ROLE OF DIGITAL MEDIA INFLUENCE ON CANCER AWARENESS AMONG UNIVERSITY STUDENTS IN SAUDI ARABIA: A CROSS-SECTIONAL STUDY

Haroon Ali[1], Rayan Ibrahim H Binduhayyim[1], Yousef Zahrani[1], Mohammad Suhail Khan[1], Faheem Ahmed[1], Izhar Hussain[1], Adam Dawaria[1], Md Zeyaullah[2] and Ali Mohieldin[1]

[1]Department of Public Health, [2]Department of Basic Medical Science,
College of Applied Medical Sciences, Khamis Mushait Campus,
King Khalid University, Abha, Saudi Arabia

Abstract. Cancer remains a major public health challenge in Saudi Arabia, and university students mainly rely on digital media for health information. Thus, the study evaluated cancer awareness among university students and examined the associations among the types of digital platforms used with their levels of cancer awareness. A cross-sectional study was conducted among 429 university students using a validated self-administered questionnaire to gather sociodemographic characteristics and digital media use for information on cancer. The majority of students reported social media as their primary source for cancer information, followed by online/AI-based platforms and videos. The overall cancer awareness was average, with a better awareness of treatment side-effects compared with other awareness categories. The students' level of cancer awareness depended on their age, educational program enrolled, residence location (urban or rural), and type/frequency of digital media accessed, with students having a lower general cancer awareness level being more likely to depend on social media for information. These findings indicated that digital media, particularly social media, are significantly associated with the level of cancer awareness among university students. Strengthening trustworthy, youth-friendly cancer awareness online content will help raise cancer understanding among the young population and facilitate adherence to public policies and recommendations on cancer prevention and control.

Keywords: cancer awareness, digital media, social media, university student, YouTube

Correspondence: Haroon Ali, Department of Public Health, College of Applied Medical Sciences, Khamis Mushait Campus, King Khalid University (KKU), AKGB3613 King Fahad Street, Abha 62437, Saudi Arabia
Tel: +966 548495789 E-mail: haalahmad@kku.edu.sa

INTRODUCTION

Cancer remains the most critical public health issue globally. Based on GLOBOCAN estimates, approximately 20 million new cases of cancer and nearly 10 million cancer-related deaths were reported worldwide in 2022 (UICC, 2024). Already, cancer is the major cause of global mortality; most instances are linked to behavioral and environmental risk factors, which can be changed (Burke *et al*, 2022; Budzik *et al*, 2025). Thus, any improvement in cancer literacy, defined as the ability to obtain, understand, evaluate, and use information on cancer, plays a pivotal role in the formulation of preventive strategies, such as early cancer detection, lifestyle modification and public education (Al-Taie and Bakur, 2024).

Cancer literacy in Saudi Arabia has been continually increasing because of the growing number of the aging population, lifestyle and dietary changes, sedentary way of life, and growing clinical awareness (Saudi Health Council, 2022). For Saudi women, breast cancer is currently the most frequently diagnosed malignancy (Islam *et al*, 2022). An updated and universal cancer literacy allows the public to understand the risk factors and become aware of early warning signs, prompting appearance at screening centers and improvement in a healthier lifestyle (Labisso *et al*, 2020). However, various studies showed that there is a persistent gap in cancer literacy despite access to information, suggesting that the availability of information alone does not improve the level of the public understanding of cancer (Restum *et al*, 2021; Merten *et al*,

2017; Rosa *et al*, 2025).

In this digital age, the electronic media have become a new means to disseminate health information, particularly among college students who are frequent users of internet-based platforms. Health-focused websites, social media, online videos, and new artificial intelligence (AI) tools have increasingly become central to the acquisition of news and information by the younger population (Sarkar *et al*, 2018; AlMuammar *et al*, 2021; AlSadrah, 2021). A cross-sectional study conducted in Riyadh found that over 70% of university students use social media as the primary source of health information, together with educational and behavioral influencing tools, such as Instagram and Twitter (Balay-Odao *et al*, 2021). Similar findings from other Middle Eastern regions confirm the close relationship between electronic health literacy and cancer awareness; higher digital literacy is associated with anticipatory health behavior and preventive action (Norman and Skinner, 2006; UICC, 2024)

The multimodal, interactive nature of the digital content (eg, video, infographic and interactive modality) resonates with both millennial and Generation Z consumers, making digital media an extremely efficient instrument for providing health education (Sarkar *et al*, 2018). Anticipating this possibility, the World Health Organization in 2021 (WHO, 2021) promoted strategic inclusion of digital media in non-communicable disease (NCD) health awareness campaigns, particularly in low- and middle-income nations where there can be a lack of traditional infrastructure for communicating health education.

In Saudi Arabia, traditional institutions such as the Saudi Ministry of Health and the Saudi Health Council have implemented a range of digital health campaigns and public awareness initiatives aimed at improving population knowledge and promoting cancer prevention and early detection. These initiatives utilize online

platforms and social media channels to disseminate health information and encourage community engagement in cancer screening and preventive practices (Ministry of Health Saudi Arabia, 2024; Almoajel *et al*, 2022).

Although such encouraging programs exist, few empirical studies have assessed the actual influence of electronic media on Saudi university students' knowledge, attitude and behavior regarding cancer. In the Saudi context, the studies have focused primarily on general cancer awareness level and/or screening practices and not explicitly on examining the specific relationship between the pattern of digital media use and cancer literacy outcome (Alghamdi *et al*, 2013; Alqahtani *et al*, 2020; Restum *et al*, 2021).

