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# The Relationship between Breast Cancer Literacy and (e)Health Literacy among Urban Women in Ariyalur, Tamil Nadu

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## ABSTRACT

**Aim:** To assess the relationship between Breast Cancer Literacy and (e)Health Literacy among urban women in Ariyalur town, Tamil Nadu.

**Study design:** Community-based cross-sectional study.

**Place and Duration of Study:** Ariyalur town, Tamil Nadu, India, between [Insert data collection months and year].

**Methodology:** The study included 370 women aged 25–65 years selected using simple random sampling. Data were collected using one semi-structured questionnaire and three standardized tools: Breast Cancer Literacy Assessment Tool (BCLAT), e-Health Literacy Scale (eHEALS), and All Aspects of Health Literacy Scale (AAHLS). Data were analysed using IBM SPSS version 26. Descriptive statistics were used to summarize sociodemographic characteristics and literacy levels. Chi-square test and Pearson correlation were used to assess associations. Statistical significance was considered at  $P < .05$ .

**Results:** The mean age of participants was  $38.35 \pm 10.88$  years. Low Breast Cancer Literacy was observed in 25.9% of women, moderate in 56.8%, and high in 17.3%. Zero Health Literacy was found in 3.0% of participants, while 17.9% of internet users had zero e-Health Literacy. A statistically significant positive correlation was observed between Breast Cancer Literacy and e-Health Literacy ( $r = .149, P = .004$ ) and between Breast Cancer Literacy and Health Literacy ( $r = .148, P = .004$ ). Education status ( $P = .001$ ), employment status ( $P = .001$ ), and family history of breast cancer ( $P = .036$ ) were significantly associated with Breast Cancer Literacy.

**Conclusion:** There is a significant positive relationship between Breast Cancer Literacy and (e)Health Literacy among urban women. Although the strength of association is weak, improving (e)Health Literacy may contribute to enhanced Breast Cancer Literacy and better screening and prevention practices.

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*Keywords: Breast Cancer Literacy; e-Health Literacy; Health Literacy; Urban women; Ariyalur ;Cross-sectional study; Tamil Nadu*

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20 **1. INTRODUCTION**

21 Breast cancer is the most commonly diagnosed cancer among women worldwide and represents a major  
22 public health challenge. It accounts for a substantial proportion of cancer-related morbidity and mortality  
23 globally (Bray et al., 2018). In India, the incidence of breast cancer has been steadily increasing,  
24 particularly in urban populations, contributing significantly to the overall cancer burden (Heer et al.,  
25 2020). Early detection through screening and timely intervention plays a crucial role in improving survival  
26 outcomes. Despite advancements in diagnostic and treatment facilities, delayed presentation remains  
27 common, often due to inadequate awareness of symptoms, risk factors, and screening practices (Prusty  
28 et al., 2020). Breast Cancer Literacy, which includes knowledge and understanding of prevention, early  
29 detection, and control measures, is therefore essential in promoting positive health behaviours among  
30 women. Health literacy is defined as the ability to access, understand, evaluate, and apply health  
31 information to make appropriate health decisions (Chinn & McCarthy, 2013). Limited health literacy has  
32 been associated with poor health outcomes and reduced participation in screening programs. With  
33 increasing access to digital platforms, e-Health Literacy has emerged as an important dimension,  
34 referring to the ability to seek, appraise, and use health information obtained from electronic sources  
35 (Zakaria et al., 2018). Higher levels of e-Health Literacy have been shown to improve disease-specific  
36 knowledge, including breast cancer awareness (Almoajel et al., 2022). Although urban women may have  
37 better access to healthcare services and online information, disparities in literacy levels persist.  
38 Understanding the relationship between Breast Cancer Literacy and (e)Health Literacy is essential for  
39 designing effective public health interventions. However, limited evidence is available regarding this  
40 relationship among urban women in Ariyalur town, Tamil Nadu. Therefore, this study aimed to assess  
41 the relationship between Breast Cancer Literacy and (e)Health Literacy among urban women in Ariyalur  
42 town, Tamil Nadu.

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45 **2. METHODOLOGY**

46 **2.1 Study Design and Setting:** A community-based cross-sectional study was conducted among urban  
47 women residing in Ariyalur town, Tamil Nadu, India, in May 2023.

