Public perception of common cancer misconceptions: A nationwide cross-sectional survey and analysis of over 3500 participants in Saudi Arabia

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ABSTRACT

Purpose/Background: Patients and healthcare providers use online health information and social media (SM) platforms to seek medical information. As the incidence of cancer rises, the popularity of SM platforms has yielded widespread dissemination of incorrect or misleading information about it. In this study, we aimed to assess public knowledge about incorrect cancer information and how they perceive such information in Saudi Arabia. **Methods:** A nationwide survey was distributed in Saudi Arabia. The survey included questions on demographics, SM platform usage, and common misleading and incorrect cancer information. **Results:** The sample (N = 3509, mean age 28.7 years) consisted of 70% females and 92.6% Saudi nationals. Most participants had no chronic illness. One-third were college graduates and less than one-quarter were unemployed. **Conclusions:** Differences in level of knowledge about cancer emerged in association with different demographic factors. Public trust in health information on SM also led to being misinformed about cancer, independent from educational level and other factors. Efforts should be made to rapidly correct this misinformation.

Keywords: Health information, misinformation, oncology, public knowledge, social media platforms

Introduction

Cancer is the second leading cause of death globally, estimated to cause 9.6 million deaths in 2018.[1] Affects millions of people annually, it is a serious healthcare problem with crucial consequences that impact cancer patients and their families, hence the society.[2] Cancer patient preferences for resorting to other alternative therapies over seeking medical treatment play a critical role determining overall patient's outcome, these preferences are significantly influenced by the cultural and societal perceptions about cancer.[2]

Since patients seek health related information (HRI) on social media, tackling misinformation is now an essential public safety goal, particularly relevant in cancer management where adoption of unproven therapies is linked to a worse survival rate.[3]

Various misconceptions and myths about cancer exist throughout all cultures and societies.[2] Consequently, misconceptions about cancer may have an impact on patient's relationship with primary

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care providers, and it is essential to guide and correct patients' perceptions about health information, in order to provide the appropriate management and prevent harmful consequences.[2]

Social media (SM) has been widely used for the dissemination of medical information, increasingly become popular widely from appearance of recent COVID-19 pandemic.[4]

A major advantage of SM use for health care is empowerment of patient by enabling patient to learn more about their medical conditions, connect with family physicians and care providers and create supportive groups with people who have similar condition.[4]

A survey by Almaiman *et al.*[5] revealed that physicians reported that seeking online health information increased their medical knowledge and improved their clinical practice. Doctors and nurses encouraged their patients to search about their conditions online, even though they rarely believed in the reliability of online HRI. As they do for other health conditions, patients also seek HRI online for information about cancer.[6]

Conversely, while offering a lot of empowerment opportunities, it carries a high risk for dissemination of misinformation and misconception about medical conditions. SM empowers influencers who lack medical experience to share their views and potential misinformation about medical care.[4]

The content shared on SM can influence users' understanding of diseases and encourage behavioral changes.[7,8] Health-related misinformation that is commonly shared online can adversely affect therapy decisions and long-term outcomes.[9]

Internet plays an essential role in sharing information and it is a major source dissemination of health misleading information.[3,4]

Understanding how health misinformation spreads and how it may influence choices and health practices are essential.[6]

In Saudi Arabia, approximately one-third to 70% of individuals get their HRI regarding their health condition from SM or the internet.[10,11] Several studies attempted to assess public knowledge about cancer, but most of the studies focused on one type of malignancy and were conducted in a single city or region in the Kingdom.[10,12-14]

Although most studies assessing public knowledge about cancer risk factors and prevention in Saudi Arabia focused on common malignancies and were conducted in large cities, the reported level of awareness is very discouraging and low.[12,14] In addition to the public's low awareness level of cancer, misconceptions regarding cancer screening and treatment in the Saudi populations are common.[10,14]

In our study, we aimed to assess the general knowledge of the public regarding incorrect or misleading information about cancer, their trust in posted cancer-related information through SM, and how they perceive such information in Saudi Arabia. To our knowledge, this is the first large scale and nation-wide study that assesses the understanding of cancer-related misconceptions by the public and unravels possible factors, including SM trust and use that might contribute to this understanding.