Although digital access is widespread among Saudi youth, studies indicate that cancer awareness remains inadequate, and reliance on online sources highlights the need to evaluate the quality and credibility of health information (Algamdi *et al*, 2021; Latif, 2014). Thus, the educational value and influence of electronic media platforms on cancer literacy within this population remain insufficiently explored (AlMuammar *et al*, 2021).

The current study explored the effects of electronic media platforms on cancer awareness among students in King Khalid University, Abha. The specific aims of the study were to determine how the patterns of digital media use are associated with the students' awareness of cancer risk factors, early warning signs, clinical screening, treatment, and side effects. The study also investigated the association of internet health information with students' demographics. The expected results should contribute to increase the current knowledge on social media as an educational tool for cancer awareness among university students and provide data for formulating population-specific cancer awareness programs and more efficient means of health communication in the country.

MATERIALS AND METHODS

Study design and participants

The cross-sectional, descriptive study was carried out among students enrolled in health- and non-health-related diploma, graduate and post-graduate programs at King Khalid University within Saudi Arabia's Abha, Asir region during August 2025 to December 2025.

Inclusion criteria were at least 18 years of age and active users of at least one of the electronic media platform. The exclusion criterion was students with a known cancer diagnosis.

Sample size was estimated using Raosoft® sample size calculator (Raosoft Inc, Seattle, WA) at 95% confidence, 5% margin of error and a response distribution assumption of 50%. The calculated sample size was 384, and 429 participants were enrolled. A convenience sampling technique was used to select the participants (Etikan *et al*, 2016).

Data collection tool

The data collection tool was a self-administered, validated, structured questionnaire. The questionnaire items were drafted and adapted based on previous research studies on cancer awareness, risk factors, warning signs, screening awareness/behavior, and awareness-related information exposure (Connor *et al*, 2020; Qin *et al*, 2021; Sabi *et al*, 2021; NCI, 2015; NCI, 2019; NCI, 2023). The draft questionnaire was organized into three predefined domains to ensure that the content coverage aligned with the study objectives and was subsequently revised for clarity and local applicability. A pilot study was conducted among 40 students to assess feasibility, comprehension and internal consistency and reliability. The pilot study produced excellent reliability (Cronbach's alpha = 0.95), confirming the questionnaire's consistency (Koo and Li, 2016). To avoid overlap and bias, participants in the pilot study were excluded

from the final project. The study's Cronbach's alpha was 0.978.

The questionnaire consisted of three domains, namely demographics (age, gender, study discipline, year of study, and place of residence), electronic media use [frequency, type of electronic media platform (eg, social media, YouTube, AI tool, and health website)] and cancer awareness (general, risk factors, warning signs, treatment options, and side effects). The latter domain was evaluated using 37 questions, each of which was scored using a 5-point Likert scale ranging from 1 = "strongly disagree" to 5 = "strongly agree". Total domain score value of ≥70% is considered good and <70% considered poor. Percentage scores were calculated by dividing the total obtained score by the maximum possible score and multiplying by 100 (Agiri *et al*, 2025).

Data were collected over six weeks, both online (via Google Forms sent by WhatsApp, Snapchat) and by email, to ensure that all eligible students could participate. Responses to the questionnaire were anonymized before the retrieval of data.

Statistical analysis

Descriptive statistics (means, standard deviations, frequencies, and percentages) were used to summarize demographics and cancer awareness data. Chi-square and Fisher's exact tests were applied to identify associations among demographic variables and cancer awareness categories. Multinomial logistic regression analysis was performed to assess predictors of media platform use regarding cancer awareness levels and demographic variables, with a p-value <0.050 considered statistically significant. Analysis was performed using the Statistical Package for Social Sciences (SPSS) version 21 (IBM Corp, Armonk, NY).

Ethical considerations

The research protocols were approved by the Research Ethics Committee, King Khalid University

(reference no: KKU-103-2025-31). Prior written consent was obtained from each participant.

RESULTS

The majority of the participants (N = 429) were male (78%), 20-24 years of age (56%), unmarried (88%), undergraduates (61%), in the nursing discipline (54%), in the 2nd and 3rd year of study (67%), and resided in Abha (64%) (Table 1). Participants across nearly all demographic groups reported that information on cancer awareness was mostly (46%) from the social media, followed by AI and web-based sources (37%), then YouTube (17%) (Table 1). Higher usage of the social media was observed among males (33%), students 20-24 years of age (24%), unmarried participants (38%), urban residents (35%), undergraduates (31%), those enrolled in the nursing discipline (27%), and 2nd year students (18%). Nearly two-thirds of the students accessed the digital platforms >1 hours/day, while only 3% never used these media (Table 1).

Participants had a high level of the general awareness about cancer, with an overall awareness mean score of 3.71 ± 1.01 (8 items, five-point Likert scale), with a Cronbach's α of 0.909, indicating excellent internal consistency and high reliability (Table 2). As regards awareness of cancer risk factors, warning signs, treatments and treatment side effects, the mean score and Cronbach's α value for each category were slightly lower than those of the general cancer awareness but still fell within the moderate to high range (risk factors: 3.63 ± 1.08 (8 items), Cronbach's α = 0.894; warning signs: 3.39 ± 1.14 (8 items), Cronbach's α = 0.942; treatments: 3.66 ± 1.08 (8 items), Cronbach's α = 0.939; and treatment side effects: 3.72 ± 1.10 (7 items), Cronbach's α = 0.920). Overall, the findings indicated that while students possessed a fundamental awareness of cancer, there was comparatively less depth in their understanding of specific details regarding risk factors, warning signs, treatments and treatment-related complications.

