

## Cancer knowledge related to nutrition among medical students

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### Authors' Affiliation:

<sup>1</sup>Cancer Research Chair, College of Medicine, King Saud University, Riyadh Saudi Arabia  
<sup>2</sup>Community Medicine Department, Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia  
<sup>3</sup>Primary Health care Department, High Institute of Public Health, Alexandria University, Alexandria, Egypt  
<sup>4</sup>Epidemiology Department, High Institute of Public Health, Alexandria University, Alexandria, Egypt  
<sup>5</sup>Family Health Department, High Institute of Public Health, Alexandria University, Alexandria, Egypt  
<sup>6</sup>Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia

### \*Corresponding author

Cancer Research Chair, College of Medicine, King Saud University, Riyadh, Saudi Arabia  
Email: [kfarhat@ksu.edu.sa](mailto:kfarhat@ksu.edu.sa)

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**Mostafa Ahmed Arafa<sup>1, 4</sup>, Karim Hamda Farhat<sup>1\*</sup>, Nahla Khamis Ibrahim<sup>2, 4</sup>, Noha S Mostafa<sup>3</sup>, Doaa Ali Mohamed<sup>5</sup>, Raghdah Hashem Ateeq<sup>6</sup>**

### ABSTRACT

**Objectives:** To assess the knowledge level of medical students about nutritional, lifestyle, and hormonal factors related to cancer among students from King Saud University (KSU), Riyadh, and King Abdulaziz University (KAU), Jeddah. **Materials and methods:** It was a cross-sectional study conducted amid medical students from both universities during the period from October 2021 and January 2022. A valid and reliable self-administered and/or Google form questionnaire was used to survey the participants. It inquired about personal data, practicing physical activities 18 questions (answered on 3 points Likert scale) related to nutrition was used. **Results:** A total of 616 medical students were recruited. The mean nutrition correct knowledge scores were 24.8±5.8 (68.9%) and 26.5±5.4 (73.6%) for students from Riyadh and Jeddah Universities, respectively (Student's t-test = 3.76 & P < 0.01). Both groups had a high percentage of right answers regarding the increased cancer risks associated with the consumption of alcohol, processed meat, and salty foods. Only 16% of the medical students from Riyadh and 30.7% from Jeddah reported that they have lectures or discussions about that association of nutrition with cancer with their staff. **Conclusion:** Students from both universities had a reasonable level of knowledge about risk factors of cancer, in favor of Jeddah students. There is a requirement for more intercessions in the medical students' curricula with further curriculum reform regarding the value of nutritional and lifestyle education and how related to cancer risks or prevention for improving future physician practices.

**Keywords:** Cancer prevention; cancer risk; nutrition; lifestyle, hormones, knowledge; medical students

### 1. INTRODUCTION

Cancer is forecast to be the principal cause of death in every country by the end of this century (Key et al., 2020). Good nutrition plays a pivot part in health advancement and disease prevention throughout life (Van Horn et al., 2019). However, poor nutritional and lifestyle habits are among the core providers to the development of chronic diseases including cancer (Van Horn et al., 2019). Nutritional status and a healthy lifestyle are important not only in

cancer etiology, but also in cancer prevention. Diet may account for about 30–35% of cancer cases (Anand et al., 2008). Nutritional factors such as inadequate fruit, non-starchy vegetables, fiber intake, and excessive red/processed meat and salt may be related to cancer (Whiteman and Wilson, 2008). Obesity is another associated factor with an increased risk of endometrial and postmenopausal breast cancers (due to a high level of circulating estrogen resulting from the increasing Body Mass Index (BMI)).

On the other hand, weight reduction decreases colorectal inflammation and uncouples cancer-promoting signaling pathways, thus dropping the risk of colorectal cancer (Schmandt et al., 2011). Furthermore, regarding hormonal factors, Oral Contraceptive Pills (OCP) might stimulate cancer production by changing estradiol: progesterone ratio, immune responses & 1-carbon metabolism (Michels et al., 2018). A meta-analysis of 93 studies concluded that, there were associations between healthy dietary patterns and reduced risk of colon cancer, and breast cancer (among the postmenopausal female). However, limited evidence of the association between unhealthy dietary patterns and the risk of upper aero-digestive system, pancreatic, ovarian, endometrial, and prostatic cancers (as they rely only on case-control designs or on a few studies) (Grosso et al., 2017).

Changing lifestyle factors (alcohol, smoking, obesity, diet, and physical activity) can reduce the risk of cancer (Luckman et al., 2017). Nutrients characteristics particularly biological ones make them ideal candidates for cancer prevention, particularly when it comes to diets high in antioxidants (Key et al., 2020). However, university students tend to have poor dietary and lifestyle practices, which in-turn influence their nutritional status. Nutritional knowledge is an important aspect for the choice of a healthy and nutritious diet (Ul-Haq et al. 2018). The National Heart, Lung, and Blood Institute hosted a workshop to address the knowledge gap by bringing together specialists from clinical and academic health professional schools, as well as the relevance of nutritional education among medical schools and health professionals (Van Horn et al., 2019).