Materials and Methods

Public knowledge: Survey distribution

A nationwide questionnaire was distributed to adults across Saudi Arabia between September 2019 and February 2020, targeting SM users. We wanted to know the most frequently used platform in Saudi Arabia in order to assess public awareness of faulty information regarding cancer shared through SM platforms, such as WhatsApp, Twitter, and Facebook. We also aimed to determine the impact of sociodemographic factors on the public's considerations of health-related messages shared through SM.

This newly developed questionnaire consisted of four parts. The first part collected sociodemographic information about the participants, including, age, gender, nationality, educational level, and parental status. The second part dealt with health information, specifically emphasizing their personal and family history of cancer. The third part focused on SM use, including the types of platforms used (WhatsApp, Twitter, Instagram, Snapchat, Facebook, and others) and which platform the participant obtains most cancer information from. These platforms were placed in the survey on the basis of a recently released report by the Saudi Ministry of Communication and Information Technology.[15] The fourth part included 7 questions about commonly spread cancer misinformation in Saudi Arabia, which was based on our search on SM platforms. We performed a pilot study with 50 participants to test the internal consistency and reliability of the questionnaire and to discover any vagueness or difficulty with it.

Ethical approval was obtained prior to conducting this study (IRB- 542-19).

Public knowledge: Data collection

Participants were selected from malls, parks, hospitals, and primary healthcare centers. Participants were asked to confirm that he or she did not work in the medical field or was a student in health sciences. We also distributed the questionnaire through social communication groups to further expand the sample. Informed consent was obtained from all participants included in this study.

Statistical analysis

Data were checked for completeness and errors corrected. The normality of the distributions of continuous variables was checked by conducting Shapiro-Wilk and Kolmogorov-Smirnov tests. The results indicated that all variables were non-normally

distributed. Frequencies and percentages were used for demographic variables (age, gender, nationality, education, occupation, children, chronic diseases, family physician follow-up, and cancer history) and SM usage (SM platforms used).

The mean number of correct answers for cancer-related questions in the questionnaire was compared within each variable by using the Kruskal-Wallis and Mann-Whitney U tests. To minimize potential confoundment, we performed a linear regression analysis. The answers to the cancer-related questions were compared with the variables by using Chi-squared and Fisher's exact tests.

All analyses were conducted with SPSS, version 23.0 (IBM, Armonk, NY, USA), and 95% confidence intervals were computed to interpret results.

Results

Questionnaire
Demographic data
A total of 3509 participants completed the questionnaire. Their mean age was 28.7 years, with a minimum of 18 years and a maximum of 74 years. Most of the participants were in the 18-32 age group. The majority of the respondents were females and Saudi nationals. Most participants were healthy with no chronic illnesses, and the majority did not have periodic follow-ups with a family physician. Most of the participants had no current or previous history of malignancy, one-third of them had family members with a malignancy, and a few percent had a malignancy at the time of filling out the questionnaire or previously. One-third of the participants were college graduates, and a minority had a higher education degree. There were more government sector employees than private sector employees. Figure 1 is a pie chart that shows the percentages of participants from each of the 13 regions in Saudi Arabia. Most participants were from Makkah and Riyadh regions, the Kingdom's largest two regions in terms of population. The details on participants demographics are in [Tables 1, 2 and Figure 1].

Social media
The most frequent SM platform used was WhatsApp, followed by Twitter. However, most of the cancer information was received from Twitter. Only a few participants used Facebook. Most participants obtain their HRI from Twitter.

Number of correct cancer-related answers
A pilot study to assess the reliability of the 7 questions was performed with 50 participants. It revealed a Cronbach's alpha of 0.722. It was determined that a score ≥5 was considered high level knowledge, a score of 3-4 was considered intermediate knowledge, and a score ≤2 was considered low level of knowledge.

Significant differences emerged in the mean number of correct answers. Younger patients tended to have better perceptions about cancer. Participants who did not have a chronic disease, who had no children, and who obtained their cancer information mostly from Twitter had more correct answers to the questions than did other participants. After adjusting for confounding factors, we found that participants with a personal or family history of cancer tended to have a better perception of cancer.