Table 1

Descriptive analysis of electronic media use for cancer awareness of students (N = 429), King Khalid University, Abha, Saudi Arabia, August to December 2025

Group	Frequency, *n* (%)			
	Social media	YouTube-video	AI and Web	Total
Sex				
Male	144 (33)	60 (14)	132 (31)	336 (78)
Female	54 (13)	12 (3)	27 (6)	93 (22)
Age group				
<20 years	45 (10)	3 (1)	27 (6)	75 (17)
20-24 years	105 (24)	51 (12)	84 (20)	240 (56)
25-29 years	24 (6)	12 (3)	42 (10)	78 (19)
30-34 years	24 (6)	6 (1)	6 (1)	36 (8)
Marital status				
Married	33 (8)	9 (2)	9 (2)	51 (12)
Unmarried	165 (38)	63 (15)	150 (35)	378 (88)
Degree program				
Diploma	45 (11)	24 (6)	66 (15)	135 (32)
Undergraduate	132 (31)	45 (10)	87 (20)	264 (61)
Post-graduate	21 (5)	3 (1)	6 (1)	30 (7)
Discipline				
Dentistry	18 (4)	15 (4)	42 (10)	75 (18)
Engineering	12 (2)	3 (1)	12 (3)	27 (6)
Nursing	117 (27)	45 (11)	69 (16)	231 (54)
Public Health	51 (12)	9 (2)	36 (8)	96 (22)

Table 1 (cont)

Group	Frequency, *n* (%)			
	Social media	YouTube-video	AI and Web	Total
Study year				
1st	9 (2)	9 (2)	3 (1)	21 (5)
2nd	78 (18)	18 (4)	69 (16)	165 (38)
3rd	54 (13)	33 (8)	36 (8)	123 (29)
4th	57 (13)	12 (3)	51 (12)	120 (28)
Residence location				
Abha	150 (35)	39 (9)	87 (20)	276 (64)
Outside Abha	48 (11)	33 (8)	72 (17)	153 (36)
Frequency of social media use				
Never	3 (1)	0 (0)	6 (2)	9 (3)
Rarely (<30 minutes/day)	12 (3)	12 (3)	15 (3)	39 (9)
Sometimes (30-60 minutes/day)	45 (10)	21 (5)	39 (9)	105 (24)
Often (>1-3 hours/day)	72 (17)	21 (5)	45 (10)	138 (32)
Very often (>3 hours/day)	66 (15)	18 (4)	54 (13)	138 (32)

AI: artificial intelligence

Table 2

Descriptive analysis of information on cancer through electronic media by students (N = 429), King Khalid University, Abha, Saudi Arabia, August to December 2025

Question	Mean ± SD*
Awareness	
Help awareness of what is cancer?	3.64 ± 1.07
Help awareness that cancer is an uncontrolled cell growth?	3.67 ± 1.00
Help awareness that cancer can affect any body part?	3.78 ± 1.06
Help awareness that early detection improves survival?	3.79 ± 1.11
Help awareness that cancer has environmental and genetic causes?	3.65 ± 1.03
Help awareness that lifestyle affects cancer risk?	3.71 ± 1.01
Help awareness that treatment depends on cancer type and stage?	3.71 ± 1.09
Help awareness of new cancer research?	3.74 ± 0.97
Overall awareness score	3.71 ± 1.01
Cronbach's alpha	0.909
Risk factor	
Smoking is a major risk factor for cancer?	3.92 ± 1.04
Exposure to toxins (eg, asbestos, pesticides) can cause cancer?	3.68 ± 1.09
Poor diet and lack of physical activity are cancer risk factors?	3.60 ± 1.07
Age increases cancer risk?	3.58 ± 1.07
Family history affects cancer risk?	3.39 ± 1.15
UV radiation from the sun is a risk factor for skin cancer?	3.73 ± 1.00
Viral infections (eg, HPV, hepatitis) can increase cancer risk?	3.47 ± 1.16
Overall risk factor score	3.63 ± 1.08
Cronbach's alpha	0.894

Table 2 (cont)

Question	Mean ± SD*
Warning sign	
Unexplained weight loss may signal cancer?	3.26 ± 1.20
Persistent fatigue could be a sign of cancer?	3.30 ± 1.15
Persistent cough or hoarseness may indicate lung cancer?	3.36 ± 1.13
Bowel or bladder habit changes can signal cancer?	3.35 ± 1.16
Lumps or thickening in the body can indicate cancer?	3.57 ± 1.10
Unusual bleeding or discharge can be a sign of cancer?	3.50 ± 1.11
Difficulty in swallowing or indigestion could be linked to cancer?	3.32 ± 1.20
Unexplained pain could be a sign of cancer?	3.45 ± 1.08
Overall warning sign score	3.39 ± 1.14
Cronbach's alpha	0.942
Cancer treatment	
Understand different types of cancer treatment?	3.61 ± 1.11
Treatment varies by cancer type and stage?	3.75 ± 1.02
Chemotherapy and radiation are common treatments?	3.80 ± 1.04
There are new treatments like immunotherapy and targeted therapy?	3.55 ± 1.09
Cancer treatments can cause side effects?	3.70 ± 1.10
Cancer treatment can be costly?	3.56 ± 1.13
Treatment involves a team of health professionals?	3.70 ± 1.09
Personalized treatments are becoming more common?	3.61 ± 1.08
Overall cancer treatment score	3.66 ± 1.08
Cronbach's alpha	0.939

Table 2 (cont)