Knowledge of medical students about risk factors of cancer needs to be good; to enhance their future clinical practices (Rodríguez-Feria et al., 2016). However, the majority of studies have concentrated on primary care physicians' knowledge of nutrition in general. Some previous studies that were undertaken to assess the knowledge of medical students about nutrition, lifestyle factors, and cancer revealed poor results (Dolatkhah et al., 2019, Darre et al., 2020). There is little information available about the knowledge level of Saudi medical students regarding the association between nutrition, lifestyle factors, and cancer. Furthermore, limited studies were done to compare the medical students' knowledge from different Saudi universities. So, such a study is needed.

The current study's goal was to evaluate the knowledge level of medical students about nutritional, lifestyle, and hormonal factors related to cancer, and compare the knowledge scores obtained by students from King Saud University (KSU), Riyadh, and King Abdulaziz University (KAU), Jeddah.

## 2. MATERIAL AND METHODS

A cross-sectional study was conducted amongst Fifth and Sixth clinical-years medical students from KSU (Riyadh) and KAU (Jeddah) universities. The sample size was calculated using the formula for the calculation of samples from the cross-sectional study. At 95% Confidence interval,  $Z = 1.96$ , and 0.04 margins of error. Because no previous research of this nature has been conducted in Jeddah, "P" was set to 0.5 as the most cautious sample size. The total number of the calculated sample was 600 students, which was exceeded during the fieldwork to reach 616 collected through a snowball sampling technique.

A validated self-administered or an electronic Google Form questionnaire was used. The questionnaire was constructed to collect personal data, practicing physical exercise, weight, and height. Questions related to the knowledge of participants about the risky and protective associations between nutrition and cancer were inquired through 18 questions (answered on 3 points Likert scale). The questionnaire was developed based on the literature review, and a pilot study with more than 20 participants was carried out to test its feasibility and reliability. Cronbach's alpha was 0.81.

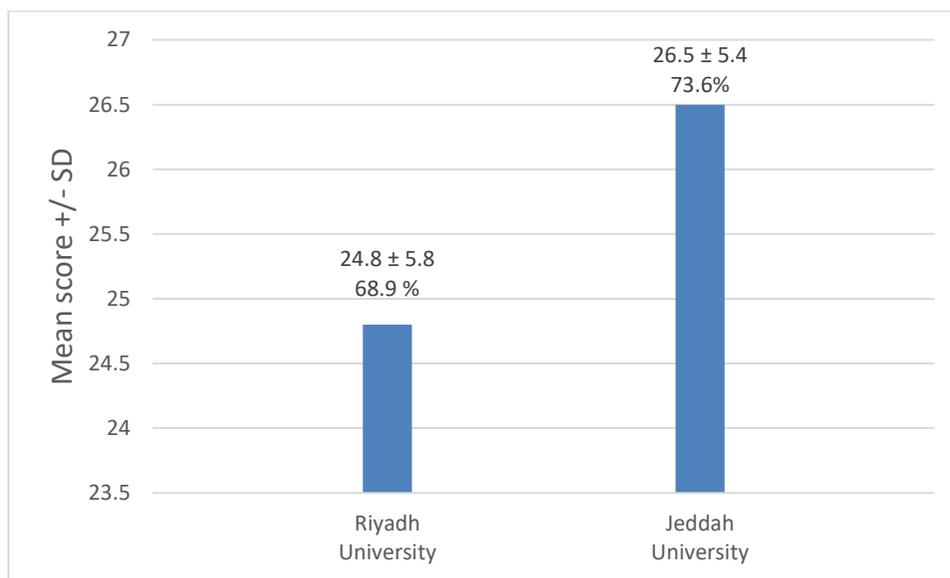
SPSS Pc+ version 21.0 statistical software was used to analyze the data. For negative questions the code was reserved. Correct answers were given a score of 2, while wrong answers and don't know answers were given a zero score. A total score was calculated. The quantitative and categorical variables were described using descriptive statistics (mean, standard deviation, frequencies, and percentages). The Chi-square test was performed to investigate the relationship between categorical study and outcome variables. The means of the variables were compared across knowledge scores using the Student's t-test. To report the statistical significance of estimates, a  $P$ -value of  $< 0.05$  was used.