48 **2.2 Study Population and Sampling:** The study population included women aged 25–65 years residing  
49 in Ariyalur town. Women who were permanent residents and willing to provide informed consent were  
50 included in the study. Women who were severely ill or unable to respond at the time of data collection  
51 were excluded. The sample size was calculated using a prevalence of 28% from a previous study, with  
52 a 95% confidence level and 5% absolute precision, using the formula:  $n = Z^2pq/d^2$

53  
54 Where:  
55  $Z = 1.96$  at 95% confidence level  
56  $p = 0.28$   
57  $q = 1 - p$   
58  $d = 0.05$

59 The calculated sample size was 310. An additional 10% was added to account for non-response,  
60 resulting in a final sample size of 341. However, a total of 370 participants were included in the study.  
61 Simple random sampling technique was used to select participants.

62 **2.3 Data Collection Tools:** Data were collected using a semi-structured questionnaire along  
63 with three standardized instruments:  
64 **Breast Cancer Literacy Assessment Tool (BCLAT)** to assess breast cancer literacy.  
65 **All Aspects of Health Literacy Scale (AAHLS)** to measure health literacy.  
66 **e-Health Literacy Scale (eHEALS)** to assess electronic health literacy.

67 The questionnaire collected information on sociodemographic characteristics, family history of breast  
68 cancer, and internet usage patterns.

69 **2.4 Data Collection Procedure:** Data were collected through face-to-face interviews after obtaining  
70 informed written consent from participants. Confidentiality and anonymity were maintained throughout  
71 the study.  
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**2.5 Statistical Analysis:** Data were entered in Microsoft Excel and analyzed using IBM SPSS version 26. Descriptive statistics such as frequency, percentage, mean, and standard deviation were used to summarize participant characteristics and literacy levels. Chi-square test was used to assess associations between sociodemographic variables and Breast Cancer Literacy. Pearson correlation analysis was performed to determine the relationship between Breast Cancer Literacy, Health Literacy, and e-Health Literacy. Statistical significance was considered at  $P < .05$ .

### 3. RESULTS AND DISCUSSION

This study was conducted among 370 urban women in Ariyalur Town to understand the relationship between Breast Cancer Literacy, e-Health Literacy, and Health Literacy. The mean, median, and standard deviation of age were 38.35, 37, and 10.88 respectively. Of the total participants, 43.0% were aged 25–34 years, followed by 25.9% aged 35–44 years, 20.5% aged 45–54 years, and 10.5% aged 55–65 years. Married women constituted 79.7% of the study population, while 20.3% were unmarried. Among married women, 10.8% were childless at the time of the study; 69.8% had  $\leq 2$  children and 19.4% had more than two children. Regarding education, 6.8% were illiterate, 34.9% had school education, 26.8% were undergraduates, and 31.6% were postgraduates. A majority (64.1%) were unemployed, 12.7% were self-employed, and 23.2% were employed under others. The median monthly family income was INR 25,000, with 66.5% earning  $\leq 25,000$  and 33.5% earning  $> 25,000$ . The median age at menarche was 14 years; 70.8% attained menarche at  $\leq 14$  years. Only 70 women had attained menopause; 37.7% were surgical and 62.3% natural menopause. Family history of breast cancer was present in 5.4% of participants. Only 30.5% had health insurance. Internet was the most common source of health information (75.4%), followed by family and friends (66.5%), television (48.9%), doctors (37.5%), pamphlets/posters (6.2%), radio (4.4%), and newspapers/books (1.9%). Among internet users, 80.3% used mobile phones, 0.7% used computers, and 19% used both. Weekly once or twice was the most common frequency of internet usage for health information (44.4%). These findings are presented in **Table 3.1**.

**Table 1: Sociodemographic Characteristics of Ariyalur women**

S.NO.	SOCIODEMOGRAPHIC VARIABLES	FREQUENCY	PERCENTAGE
1.	<b>AGE (Mean=38.35,Median=37,S.D.=10.88)</b>		
	25-34	159	43.0
	35-44	96	25.9
	45-54	76	20.5
	55-65	39	10.5
2.	<b>MARRITAL STATUS</b>		
	Married	295	79.7
	Unmarried	75	20.3
3.	<b>NUMBER OF CHILDREN (295)</b>		
	0	32	10.8
	$\leq 2$	206	69.8
	$> 2$	57	19.4