Question	Mean ± SD*
Side effect	
Chemotherapy may cause nausea, vomiting, and hair loss?	3.78 ± 1.06
Radiation therapy can cause fatigue and skin irritation?	3.69 ± 1.09
Fatigue is common during cancer treatment?	3.74 ± 1.09
Emotional side effects can result from cancer treatment?	3.64 ± 1.09
Long-term side effects can occur after cancer treatment?	3.64 ± 1.14
Increased empathy for those with side effects after cancer treatment?	3.81 ± 1.12
Overall side effect score	3.72 ± 1.10
Cronbach's alpha	0.920
Overall Cronbach's alpha	0.978

*Measured on a five-point Likert scale ranging from 1 = "strongly disagree" to 5 = "strongly agree". Scores for individual items were summed to generate domain-specific and overall scores.
HPV: human papillomavirus; SD: standard deviation; UV: ultraviolet

An analysis was carried out to explore the degree of awareness of the five categories of cancer by the participants grouped according to their demographic characteristics. Awareness was reported as either "poor" or "good" based on pre-decided cut off (Table 3). For sex of students, there are no significant differences between the two sexes in the evaluations of the five categories of cancer awareness except for treatment side-effects category (p-value <0.050). For marital status, there are no significant differences between the status in the evaluations of the five categories of cancer awareness. For age groups, differences were found among the age groups in evaluation of the awareness in the categories of general awareness,

Table 3

Statistical association between demographic variables and cancer awareness categories among students (N = 429), King Khalid University, Abha, Saudi Arabia, August to December 2025

Group	General awareness *n* (%)		*p*-value*	Risk factors' awareness *n* (%)		*p*-value*	Warning signs' awareness *n* (%)		*p*-value*	Cancer treatments' awareness *n* (%)		*p*-value*	Cancer treatment side effects' awareness *n* (%)		*p*-value*
	Poor	Good		Poor	Good		Poor	Good		Poor	Good		Poor	Good	
Sex															
Male	126 (29)	210 (49)	0.831	159 (37)	177 (41)	0.199	198 (46)	138 (32)	0.681	150 (35)	186 (43)	0.307	144 (34)	192 (45)	<0.050
Female	36 (9)	57 (13)		51 (12)	42 (10)		57 (13)	36 (9)		36 (9)	57 (13)		27 (6)	66 (15)	
Age group															
<20 years	18 (4)	57 (13)	<0.050	27 (6)	48 (11)	0.067	30 (7)	45 (10)	<0.050	24 (6)	51 (12)	0.058	15 (4)	60 (14)	<0.001
20-24 years	93 (22)	147 (34)		120 (28)	120 (28)		153 (36)	87 (20)		105 (24)	135 (31)		105 (24)	135 (31)	
25-29 years	36 (8)	42 (10)		42 (10)	36 (8)		51 (12)	27 (6)		42 (10)	36 (8)		39 (9)	39 (9)	
30-34 years	15 (4)	21 (5)		21 (5)	15 (4)		21 (5)	15 (4)		15 (4)	21 (5)		12 (3)	24 (6)	
Marital status															
Married	24 (5.6)	27 (6.3)	0.145	30 (7)	21 (5)	0.133	30 (7)	21 (5)	0.924	27 (6)	24 (6)	0.141	21 (5)	30 (7)	0.838
Unmarried	138 (32.2)	240 (55.9)		180 (42)	198 (46)		225 (52)	153 (36)		159 (37)	219 (51)		150 (35)	228 (53)	
Education level															
Diploma	45 (11)	90 (21)	<0.001	63 (15)	72 (17)	0.056	69 (16)	66 (15)	<0.050	51 (12)	84 (20)	<0.050	45 (11)	90 (21)	<0.050
Graduate	96 (22)	168 (39)		126 (29)	138 (32)		165 (39)	99 (23)		114 (26)	150 (35)		108 (25)	156 (36)	
Post-graduate	21 (5)	9 (2)		21 (5)	9 (2)		21 (5)	9 (2)		21 (5)	9 (2)		18 (4)	12 (3)	

Table 3 (cont)

Group	General awareness *n* (%)		*p*-value*	Risk factors' awareness *n* (%)		*p*-value*	Warning signs' awareness *n* (%)		*p*-value*	Cancer treatments' awareness *n* (%)		*p*-value*	Cancer treatment side effects' awareness *n* (%)		*p*-value*
	Poor	Good		Poor	Good		Poor	Good		Poor	Good		Poor	Good	
Discipline															
Dentistry	18 (4)	57 (13)	<0.050	30 (7)	45 (10)	0.364	36 (8)	39 (9)	0.103	24 (5)	51 (12)	0.169	24 (6)	51 (12)	0.220
Engineering	15 (4)	12 (3)		15 (4)	12 (3)		18 (4)	9 (2)		12 (3)	15 (3)		9 (2)	18 (4)	
Nursing	96 (22)	135 (31)		117 (27)	114 (27)		138 (32)	93 (22)		108 (25)	123 (29)		102 (24)	129 (30)	
Public Health	33 (8)	63 (15)		48 (11)	48 (11)		63 (15)	33 (8)		42 (10)	54 (13)		36 (8)	60 (14)	
Study year															
1st	6 (1)	15 (4)	0.837	12 (2.8)	9 (2.1)	0.848	15 (3.5)	6 (1.4)	<0.050	9 (2.1)	12 (2.8)	0.996	9 (2.1)	12 (2.8)	0.883
2nd	63 (15)	102 (24)		78 (18.2)	87 (20.3)		84 (19.6)	81 (18.9)		72 (16.8)	93 (21.7)		63 (14.7)	102 (23.8)	
3rd	48 (11)	75 (17)		60 (14.0)	63 (14.7)		81 (18.9)	42 (9.8)		54 (12.6)	69 (16.1)		48 (11.2)	75 (17.5)	
4th	45 (11)	75 (17)		60 (14.0)	60 (14.0)		75 (17.5)	45 (10.5)		51 (11.9)	69 (16.1)		51 (11.9)	69 (16.1)	
Residence location															
Abha	99 (23)	177 (41)	0.277	126 (29)	150 (35)	0.066	144 (33)	132 (31)	<0.001	102 (24)	174 (40)	<0.001	99 (23)	177 (41)	<0.050
Outside Abha	63 (15)	90 (21)		84 (20)	69 (16)		111 (26)	42 (10)		84 (20)	69 (16)		72 (17)	81 (19)	
Electronic media platforms used for health-related information															
Social media	72 (17)	126 (29)	<0.050	90 (21)	108 (25)	0.367	111 (26)	87 (20)	0.098	84 (20)	114 (26)	0.821	66 (15)	132 (31)	<0.050
YouTube	18 (4)	54 (13)		39 (9)	33 (8)		39 (9)	33 (8)		30 (7)	42 (10)		27 (6)	45 (11)	
AI and Web	72 (17)	87 (20)		81 (19)	78 (18)		105 (24)	54 (13)		72 (17)	87 (20)		78(18)	81(19)	