The mean number of right responses increases with higher educational degree. Participants who did not trust the information on SM were more likely to provide correct answers than were those who did trust it.

Cancer-related questions and demographics
The first question was, "Are complementary and alternative medicine (CAM) modalities enough to treat cancer?" The correct answer to this question is "No." Younger and female participants with a higher education were more likely to answer correctly.

The second question was, "Does reducing daily sugar requirements help cure cancer?" The correct answer to this question was "No." Older participants and parents thought that reducing sugar plays a preventative role in cancer or can cure it. Participants with a higher education level were more likely to answer this question correctly.

The third question was, "Does consuming microwaved food increase risk of developing cancer?" The correct answer to this question is "No." Younger participants, college graduates, and participants with no children had higher percentages of correct answers for this question.

The fourth question was, "Does eating smoked food increase the risk of cancer?" The correct answer to this question is "Yes." Older participants with a higher education and parents were more likely to answer this question correctly. Students were most likely to answer incorrectly.

The fifth question was, "Can a vegan diet reduce the risk of cancer?" The correct answer to this question is "Yes." Older
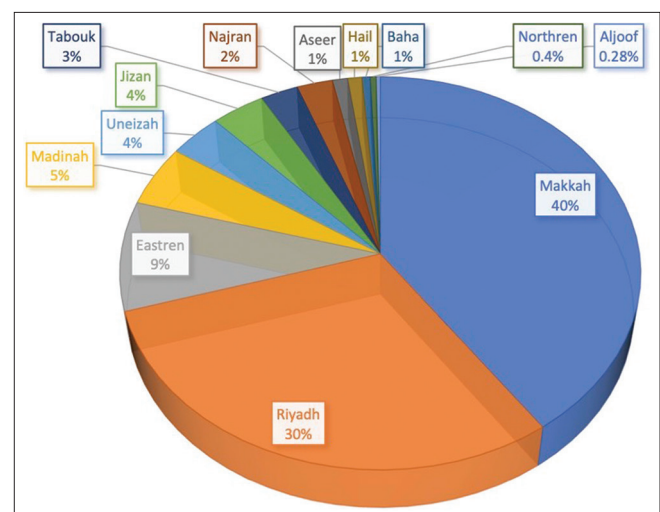

Figure 1: Approximate percentages of respondents per region

participants, non-Saudi nationals, and those with a lower education had more correct answers.

The sixth question was, "Can radio waves from cell phones lead directly to cancer?" The correct answer to this question is "No." Males, participants with a higher education level, and non-parents had higher percentages of correct answers.

The seventh question was, "Is camel milk enough to treat cancer?" The correct answer to this question is "No." College students, females, and younger individuals were more likely to

answer correctly. Figure 2 illustrates the specific percentages of individuals who accurately answered questions in the respective groups, which include HS (high school or lower), CS (college students), and HE (higher education).

Discussion

Because of its ease of access and low cost, SM has lately been one of the most frequently used sources of cancer-related information in Saudi Arabia regarding treatments, side effects, and alternative therapies. SM facilitates the rapid spread of