<b>4.</b>	<b>AGE OF MENARCHE (Median=14)</b>		
	10-14	262	70.8
	15-18	108	29.2
<b>5.</b>	<b>AGE OF MENOPAUSE</b>		
	( surgical menopause) 36-45	26	7.0
	46-55	44	11.9
	Not yet reached	300	81.1
<b>6.</b>	<b>EDUCATION STATUS</b>		
	Illiterate	25	6.8
	School education	129	34.9
	Under Graduate	99	26.8
	Post Graduate	117	31.6
<b>7.</b>	<b>EMPLOYMENT STATUS</b>		
	Unemployed	237	64.1
	Selfemployed	47	12.7
	Employed under others	86	23.2
<b>8.</b>	<b>MONTHLY FAMILY INCOME (median=25,000)</b>		
	≤25000	246	66.5
	> 25000	124	33.5
<b>9.</b>	<b>HEALTH INSURANCE STATUS</b>		
	Yes, I have	113	30.5
	No, I don't have	257	69.5
<b>10.</b>	<b>FAMILY HISTORY OF BREAST CANCER</b>		
	Yes	20	5.4
	No	350	94.6
<b>11.</b>	<b>SOURCES OF HEALTH INFORMATION</b>		
	INTERNET	279	75.4
	FAMILY & FRIENDS	246	66.5
	T.V.	181	48.9
	DOCTOR	139	37.5
	PAMPHLETS/POSTERS	23	6.2
	RADIO	16	4.4
	NEWSPAPER & BOOKS	7	1.9

12.	SOURCES OF INTERNET		
	MOBILEPHONE	224	80.3
	COMPUTER	2	0.7
	MOBILEPHONE & COMPUTER	53	19
13.	FREQUENCY OF INTERNET USAGE FOR HEALTH INFORMATION		
	Rarely	68	24.4
	Daily once	44	15.8
	Weekly once or twice	124	44.4
	Monthly once or twice	43	15.4

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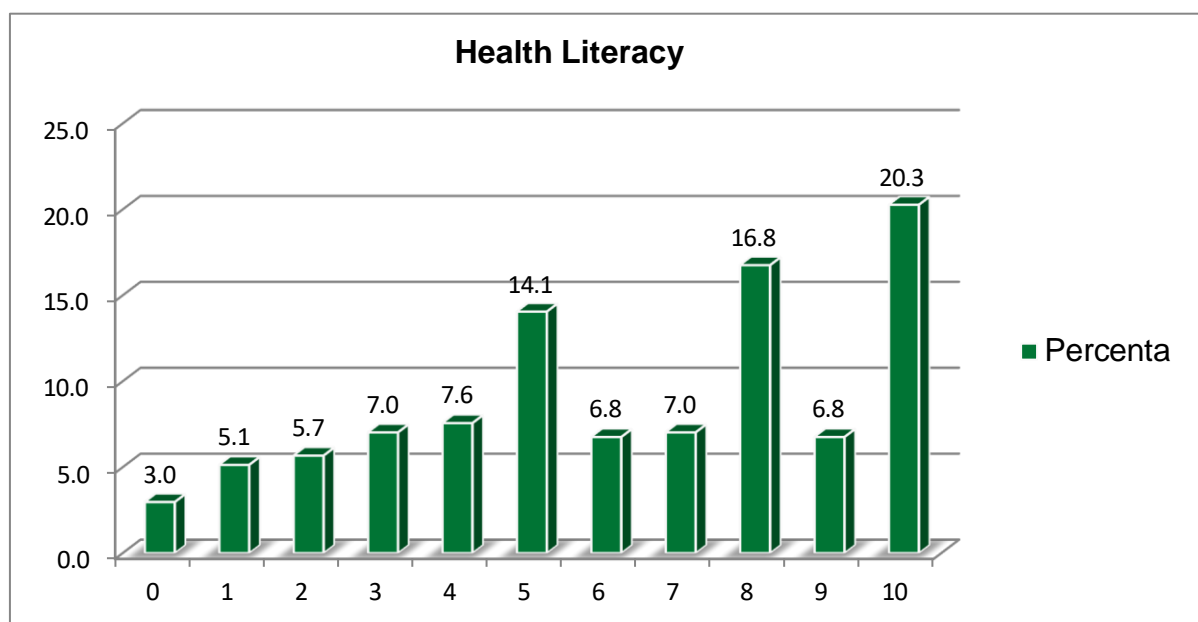
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Figure .1 shows the level of Health Literacy among urban women in Ariyalur. Among the 370 women who took part in the study, only 3.0% of women had zero Health Literacy. The percentage of women who had answered correctly for less than five questions was 39.5% and for more than 5 questions was 57.7%. All the ten questions were correctly answered by 20.3% of the women.