Table 3 (cont)

Group	General awareness *n* (%)		*p*-value*	Risk factors' awareness *n* (%)		*p*-value*	Warning signs' awareness *n* (%)		*p*-value*	Cancer treatments' awareness *n* (%)		*p*-value*	Cancer treatment side effects' awareness *n* (%)		*p*-value*
	Poor	Good		Poor	Good		Poor	Good		Poor	Good		Poor	Good	
Frequency of social media use															
Never	6 (1)	3 (1)	<0.050	6 (1)	3 (1)	<0.001	3 (1)	6 (1)	<0.050	3 (1)	6 (1)	<0.001	3 (1)	6 (1)	<0.050
Rarely (<30 minutes/day)	21 (5)	18 (4)		27 (6)	12 (3)		30 (7)	9 (2)		27 (6)	12 (3)		24 (6)	15 (3)	
Sometime (30-60 minutes/day)	45 (11)	60 (14)		63 (15)	42 (10)		66 (15)	39 (9)		54 (13)	51 (12)		51 (12)	54 (13)	
Often (>1-3 hours/day)	39 (9)	99 (23)		54 (13)	84 (19)		75 (18)	63 (15)		45 (10)	93 (22)		48 (11)	90 (21)	
Very often (>3 hours/day)	51 (12)	87 (20)		60 (14)	78 (18)		81 (19)	57 (13)		57 (13)	81 (19)		45 (10)	93 (22)	

*p-value <0.050 is considered statistically significant while p-value <0.001 is considered as statistically highly significant using Chi-square or Fisher's exact test.

AI: artificial intelligence

warning signs (p-value <0.050 for both) and treatment side-effects (p-value <0.001), indicating variations in awareness of cancer categories across the age groups. For types of study programs, differences in awareness of the cancer categories were found among all program types (p-value <0.050), except a marginally significant difference in the category of risk factors (p-value = 0.056), indicating that cancer awareness differed among the types of study programs in which the students were enrolled. For study discipline, differences in awareness were discerned among all disciplines only in the general awareness category (p-value <0.050), while for study year, differences in awareness were found among all study years only in the warning signs category (p-value <0.050). For location of students' residence, differences in awareness were seen between urban and rural location in the categories of warning signs, treatments (p-value <0.001each) and side effects (p-value <0.050).

A similar analysis was also carried on the degree of awareness of the five categories of cancer according to the type of digital media platforms and daily frequency of use by the students. Differences in awareness were observed among the types of digital platforms use in the categories of general awareness (p-value <0.050) and treatment side-effects (p-value <0.050) (Table 3). For frequency of social media use, differences in awareness were noted for the frequencies (hours/day) of usage in all categories (p-value <0.005) except for a marginal difference in the category of warning signs (p-value <0.050).

A multinomial logistic regression analysis was performed to identify an independent variable in the various groups (using one variable in each group as reference) that was evaluated aforementioned as having differences in cancer awareness from the use of the digital media (Table 4). Regarding cancer awareness, poor awareness assessments were obtained for

general awareness from use of social media (odds ratio (OR) = 8.49, *p*-value <0.010) or YouTube (OR = 9.86, *p*-value <0.010), for risk factors' awareness from use of YouTube (OR = 7.30, *p*-value <0.01), for warning signs' awareness from use of social media (OR = 0.41, *p*-value <0.050) or YouTube (OR = 0.11, *p*-value <0.010), and for treatment side-effects' awareness from use of social media (OR = 0.11, *p*-value <0.010) or YouTube (OR = 0.13, *p*-value <0.010); however, for treatments' awareness, poor awareness was revealed from use of YouTube (OR = 0.221, *p*-value <0.05) but not from use of social media (OR =0.929, *p*-value = 0.850).

Regarding demographic groups, good awareness assessments were obtained for married status with use of social media (OR = 3.82, *p*-value <0.050), for enrollment in a diploma program with use of social media (OR = 0.14, *p*-value <0.010) or YouTube (OR = 0.08, *p*-value <0.050), for 2nd year of study with use social media (OR = 3.25, *p*-value <0.010) or 1st and 3rd year with use of YouTube (OR = 17.45 and 3.53, *p*-values <0.010 and <0.050 respectively), and for urban residence with use of social media (OR = 3.06, *p*-value <0.010); whereas differences in sex, age groups and study disciplines showed indifferent (neither poor nor good) awareness assessments with the types of digital media used (Table 4).