## 3. RESULTS

A total of 616 students accepted to take part in the research, 316 were medical students from KSU (Riyadh) and 300 students from KAU (Jeddah). Their mean age was  $23.06 \pm 0.8$  years. Males constitutes nearly two-thirds (67.3%) of the sample. Only 16% of the

medical students in Riyadh and 30.7% in Jeddah reported that they have lectures or discussions about that association of nutrition with cancer with their staff. Both groups have fair knowledge scores related to nutrition and cancer. The mean correct knowledge scores were  $24.8 \pm 5.8$  (68.9%) and  $26.5 \pm 5.4$  (73.6%) for students from Riyadh and Jeddah Universities, respectively. A highly statistically significant difference was present between the mean knowledge scores of both universities (Student's t-test = 3.76 &  $P < 0.01$ ), Figure 1.

No significant differences between males and females was detected with regards to the knowledge level about cancer ( $t = 0.7$  &  $P = 0.4$ ). Similarly, there were no significant associations were found between the knowledge score and practicing physical activities or the BMI of the students ( $P > 0.05$ ).



**Figure 1** The average knowledge level among medical students

Tables 1, illustrates comparisons between knowledge statements of factors that increase cancer risk across the two universities. Most of these statements showed significantly better correct knowledge in favor of medical students from Jeddah. The knowledge about the relationship of some risky food and beverage items like red meat, alcohol, and starchy food showed statistically significant differences between both groups (67.3% VS 39.6% & 93% VS 81.3% & 83.3% VS 25.3%, for the three items respectively), and in favor of the first Jeddah group. The knowledge of Jeddah's students (71.3%) is better than the other university (54.7%) regarding the increased risk of cancer by use of hormones as contraceptive pills, with highly statistical significant deference ( $P < 0.001$ ).

On the other hand, both groups expressed fair knowledge scores with non-significant associations regarding obesity, physical inactivity, and excessive fat intake; as risk factors of cancer ( $P > 0.05$ ).

**Table 1** Comparisons between knowledge of medical students from Riyadh and Jeddah universities regarding dietary, lifestyle and hormonal factors that increase the risk of cancer

University	Riyadh (Total 316)		Jeddah (Total 300)		P value
	Nutritional & Hormonal Factors				
	Correct answer	Wrong or don't know answers	Correct answer	Wrong or don't know answers	
EXCESSIVE BODY WIGHT (OBESITY)	186 (58.9%)	130 (41.1%)	168 (56.0%)	132 (44%)	0.4

PHYSICAL INACTIVITY	162 (51.3%)	154 (48.8%)	160 (53.3%)	140 (46.7)	0.2
HIGH-DENSITY FAT FOODS	217 (68.7%)	99 (31.4%)	222 (74%)	78 (26%)	0.1
RED MEAT	125 (39.6%)	191 (60.4%)	202 (67.3%)	98 (32.7%)	0.0001
PROCESSED MEAT	210 (66.5%)	106 (33.6%)	266 (88.7%)	34 (11.3%)	0.001
HIGH SUGAR DRINKS/FOOD	152 (48.1%)	164 (51.9%)	174 (58%)	126 (42%)	0.01
ALCOHOL INTAKE	257 (81.3%)	59(18.7%)	280 (93%)	20 (6.7%)	0.001
CANNED FOODS	171 (54.1%)	145 (45.8%)	226 (75.3%)	74 (24.7%)	0.0001
SALTY FOOD	211 (66.8%)	105 (33.2%)	276 (92%)	24 (8%)	0.001
STARCHY FOOD	80 (25.3%)	236(74.6%)	250 (83.3%)	50 (16.7%)	0.0001
CONTRACEPTIVE PILLS	173 (54.7%)	143 (45.2%)	214 (71.3%)	86 (28.7%)	0.0001

Table 2, presents the associations between knowledge of students from both universities concerning cancer-protective factors. From Jeddah, a large number of students identified the role of seafood in comparison to those from Riyadh University (84.7% VS only 22.5%) and green tea (92% VS only 20.6%) in cancer prevention. Highly statistically significant differences were present between both groups ( $P < 0.001$ ). Among the items that inquired about, some are related to supplements related to the commonly used vitamins as C and E, and vitamin B12. Correct answers were reported by 44% VS 59.3% & 43.0 % VS 55.3%, in favor of Jeddah's second group, respectively. Fruits and vegetables and food rich in fibers (as protective factors against cancer) attained a very high percentage of correct answers (about 80 %) among both groups. However, no statistically significant differences were present between the two groups.

**Table 2** Comparisons between knowledge of medical students from Riyadh and Jeddah universities regarding the food that decrease the risk of cancer.