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**Figure 1: Level of Health Literacy among women in Ariyaaur town**



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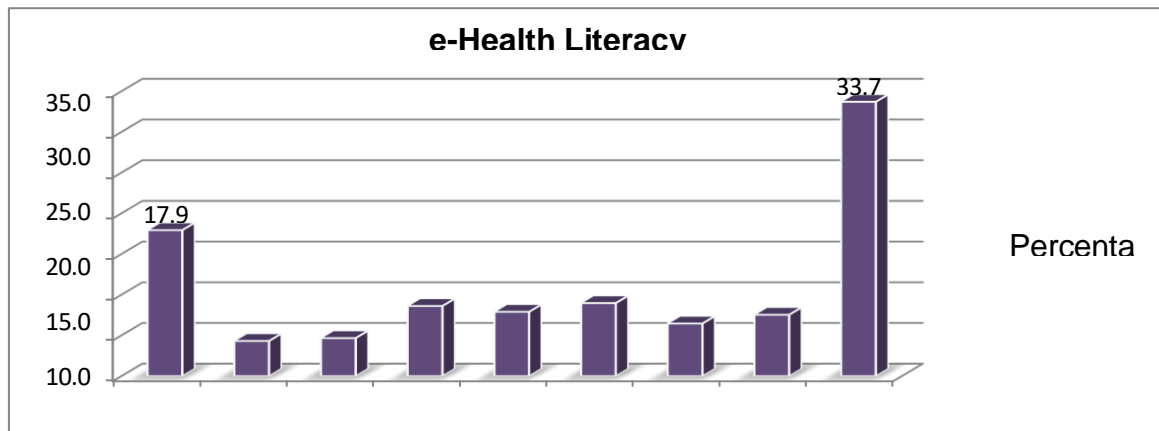
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Figure 2 depicts the level of e-Health Literacy among women in Ariyalur town. It shows that out of the 370 women in the study only 279 women used internet as source of Breast Cancer information. Among that 279 internet users 17.9% of women had zero Health Literacy. The percentage for women who have answered correctly for less than or equal to four questions was 25.5% and that for more than four questions was 56.7%. The percentage of women who had answered correctly for all the eight questions was 33.7%

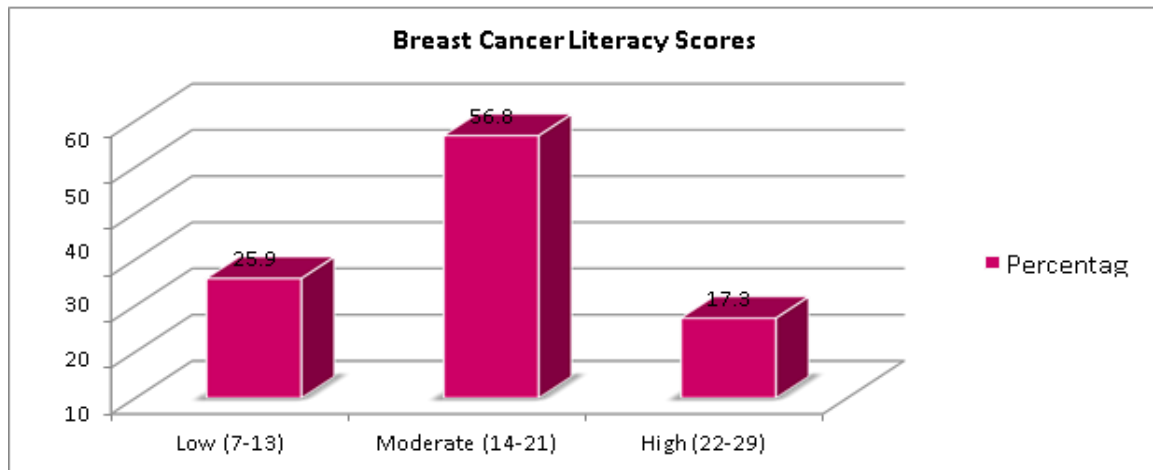
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117 **Figure 2: Level of e-Health Literacy among women in Ariyalur town**



125 Figure 3 shows the Level of Breast Cancer Literacy among women in Ariyalur town. Women who took  
 126 part in this study ranked seven as the lowest score and twenty nine as the highest score. Low level of  
 127 Breast Cancer Literacy (scores, 7-13) was seen in 25.9% of women. More than half of the women i.e.,  
 128 56.8% had Moderate level of Breast Cancer Literacy (scores, 14-21) and Low level of Breast Cancer  
 129 Literacy was (scores, 22-29) was seen in 17.3% of the women. The percentage of women who either  
 130 answered wrong for all the 34 questions or answered correct for all the 34 questions was null.