DISCUSSION

The study explored the associations among demographic characteristics and among use of digital media with various categories of cancer awareness using a self-answered questionnaire received from 429 students attending King Khalid University, Abha during August 2025 to December 2025. Social media was the most used source for cancer information, followed by AI-based sources and YouTube videos. This finding is in agreement with a previous study, which indicated a rather greater dependence on online sources of information on health, particularly

Table 4

Multinomial logistic regression of cancer awareness categories and demographic variables with digital media use as the dependent variable

Parameter	Multinomial logistic regression based on social media use						Multinomial logistic regression based on YouTube use					
	B	SE	Wald	p-value*	Exp(B)	95% CI	B	SE	Wald	p-value*	Exp(B)	95% CI
Intercept	1.025	1.02	1.013	0.314	-	-	-0.024	1.478	0.000	0.987	-	-
General awareness												
Poor	2.139	0.59	13.100	<0.010	8.493	2.667-27.046	2.288	0.794	8.302	<0.010	9.857	2.079-46.746
Good	reference						reference					
Awareness of risk factors												
Poor	0.254	0.41	0.386	0.535	1.289	0.578-2.876	1.988	0.571	12.132	<0.010	7.301	2.385-22.345
Good	reference						reference					
Awareness of warning signs												
Poor	-0.900	0.40	4.999	<0.050	0.406	0.184-0.895	-2.233	0.508	19.309	<0.010	0.107	0.040-0.290
Good	reference						reference					
Awareness of cancer treatments												
Poor	-0.070	0.39	0.036	0.850	0.929	0.435-1.985	-1.509	0.599	6.340	<0.050	0.221	0.068-0.716
Good	reference						reference					
Awareness of side effects												
Poor	-2.260	0.56	16.190	<0.010	0.105	0.035-0.314	-2.030	0.771	6.927	<0.010	0.131	0.029-0.596
Good	reference						reference					

Table 4 (cont)

Parameter	Multinomial logistic regression based on social media use						Multinomial logistic regression based on YouTube use					
	B	SE	Wald	p-value*	Exp(B)	95% CI	B	SE	Wald	p-value*	Exp(B)	95% CI
Sex												
Male	-0.510	0.32	2.492	0.114	0.601	0.320-1.131	-0.088	0.474	0.034	0.853	0.916	0.362-2.318
Female	reference						reference					
Age group												
<20 years	-1.000	0.78	1.638	0.201	0.368	0.080-1.700	-1.566	1.245	1.582	0.209	0.209	0.018-2.398
20-24 years	-0.460	0.76	0.371	0.542	0.629	0.141-2.797	0.613	1.085	0.320	0.572	1.847	0.220-15.488
25-29 years	-1.070	0.74	2.078	0.149	0.344	0.081-1.468	-0.012	1.027	0.000	0.990	0.988	0.132-7.393
30-34 years	reference						reference					
Marital status												
Married	1.341	0.58	5.436	<0.050	3.821	1.238-11.793	0.549	0.771	0.507	0.476	1.731	0.382-7.840
Unmarried	reference						reference					
Education												
Diploma	-1.940	0.69	7.844	<0.010	0.143	0.037-0.558	-2.493	1.047	5.675	<0.050	0.083	0.011-0.643
Graduate	-0.810	0.60	1.819	0.177	0.443	0.136-1.446	-1.682	0.904	3.466	0.063	0.186	0.032-1.093
Post-graduate	reference						reference					

Table 4 (cont)

Parameter	Multinomial logistic regression based on social media use						Multinomial logistic regression based on YouTube use					
	B	SE	Wald	p-value*	Exp(B)	95% CI	B	SE	Wald	p-value*	Exp(B)	95% CI
Discipline												
Dentistry	-0.290	0.59	0.236	0.627	0.752	0.238-2.375	1.010	0.944	1.147	0.284	2.747	0.432-17.458
Engineering	0.043	0.61	0.005	0.944	1.044	0.316-3.449	1.125	0.967	1.354	0.245	3.080	0.463-20.486
Nursing	0.407	0.36	1.281	0.258	1.502	0.743-3.039	1.072	0.601	3.178	0.075	2.920	0.899-9.485
Public Health	reference						reference					
Study year												
1st	0.936	0.82	1.321	0.250	2.551	0.517-12.597	2.859	0.898	10.134	<0.010	17.452	3.001-101.493
2nd	1.178	0.41	8.323	<0.010	3.248	1.459-7.229	0.449	0.629	0.509	0.476	1.566	0.456-5.375
3rd	0.309	0.37	0.687	0.407	1.362	0.656-2.826	1.261	0.518	5.918	<0.050	3.529	1.278-9.748
4th	reference						reference					
Residence location												
Abha	1.118	0.29	14.980	<0.010	3.060	1.737-5.390	-0.311	0.384	0.655	0.418	0.733	0.345-1.556
Outside Abha	reference						reference					

References are AI and Web.

* *p*-value <0.050 is considered statistically significant, using (Wald Chi-square) test.

- for some of the Exp(B) and 95% CI indicates that they are uninterpretable.

B: regression coefficient; CI: confidence interval; Exp(B): exponentiated regression coefficient; SE: standard error; Wald: Wald chi-square test

among the youth (Norman and Skinner, 2006; Balay-Odao *et al*, 2021). The dominance of the 20-24 years of age group in media usage and cancer awareness level was consistent with an earlier study that showed university-age participants are the most active online consumers of health-related information (AlMuammar *et al*, 2021). More recently, WHO/Europe (2025) reported that social media sites such as Instagram, Twitter, and TikTok offer significant sources of general health information among young people than conventional media in reach and interaction. However, the current study did not find any increase in cancer awareness associated with age groups or duration of online media use, which indicated that the digital media was not an adequate provider of health information.