Table 1: Demographic characteristics of the study participants							
	n	%	Mean number of correct answers (SD)	Not adjusted		Adjusted*	
				95% Confidence interval	*P*	B	*P*
Age (years)							
18-32 (1)	2550	72.70	2.98±1.47	2.92-3.04	<0.001	-0.263	<0.001
33-46 (2)	607	17.30	2.72±1.55	2.59-2.84			
47-60 (3)	286	8.20	2.24±1.41	2.08-2.41			
61-74 (4)	66	1.9	2.33±1.44	1.98-2.69			
Gender							
Male (1)	1053	30.0	2.81±1.60	2.71-2.91	0.128	0.116	0.039
Female (2)	2456	70.0	2.89±1.45	2.83-2.94			
Nationality							
Non-Saudi (1)	260	7.4	2.72±1.53	2.53-2.91	0.081	0.084	0.368
Saudi (2)	3249	92.6	2.88±1.49	2.82-2.93			
Chronic illness							
Yes (1)	567	16.20	2.73±1.48	2.60-2.86	0.031	0.035	0.018
No (2)	2842	83.8	2.89±1.50	2.84-2.95			
Periodic health checkup with family physician							
Yes (1)	612	17.40	2.78±1.50	2.66-2.90	0.090	- 0.082	0.239
No (2)	2897	82.60	2.88±150	2.83-2.94			
Education							
High school or less (1)	569	16.20	2.53±1.42	2.41-2.64	<0.001	0.174	<0.001
College student (2)	1545	44.0	2.90±1.46	2.82-2.97			
College graduate (3)	1159	33.0	2.95±1.55	2.86-3.04			
Higher education (4)	236	6.70	3.06±1.54	2.87-3.26			
Occupation							
Unemployed (not a student) (1)	865	24.70	2.78±1.51	2.68-2.88			
Student (2)	1603	45.70	2.90±1.47	2.83-2.98	0.097	0.028	0.282
Private sector employee (3)	457	13.00	2.95±1.45	2.82-3.09			
Government sector employee (4)	584	16.60	2.81±1.58	2.68-2.94			
Children							
No (1)	2318	68.50	2.96±1.49	2.90-3.02	<0.001	0.074	0.266
Yes (2)	1067	31.50	2.66±1.49	2.58-2.75			
Cancer history							
No personal/family history of cancer (1)	2153	63.60	2.82±1.50	2.75-2.88			
Had/has a family member with cancer (2)	1137	33.60	3.00±1.49	2.87-3.04	0.110	0.132	0.003
Was previously a cancer patient (3)	75	2.20	2.75±1.49	2.42-3.09			
Currently a cancer patient (4)	20	0.60	3.14±1.46	2.48-3.81			
Do you trust cancer related information from social media?							
Yes (1)	399	11.40	2.72±1.42	2.58-2.86	<0.001	0.409	<0.001
Sometimes (2)	2599	74.0	2.77±1.48	2.72-2.83			
No (3)	511	14.6	3.45±1.52	3.30-3.57			
Most information about cancer from							
Snapchat (1)	74	2.10	2.34±1.42	2.00-2.67			
WhatsApp (2)	837	23.90	2.43±1.49	2.33-2.53			
Facebook (3)	58	1.70	2.45±1.67	2.01-2.89	<0.001	0.169	<0.001
Other** (4)	152	4.30	2.48±1.38	2.12-2.85			
Instagram (5)	492	14.00	2.64(± 1.46	2.50-2.76			
Twitter (6)	1896	54.00	3.16±1.43	3.10-3.23			

*Adjusted by linear regression analysis. Variables were coded for analysis as shown in the parenthesis in the first column. **Other includes Telegram and Pinterest

misinformation, which may adversely affect patient decisions and outcomes in the long run, as well as the doctor-patient relationship. In this study, we aimed to assess the perception of the general public about cancer misinformation including treatment, diagnosis, and prevention.

The sufficiency of CAM usage to treat cancers

In 2018, a study found that CAM usage by cancer patients increases the risk of mortality, which was mediated by their refusal to undergo conventional cancer therapy.[16] In Saudi Arabia, the belief that CAM can suffice as treatment for cancer has led many patients to delay seeking health care.[17] Our study found that the majority of correct answers were given by people between 18 and 32 years of age, females, and Saudis. In addition, questions were answered correctly by non-parents and those with a higher education.

Sugar reducing role in curing cancers

The misconception that sugar feeds cancer is well-known in the medical community but is also widely disseminated through SM. The guidelines of the European Society for Clinical Nutrition and Metabolism advise patients to maintain moderate sugar consumption as part of a healthy diet to prevent malnutrition as a first line of defense against cancer-associated morbidity and mortality, but not to stop, refuse, or diminish sugar intake during scheduled anticancer treatments, as it could affect them negatively.[18] People who answered this question correctly were younger. The correct answers to this question were more often given by college students or those with a higher level of education and by those who were unemployed. There was no significant association between the answer to this second question and gender.

Consumption of food heated by microwave ovens and risk of cancer

According to the American Cancer Society, heating food in microwave ovens does not make the food a radioactive substance, because they do not use x-rays or gamma rays and thus pose no health risk.[19] Those who answered correctly most often were between 18 and 32 years of age. People at a younger age had higher levels of awareness. Moreover, non-parents had a higher percentage of correct answers than parents did. The results showed that the percentage of correct answers was higher among college students than among those with other educational levels. College students usually have no time for meal preparation, and they use the microwave more frequently. For this reason, they could be more aware of its advantages and disadvantages.