131 **Figure 3: Breast Cancer Literacy among women in Ariyalur town**



133 Table 2 represents that chi square test run for association between Breast Cancer literacy and e-  
 134 Health literacy shows five out of eight questions show significant relationship which includes questions  
 135 2) I know where to find helpful health resources on the Internet, 3).I know how to find helpful health  
 136 resources on the Internet, 4).I know how to use the Internet to answer my questions about health has a  
 137 significant relationship, 6). I have the skills I need to evaluate the health resources I find on the Internet,  
 138 7).I can tell high quality health resources from low quality health resources on the Internet, as the p-  
 139 values were < 0.05. On the other hand the questions, 1).I know what health resources are available on  
 140 the Internet, health 5).I know how to use the health information I find on the Internet to help me and 8).I  
 141 feel confident in using information from the Internet to make health decisions have had no significant  
 142 relationship as the p- values were > 0.05.

143  
 144  
 145 **Table 2: Association of Breast Cancer Literacy and e-Health Literacy**

eHEALS QUESTIONS	BCLAT	
	CHI-SQUARE TESTS	
	VALUE	SIGNIFICANCE
1).I know what health resources are available on the Internet	9.322	0.054
2).I know where to find helpful health resources on the Internet	25.196	< 0.01*
3).I know how to find helpful health resources on the Internet	21.426	< 0.01*
4).I know how to use the Internet to answer my questions about health	21.812	0.005*
5).I know how to use the health information I find on the Internet to help me	8.249	0.843
6). I have the skills I need to evaluate the health resources I find on the Internet	18.556	0.001*
7).I can tell high quality health resources from low quality health resources on the Internet	14.921	0.005*
8).I feel confident in using information from the Internet to make health decisions	8.556	0.073

(\*indicates a significant relationship at the level 95% confidence interval )

Table 3.3 indicates that all the three questions of functional and Communicative Health Literacy domains showed a p-value < 0.05 which indicates the existence of a significant relationship between Health Literacy and Breast Cancer literacy. In case, of critical health Literacy domain only one out of four questions And in terms of Empirical Health Literacy two questions showed p- value < 0.05 indicating the existence of the significant relationship between them and Breast Cancer Literacy. In the Empirical Domain it is found that majority of people think that there are plenty of ways to have a say in what the government does about health and they have not taken any actions to do something about a health issue that affects their family or community and also majority of people think that good housing, education, decent jobs and good local facilities matters the most for everyone's health than that of information and encouragement to lead healthy lifestyles.

**Table 3: Association of Breast Cancer Literacy and Health Literacy**

	<b>BCLAT</b>	
<b>AAHLS</b>	<b>CHI_SQUARE TESTS</b>	
	<b>VALUE</b>	<b>SIGNIFICANCE</b>
<b>FUNCTIONAL HEALTH LITERACY</b>		
1).FQ1-How 1 do you need someone to help you when you are given information to read by your doctor, nurse or pharmacist?	28.646	< 0.01*
2).FQ2-When you need help, can you easily get hold of someone to assist you?	13.803	0.008*
3).FQ3-Do you need help to fill in official documents?	33.254	< 0.01*
<b>COMMUNICATIVE HEALTH LITERACY</b>		
4).ComQ1 -When you talk to a doctor or nurse, do you give them all the information they need to help you?	10.411	0.034*
5).ComQ2 -When you talk to a doctor or nurse, do you ask the questions you need to ask?	16.583	0.002*
6).ComQ3 - When you talk to a doctor or nurse, do you make sure they explain anything that you do not understand?	12.000	0.017*
<b>CRITICAL HEALTH LITERACY</b>		
7).Cr1- Are you someone who likes to find out lots of different information about your health?	0.712	0.956
8).Cr2 -do you think carefully about whether health information makes sense in your particular situation?	3.735	0.443*
9).Cr3 -How do you try to work out whether information about your health can be trusted?	5.973	0.193
10).Cr4- Are you the sort of person who might question your doctor or nurse's advice based on your own research?	8.029	0.083
<b>EMPIRICAL HEALTH LITERACY</b>		

11).Emp1- Do you think that there plenty of ways to have a say in what the government does about health?	15.881	0.003*
12).Emp2 -Within the last 12 months have you taken action to do something about a health issue that affects your family or community?	0.483	0.786
13).Emp3- What do you think matters most for everyone's health?	7.254	0.027*

(\*indicates a significant relationship at the level 95% confidence interval)

From Table 3.4, it is shown that there exists a significant correlation (p-value=0.004 which is < 0.05) between breast Cancer Literacy and (e)Health Literacy. Additionally, the correlation coefficient of 0.149 and 0.148 suggests a positive, weak to moderate linear relationship between Breast Cancer Literacy and (e)Health Literacy.

