procedures and Preventive Measures

n = 126

Variables	Mean	SD	"r" Value
Post-test knowledge score	22.91	3.22	*0.21
Post-test practice score	45.94	2.44	

*r value for df (124) = 0.174, significant at 0.05 level

Table 10.Association between Post-test Knowledge Scores with Selected Variables

n = 126

Factors	Knowledge Score		df	Chi-square Calculated Value	Chi-square Table Value
	Below Median (f)	Above Median (f)			
Gender					
Male	23	40	1	0.035^{NS}	3.841
Female	22	41			
Stream of study					
Arts	03	07	2	21.37^{S}	5.991
Science	05	05			
Commerce	06	04			
Year of study					
First	22	20	2	10.16^{S}	5.991
Second	15	27			
Third	8	34			

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Religion					
Hindu	15	43	2	5.12^{NS}	5.991
Muslim	20	22			
Christian	10	16			
Educational status of mother					
Up to 5th class	2	2	4	8.32^{NS}	9.49
6th to 10th	10	07			
11th to 12th	15	37			
Graduation	15	21			
Postgraduation & above	3	14			
Educational status of father					
Up to 5th class	03	03	4	1.26^{NS}	9.49
6th to 10th	06	15			
11th to 12th	18	30			
Graduation	12	20			
Postgraduation & above	06	13			
H/o cancer in family					
Yes	3	10	2	1.10^{NS}	5.991
No	36	60			
Don't know	6	11			
Presence of healthcare professionals in family					
Yes	16	6	1	15.90^{S}	3.841
No	29	75			
H/o previous exposure to cancer screening education					
Yes	06	22	1	3.2^{NS}	3.841
No	39	59			

0.05 level of significant, S: Significant, NS: Not significant

Table 11.Association between Post-test Practice Scores with selected Variables of Undergraduate Students

n = 126

Factors	Practice Score		df	Chi-square Calculated Value	Chi-square Table Value
	Below Median (f)	Above Median (f)			
Gender					
Male	38	25	1	17.23^{S}	3.841
Female	15	48			
Stream of study					
Arts	15	27	2	2.91^{NS}	5.991
Science	12	30			
Commerce	26	16			
Year of study					
First	15	27	2	2.91^{NS}	5.991
Second	12	30			
Third	26	16			

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Religion					
Hindu	30	28	2	3.82 NS	5.991
Muslim	13	29			
Christian	10	16			
Educational status of mother					
Up to 5th class	02	02	4	7.89 NS	9.49
6th to 10th	07	10			
11th to 12th	21	31			
Graduation	16	20			
Postgraduation & above	7	10			
Educational status of father					
Up to 5th class	03	03	4	8.05 NS	9.49
6th to 10th	11	10			
11th to 12th	25	230			
Graduation	10	22			
Postgraduation & above	4	15			
H/o cancer in family					
Yes	3	10	2	3.90 NS	5.991
No	40	56			
Don't know	10	7			
Presence of healthcare professionals in family					
Yes	11	11	1	0.69 NS	3.841
No	42	62			
H/o previous exposure to cancer screening education					
Yes	2	5	1	0.595 NS	3.841
No	8	15			

0.05 level of significant, S: Significant, NS: Not significant

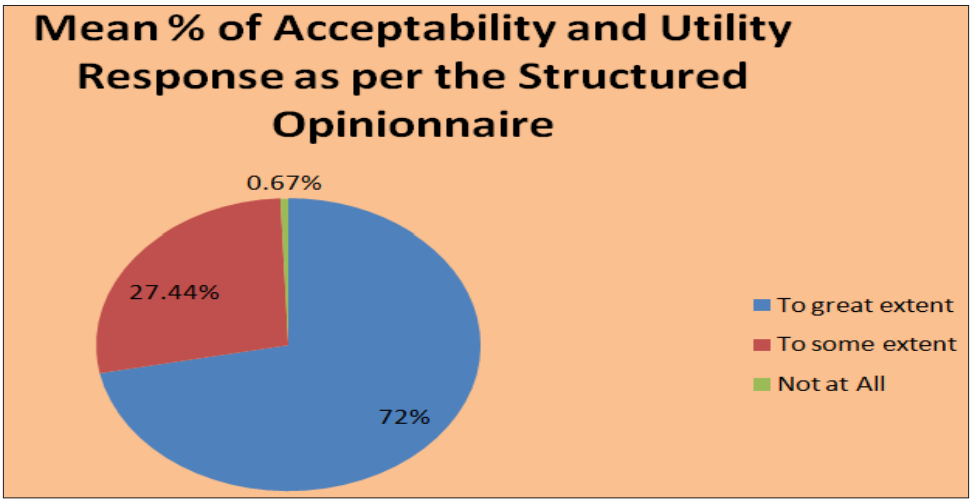

Figure 2.Mean Percentage Acceptability and Utility Response on Opinionnaire regarding Mobile App CANScreen