Regression analysis revealed that students with lower baseline cancer awareness were more likely to report using social media and YouTube for cancer-related information. This finding suggested that students with lower cancer awareness sought information via these convenient sources rather than that these platforms helped to improve awareness. Prior research indicated that digital platforms serve as readily accessible information sources for the young population (Sarkar *et al*, 2018; Abbas and Baig, 2023). On the other hand, a negative correlation between awareness of cancer warning signs and treatments with YouTube users suggested that although such websites are widely used, they did not provide a comprehensive medical information. This once again highlighted the need to improve the quality, breadth and comprehensible cancer-related information presented on social media (Tavakol and Dennick, 2011; WHO, 2021).

Demographic factors also were significantly associated with cancer awareness and the types of digital media used. Married students and those residing in Abha (an urban setting) had better awareness of cancer and more usage of the online

media, likely due to exposure to city-level health campaigns and ease of access to wi-fi facilities. It is noted that Saudi Arabian city dwellers are more inclined towards the utilization of digital health services. As expected, students in the health sciences, exhibited higher levels of cancer awareness. Previously Norman and Skinner (2006) reported that the educational environment significantly influences students' health behavior.

An interesting finding was the statistically significant association between frequency of social media usage and in-depth cancer awareness. Students who reported using social media "often" or "very often" reported higher levels of awareness of cancer causal and risk factors, treatments and their side-effects. This showed that the digital media was not only a passive source of information but also that it can be utilized as an active learning tool and as a means to mould students' health attitudes and behavior, as also noted by WHO (2021) and supported by national awareness initiatives implemented by the Ministry of Health Saudi Arabia (2024).

The study has several strengths and weaknesses. The study strengths were (i) addressing an important and timely topic, (ii) recruiting a reasonably large cohort that included students from various disciplines and education programs, (iii) constructing a questionnaire that was validated, pre-tested and used descriptive and multinomial logistic regression statistics, thereby allowing a deeper understanding of the associations among the various parameters. On the other hand, the study weaknesses included (i) cross-sectional design that did not allow the determination of a cause-and-effect relationship between digital media usage and cancer awareness, (ii) employment of the convenience sampling method that could introduce a selection bias and limit generalization of the findings to the general population, thereby and diminishing its potential impact,

(iii) unequal representation of the sexes, (iv) recruitment of students from a single university, and (v) reliance on self-reported data, prone to bias in recall and socially desired replies, and (vi) item redundancies of the questionnaire as evidenced by the high Cronbach's alpha value (>0.95).

In conclusion, the study highlighted the critical role played by the digital media, in particular social media, in providing information on cancer among university students attending King Khalid University at Abha. Although most students exhibited moderate to good awareness in most aspects of cancer, regular use of the digital platforms was associated with a better cancer awareness, in particular regarding symptoms, treatments, and treatment side-effects. However, there were inequalities in awareness between demographic groups, highlighting the need for more comprehensive, focused and trustworthy health communication system. With the current interconnected world *via* the digital media, this allows an opportunity, not only to close the information gap among different sociodemographic groups but also to enable young adults (and older) to become participants in the dissimilation of cancer awareness, risk, treatment and prevention in Saudi Arabia and beyond.

ACKNOWLEDGEMENTS

The authors extend their appreciation to the Deanship of Scientific Research at King Khalid University for funding through the General Research Project (Grant No. GPR/78/46).

CONFLICT OF INTEREST DISCLOSURE

The authors declare no conflict of interest.

REFERENCES

Abbas M, Baig M. Knowledge and practice concerning breast cancer risk factors and screening among females in the UAE. *Asian Pac J Cancer Prev* 2023; 24(2): 479-87.

Agiri O, Osena G, Bahati F, *et al*.

Knowledge, attitudes and practices survey on antimicrobial resistance and stewardship among pharmacy healthcare workers in 28 African countries. *BMJ Glob Health* 2025; 10(10): e019151.

Algamdi MM, Gonzales A, Farah E. Awareness of common cancer risk factors and symptoms in Saudi Arabia: a community-based study. *Asian Pac J Cancer Prev* 2021; 22(6): 1813-19.

Alghamdi IG, Hussain II, Alghamdi MS, El-Sheemy MA. The incidence rate of female breast cancer in Saudi Arabia: an observational descriptive epidemiological analysis of data from Saudi Cancer Registry 2001-2008. *Breast Cancer (Dove Med Press)* 2013; 5: 103-9.

Almoajel A, Alshamrani S, Alyabsi M. The relationship between e-Health literacy and breast cancer literacy among Saudi women. *Front Public Health* 2022; 10: 841102.

AlMuammar SA, Noorsaeed AS, Alafif RA, Kamal YF, Daghistani GM. The use of internet and social media for health information and its consequences among the population in Saudi Arabia. *Cureus* 2021; 13(9): e18338.

Alqahtani WS, Almufareh NA, Domiaty DM, *et al*. Epidemiology of cancer in Saudi Arabia thru 2010-2019: a systematic review with constrained meta-analysis. *AIMS Public Health* 2020; 7(3): 679-96.

AlSadrah SA. Social media use for public health promotion in the Gulf Cooperation Council. An overview. *Saudi Med J* 2021; 42(1): 9-20.