The association of smoked food intake and the risk of getting cancer

A shred of evidence from a previous study showed that high consumption of smoked meats increases the risk of breast and head and neck malignancies.[20,21] People with high educational levels were the group with the most accurate answers to a significant level.

Vegan diet and the risk of cancer occurrence

A previous systematic review and meta-analysis showed that a vegan diet is protective, reporting a significant result in reducing the risk of getting cancer.[22] Older adults replied most accurately, which illustrates that aging makes people more careful with the choices that may benefit their health. Younger respondents were not as precise in their answers, possibly because of the popularity and expansion of affordable fast-food restaurants that target young people. Non-Saudi respondents more often answered correctly than Saudi respondents did, confirming cultural and social differences between the 2 groups.

The correlation of radio waves from cell phones with cancer

A meta-analysis showed that there is no indication of an increased risk of cancer from using cell phones.[23] Our results suggest that people of younger ages may be more familiar with

| Table 2: Social media platforms used by participants					
Social media platforms used	*n*	%	Mean number of correct answers (SD)	95% Confidence interval	*P*
WhatsApp					0.360
Yes	3126	89.09	2.86±1.51	2.80-2.91	
No	383	10.91	2.93±1.43	2.78-3.07	
Twitter					<0.001
Yes	2776	79.11	3.00±1.48	2.95-3.06	
No	733	20.89	2.33±1.45	2.23-2.44	
Instagram					<0.000
Yes	2546	72.56	2.93±1.49	2.87-2.99	
No	963	27.44	2.69±1.51	2.59-2.79	
Snapchat					<0.001
Yes	2747	78.28	2.95±1.49	2.89-3.00	
No	762	21.72	2.57±1.49	2.46-2.67	
Facebook					<0.001
Yes	460	13.11	2.81±1.59	2.67-2.96	
No	3049	86.89	2.87±1.48	2.82-2.97	
Other*					<0.001
Yes	146	4.16	2.17±1.45	1.93-2.41	
No	3363	95.84	2.89±1.49	2.84-2.94	

*Other includes Telegram and Pinterest
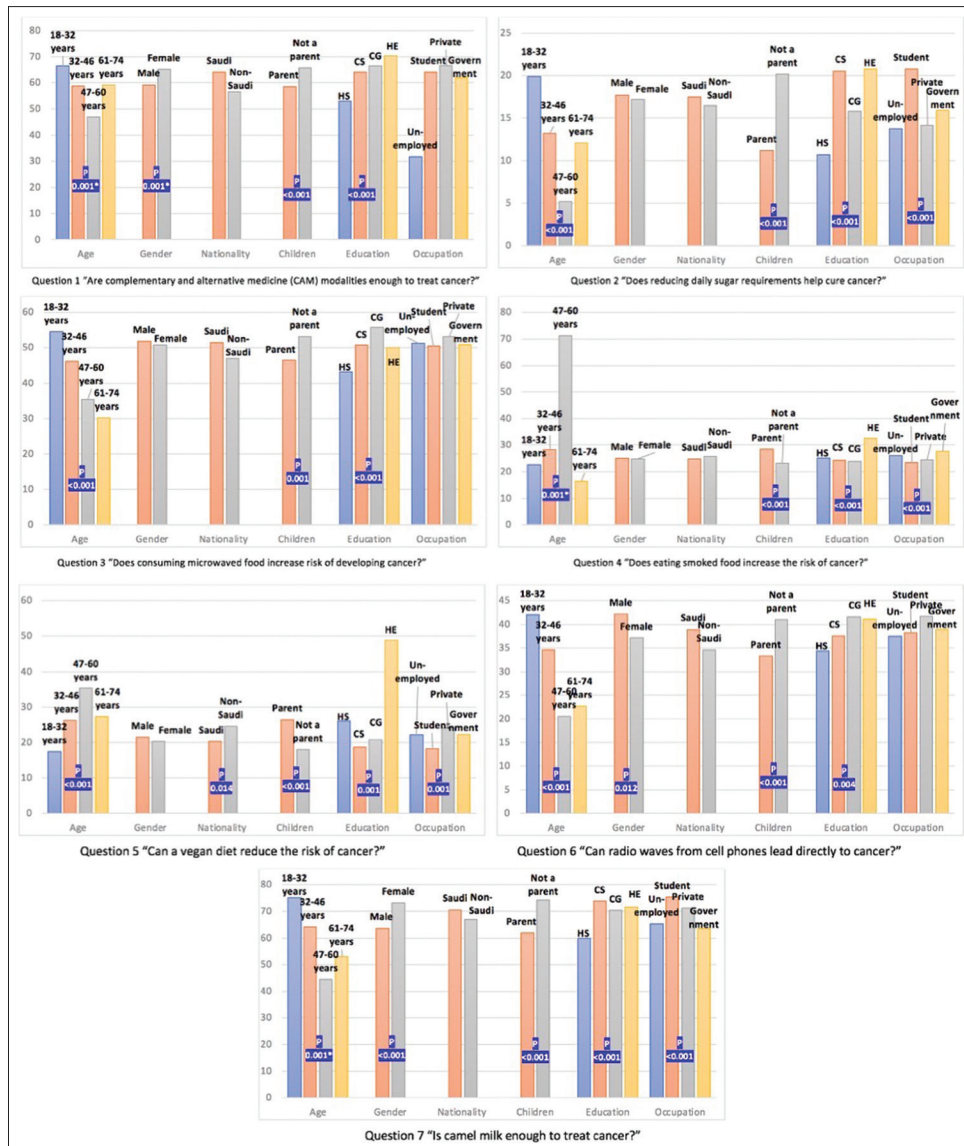
Figure 2: Percentages of participants who correctly answered the questions in each category. HS: High school or less, CS: College students, HE: Higher education. * Fisher exact test