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Section VB: Association of the Post-test Practice Scores of Undergraduate Students with selected Variables

Table 11 shows that the computed chi-square value between post-test practice scores of undergraduate students and their selected demographic variable of gender was found statistically significant, but factors like stream of study, year of study, religion, educational status of mother and father, history of cancer in the family, presence of healthcare professionals in the family, and previous exposure to cancer screening education were found to be statistically not significant with post-test practice scores of the undergraduate students. This indicates that practice is not dependent on selected variables except gender. Hence the investigator partially failed to reject the null hypothesis H05 (there will not be any significant association between the mean post-test practice scores of undergraduate students and selected variables after administration of CANScreen on selected common cancer screening procedures and preventive measures as measured by practice checklists at 0.05 level of significance in terms of selected variables). The practice was independent and not influenced by majority of the selected variables.

Section VI: Acceptability and Utility of the Mobile App CANScreen by the Undergraduate Students

Figure 2 shows that the maximum (72%) users accepted CANScreen to a great extent, while 27.44% accepted as to some extent.

Discussion

The findings of the study revealed that the mobile app CANScreen on selected common cancer screening procedures and preventive measures was effective to enhance knowledge and practice among undergraduate students regarding common cancer screening procedures and preventive measures. In this section, the major findings of the study have been discussed with results obtained by other researchers.

Findings related to Effectiveness of CANScreen in increasing Knowledge of Undergraduate Students regarding Common Cancer Screening Procedures and Preventive Measures

Findings of the present study indicated that there was a knowledge deficit among the undergraduate students regarding common cancer screening procedures and preventive measures as per the pre-test knowledge scores (mean 5.94) and after the administration of CANScreen, their post-test knowledge scores increased (mean 22.91). The findings of the study are consistent with those of another study[12] which revealed that there was inadequate knowledge among professional college students of Bengaluru regarding cancer screening procedures, especially, cervical cancer screening techniques. Similar findings were revealed in a study by Tapera R et al.[16] which showed that the university college students of Botswana had insufficient knowledge regarding cancer screening and prevention and it enhanced after teaching.

Findings related to Effectiveness of CANScreen in increasing Practice of Undergraduate Students regarding Common Cancer Screening Procedures and Preventive Measures

Findings of the present study indicated that there was a practice deficit among the undergraduate students regarding common cancer screening procedures and preventive measures as per the pre-test practice scores (mean 12.76) and after the administration of CANScreen, their post-test practice scores increased (mean 45.94). The findings of the study are consistent with findings of another study[10] which revealed that there was inadequate practice among basic science college students of Andhra Pradesh regarding cancer screening procedures, especially breast cancer screening techniques including breast self-examination. A study by Gandeh MB et al.[11] showed that the secondary school students in Jeddah had insufficient practice regarding breast cancer screening and prevention and it enhanced after the implementation of a planned teaching programme on breast cancer awareness.

Implications

The findings of the present study have important implications in the fields of nursing practice, nursing education, nursing research, and nursing administration.

Nursing Practice

As the nurses are the main force of healthcare delivery systems so it is the responsibility of a nurse to educate the people about the screening and prevention of cancer. Health education on the prevention and screening of cancers can be given at the hospital level and community level so as to spread the knowledge and cover the maximum population. Nurses can use newer educational technologies like mobile apps for making their health education sessions more effective and easier.

Nursing Education

The nursing curriculum, especially in subjects of medical and surgical nursing and oncology nursing should emphasise on motivating the people to adopt healthy practices for the prevention of cancer and for routine self cancer screening procedures and investigations to ensure early detection and diagnosis. All nursing students must have knowledge about common cancer screening techniques, procedures, and preventive measures so that they can provide effective health education to their patients in their day to day clinical practice.

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Nursing Administration

Nursing administration should encourage nurses to organise cancer screening camps which will encourage people to take medical help on time without hesitation. Nursing administration should also promote necessary facilities and opportunities for nursing staff to update their knowledge on cancer screening and prevention. Nursing administrators should also take a keen interest to establish nurse-led cancer clinics such as nurse-led breast care clinics (BCC).

Nursing Research

The present study can help in further research conducted in the future related to the knowledge and practice of various categories of the population regarding cancer screening and prevention for early detection and diagnosis of cancer. Nursing research will help to understand the role of a nurse in generating awareness in the community and developing healthy practices to reduce cancer cases. The result of the study can be used for evidence-based nursing as a rising trend.

Conclusion

Day by day cancer incidence is increasing in our society. Most of them can be either detected early by doing screening procedures or can be prevented by practising healthy lifestyles. This motivated the investigator to develop an educational mobile app CANScreen, to educate the undergraduate students regarding selected common cancer screening procedures and preventive measures. These students are the future citizens of our country. By educating them in their early life, they can practice these techniques and preventive measures to ensure a quality life.

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