**Table .4: Correlation of Breast Cancer Literacy and (e) Health Literacy**

LITERACY	BREAST CANCER LITERACY	
	PEARSON CORRELATION	
	VALUE	SIGNIFICANCE
eHEALTH	.149	.004*
HEALTH	.148	.004*

(\*indicates a significant relationship at the level 95% confidence interval )

From Table 3.5, it is seen that sociodemographic variables like education status, employment status, and family history of breast cancer show a statistically significant relationship with Breast Cancer Literacy, while age, health insurance status, and monthly income do not show significant relationship with Breast Cancer Literacy.

**Table 5: Association of Breast Cancer Literacy and Socio-demographic Characteristics**

SOCIODEMOGRAPHIC VARIABLES	BCLAT	
	CHI SQUARE TEST	
	VALUE	SIGNIFICANCE
1.AGE	10.686	0.096
2.EDUCATION STATUS	22.867	0.001*
3.EMPLOYMENT STATUS	21.862	0.001*
4. HEALTH INSURANCE STATUS	5.589	0.061
5. MONTHLY INCOME	4.378	0.112
6.FAMILY HISTORY OF BREASTCANCER	6.381	0.036*

(\*indicates a significant relationship at the level 95% confidence interval )

These findings demonstrate a significant relationship between Breast Cancer Literacy and both e-Health Literacy and Health Literacy. Education status, employment status, and family history of breast cancer were also significantly associated with Breast Cancer Literacy. Internet emerged as the primary source of health information, followed by family and friends, television, doctors, pamphlets/posters, radio, and newspapers/books.

A small proportion of women had zero Health Literacy (3.0%) and zero e-Health Literacy (17.9%). Moderate Breast Cancer Literacy was observed in the majority (56.8%), while 25.9% had low literacy and 17.3% had high literacy. The chi-square analysis confirmed a significant association between Breast Cancer Literacy and (e)Health Literacy.

The relationship between Breast Cancer Literacy and e-Health Literacy is consistent with the findings of Almoajel et al. [12]. The role of television and education in influencing breast cancer knowledge aligns with the findings of Parash Mani Bhandari et al. [15] and Ranjan Kumar Prusty et al. [16]. However, contrary to the findings of Rakesh Singh et al. [17], this study observed a significant association between education and Breast Cancer Literacy.

Previous studies by Ghulam Murtaza et al. [18] and Hemalatha Kumarasamy et al. [19] have highlighted that limited awareness, cultural differences, and variations in education and health services influence breast cancer knowledge. Similarly, the present study suggests that strengthening Health Literacy and e-Health Literacy may improve Breast Cancer Literacy and positively influence women's health decisions.

#### 4.CONCLUSION

The study identified a statistically significant positive relationship between Breast Cancer Literacy and both Health Literacy and e-Health Literacy, with a low to moderate strength of association. These findings suggest that efforts to improve general and digital health literacy may contribute to enhanced Breast Cancer Literacy among women.

Education status, employment status, and family history of breast cancer were significantly associated with Breast Cancer Literacy. The Internet emerged as the primary source of health information, followed by family and friends, television, doctors, pamphlets/posters, radio, and newspapers/books.

214 Breast cancer education, screening, prevention, and control programs may be more effective when  
215 women's e-health literacy is assessed and strengthened. The findings of this study provide valuable  
216 insights for developing targeted interventions to improve breast cancer awareness among urban women.

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219 cooperation. The author also acknowledges the support and guidance provided by the faculty and  
220 Institutional Ethics Committee of SRM Institute of Science and Technology during the conduct of this  
221 research.

## 222 **COMPETING INTERESTS**

223 The author declares that there are no competing interests.

## 224 **CONSENT**

225 Informed written consent was obtained from all participants prior to inclusion in the study.

## 226 **ETHICAL APPROVAL**

227 Ethical approval for the study was obtained from the Institutional Ethics Committee of SRM Institute of  
228 Science and Technology (IEC Ref No: 0014/IEC/2023). The study was conducted in accordance with  
229 ethical standards, and confidentiality and anonymity of participants were maintained throughout the  
230 research process.

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