Al-Taie A, Bukar A. Assessment of knowledge of cancer risk factors and awareness of early cancer warning signs among university students. *Clin Exp Health Sci* 2024; 14: 139-45.

Balay-Odao EM, Alquwez N, Alsolami F, Tork HMM, Otaibi KA, Thobaity AA. COVID-19 crisis: influence of eHealth literacy on mental health promotion among Saudi nursing students. *J Taibah Univ Med Sci* 2021; 16(6): 906-13.

Budzik MP, Fudalej M, Mękal D, Badowska-Kozakiewicz AM. The impact of an educational project on cancer-related knowledge and awareness among high school students. *J Cancer Educ* 2025; 40(6): 947-57.

Burke AD, Burns JW, Chakraborty S, Saha T, Ray A, Borsch DM. Evaluation of cancer awareness, cancer education, and prevention intervention techniques among university-level students in the United States and India. *J Educ Health Promot* 2022; 11: 187.

Connor K, Hudson B, Power E. Awareness of the signs, symptoms, and risk factors of cancer and the barriers to seeking help in the UK: comparison of survey data collected online and face-to-face. *JMIR Cancer* 2020; 6(1): e14539.

Etikan I, Musa SA, Alkassim RS. Comparison of convenience sampling and purposive sampling. *Am J Theor Appl Stat* 2016; 5(1): 1-4.

Islam MA, AlShayban DM, Nisa ZU, *et al*. What is the current state of awareness, knowledge, and attitudes toward breast cancer? A cross-sectional survey among health and non-health college students. *Front Public Health* 2022; 10: 838579.

Koo TK, Li MY. A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *J Chiropr Med* 2016; 15(2): 155-63.

Labisso WL, Leka Y, Leka Y, Haileselassie W. A descriptive cross-sectional study on awareness and belief of people about cancer in Southern Ethiopia: special focus on breast and cervical cancers. *Risk Manag Healthc Policy* 2020; 13: 2655-68.

Latif R. Knowledge and attitude of Saudi female students towards breast cancer. *J Taibah Univ Med Sci* 2014; 9(4): 328-34.

Merten JW, Parker A, Williams A, King JL, Largo-Wight E, Osmani M. Cancer risk factor knowledge among young adults. *J Cancer Educ* 2017; 32(4): 865-70.

Ministry of Health Saudi Arabia. Early detection of cancer, 2024 [cited 2025 Sep 21]. Available from: URL: https://www.moh.gov.sa/en/awarenessplateform/ChronicDisease/Pages/Early-detection-of-cancer.aspx

National Cancer Institute (NCI). Cancer screening overview (PDQ®) - patient version, 2023 [cited 2025 Dec 15]. Available from: URL: https://www.cancer.gov/about-cancer/screening/patient-screening-overview-pdq

National Cancer Institute (NCI). Risk factors for cancer, 2015 [cited 2025 Dec 15]. Available from: URL: https://www.cancer.gov/about-cancer/causes-prevention/risk

National Cancer Institute (NCI). Symptoms of cancer, 2019 [cited 2025 Dec 15]. Available from: URL: https://www.cancer.gov/about-cancer/diagnosis-staging/symptoms

Norman CD, Skinner HA. eHEALS: The eHealth Literacy Scale. *J Med Internet Res* 2006; 8(4): e27.

Qin L, Zhang X, Wu A, *et al*. Association between social media use and cancer screening awareness and behavior for people without a cancer diagnosis: matched cohort study. *J Med Internet Res* 2021; 23(8): e26395.

Restum S, Alloush M, Kubtan MA. Awareness of prostate cancer: a research study on Syrian private university students, Syria. *J Cancer Prev Curr Res* 2021; 12(2) :44-6.

Rosa A, Pereira A, Carapeto MJ. Cancer literacy among youth university students and motivations for volunteering. *Psychol Int* 2025; 7(1): 23.

Sabi EM, Mujamammi AHA, Abdulghani M, *et al*. Awareness level of cancer risk factors and warning signs and cancer campaign attendance behavior among Saudi adults in a tertiary hospital in Riyadh. *Asian Pac J Cancer Prev* 2021; 22(8): 2421-8.

Sarkar U, Le GM, Lyles CR, Ramo D, Linos E, Bibbins-Domingo K. Using social media to target cancer prevention in young adults: viewpoint. *J Med Internet Res* 2018; 20(6): e203.

Saudi Health Council. Cancer incidence report in the Kingdom of Saudi Arabia 2018, 2022 [cited 2025 Dec 30]. Available from: URL: https://shc.gov.sa/Arabic/NewNCC/Activities/AnnualReports/2018.pdf

Tavakol M, Dennick R. Making sense of Cronbach's alpha. *Int J Med Educ* 2011; 2: 53-5.

Union for International Cancer Control (UICC). GLOBOCAN 2022: Latest global cancer data shows rising incidence and stark inequities, 2024 [cited 2025 Dec 30]. Available from: URL: https://www.uicc.org/news/globocan-2022-latest-global-cancer-data-shows-rising-incidence-and-stark-inequities

World Health Organization. Global strategy on digital health 2020-2025, [cited 2025 Dec 16]. Available from: URL: https://iris.who.int/server/api/core/bitstreams/1f4d4a08-b20d-4c36-9148-a59429ac3477/content

World Health Organization Regional Office for Europe (WHO/Europe). Addressing the digital determinants of youth mental health and well-being, 2025 [cited 2025 Dec 01]. Available from: URL: https://iris.who.int/server/api/core/bitstreams/26d26448-7fdd-44be-8e7e-bbcbe4ee4ce1/content