this information. Employees in the private sector more often answered correctly than did those in other occupations, but the difference in percentages was not significant.

Camel milk as an alternative for treating cancer

It has been shown that camel milk cannot replace standard therapies such as chemotherapy or radiation.[24] Results of the current study showed that a correct answer was given mostly by younger people.

Primary healthcare providers should seek to improve the public's knowledge regarding breast cancer by raising awareness, eradicating myths, and stepping up to outreach and spread the right information.[25]

A previous study in Malaysia found that when patients' needs are met, they are eager to interact with health educators. Healthcare

providers must always update their knowledge and abilities in order to succeed and eventually become the leading educators within their own specialized sector.[26]

Strengths and Limitations

This study provides valuable insights on the nation-wide level of knowledge about cancer in one of the largest populations in the Middle East. The results of our study could be utilized to plan targeted health and cancer awareness programs that are age-specific and educational level-specific. There are several limitations that need to be addressed. Although this study was conducted on more than 3509 participants from all Saudi regions, the cultural and demographic variations between countries and continents make the generalizability of the results limited. The cancer-related information questionnaire in our study was reliable but consists of 7 questions only. Lastly, this study did not assess if and how these cancer misconceptions

and low level of awareness affected seeking health care in Saudi Arabia.

Conclusions

Our study demonstrates the widespread misconceptions regarding cancer among people in Saudi Arabia. Subpar education, greater trust in SM, and various socioeconomic factors influence the public's correct understanding of cancer, its causes, and the treatment modalities applied. In future, studies should focus on assessing how misconceptions influence the public in seeking healthcare and complying with treatment and follow-up, as well as how such misconceptions affect mortality rates. In addition, methods should be proposed to control the spread of incorrect or misleading information on SM platforms.

Key points

1. People with lower levels of education are more likely to believe health-related information shared on social media, which has influenced their incorrect responses to questions concerning common misconceptions about cancer.
2. The results of our study confirm the need for greater monitoring of HRI posted in SM.

Take home message

1. Primary healthcare providers play an essential role in spreading awareness about the widespread cancer myths to people from various socioeconomic backgrounds of the population.
2. Due to the broad usage of social media in our society, primary healthcare providers can improve awareness and effectively reduce misconceptions about cancer through media campaigns.

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Conflicts of interest

There are no conflicts of interest.

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