University	Riyadh (Total 316)		Jeddah (Total 300)		P value
	Correct answer	Wrong or don't know answers	Correct answer	Wrong or don't know answers	
VEGETABLES AND FRUITS	246 (78.1%)	69 (21.9%)	242 (80.7%)	58 (19.3%)	0.4
FOOD RICH IN FIBERS	232 (73.4%)	84 (26.5%)	230 (76.7%)	70 (23.3%)	0.4
ORGANIC FOOD	176 (55.7%)	140 (44.3%)	188 (62.7%)	112 (37.3%)	0.7
VITAMIN C and E	139 (44.0%)	176 (55.9%)	178 (59.3%)	122 (40.7%)	0.0001
VITAMIN B12	136 (43.0%)	180 (56.9%)	166 (55.3%)	134 (44.7%)	0.002
SEA FOOD	71 (22.5%)	145 (50.7%)	254 (84.7%)	46 (15.3%)	0.0001
GREEN TEA	65 (20.6%)	251 (79.4%)	276 (92%)	24 (8%)	0.0001

#### 4. DISCUSSION

Health care professionals and medical students often operate as role models in a community. They play a significant role in promoting healthy nutrition and lifestyle patterns against chronic diseases such as cancer (Dolatkhah et al., 2019). So, their accurate information and sound practices are vital. The current study found that the average correct knowledge score obtained by the medical students from Riyadh and Jeddah universities (out of 36 points) was good (24.8±5.8 and 26.5 ± 5.4, respectively). More than

two-thirds of the students (68.9% and 73.6 %) from Riyadh and Jeddah universities correctly answered the nutritional and lifestyles questions. The cause of the higher knowledge score from Jeddah compared to Riyadh may be attributed to inclusion of a nutrition module in the curriculum during the third-medical year. They also studied the nutritional risk factors of cancer in some other modules. KAU conducted an innovation curriculum reform as outlined by the Tomorrow's Doctors mandate (Ibrahim et al., 2014).

The percentages of the correct answers from both medical schools in the current study are slightly better than those obtained from another Saudi study done in two medical colleges in Jeddah and Makkah. They reported that dietary habits were identified as a risk factor for 60 percent of the medical students as a risk factor for colo-rectal cancer (Althobaiti and Jradi, 2019). The cause of the slightly higher rate attained from the current study may be because that, the previous study asked about the risk factors of colorectal cancer only. On the other hand, Dolatkah et al., (2019), conducted a study among medical students from Iran, where their results revealed that nutritional knowledge was poor among more than one-half (52.3%) of their medical students.

Furthermore, the study results from Darre et al., (2020) revealed that diet for breast cancer was among the least mentioned risk factors (21.5%). Similarly, Alnagar and Chen, (2011), concluded another study that found that the most of students from Malaysian's Management and Science University had poor knowledge about the role of nutrition in cancer prevention (medical and health sciences students had significantly better knowledge scores than other students). The differences in results between previous studies and the current one regarding the lower knowledge level may be attributed to differences in the target populations, sample size, or the nutritional education obtained from the different universities.

Luckman et al., (2017), conducted a study in 7 UK universities among 218 students. Results revealed that only 14% and 10%, and 7% of the students reported that alcohol intake, excessive weight, and physical inactivity linked to the risk of any cancer. The corresponding correct knowledge percentages from our is much better than the UK study (93% and 81.3% for alcohol intake & 56.0% and 58.9% for obesity & 53.3% and 51.3% for physical inactivity; for students from Jeddah and Riyadh, respectively). These inconsistencies of results may be due to differences between the education of medical and all university students, or due to the smaller sample size from the UK study.

In the present study, knowledge about the increased cancer risks by alcohol consumption, processed meat, and salty food attained a high percentage of correct answers among both groups, especially in Jeddah ( $P < 0.01$ ). Similarly, in an older Turkish study, 83.9% of the adolescents believed that alcohol has a role in cancer (Can et al., 2008). This percentage was near our correct answers regarding alcohol (81.3% and 93.0 % of answers of the students from Riyadh and Jeddah, respectively). A recent study conducted among Polish high school adolescents revealed that no one knew that drinking alcohol can be a risk factor of cancer, and only a very few participants related diets (2.2%) as one of cancer risk factors (Rucinska et al., 2021). On the other hand, more than four-fifths and one-half of our samples linked between alcohol use and physical inactivity with risk of cancer, respectively. The Polish study found that a much smaller percentage (0.9%) of their participants identified such an association (Rucinska et al., 2021). The cause of such a very low rate from the Polish study may be due to differences between the target populations. Obesity caused by chronic overfeeding has been definitively linked to an increased risk of certain cancers (Arends, 2020). However, less than 60% of our students documented obesity as an important predisposing factor for cancer.

A study was done in Croatia to determine medical students' knowledge concerning the association between dietary factors and the risk of cancer among 390 medical students. Results reported that students' nutrition-disease information was mostly insufficient. They concluded that medical schools should provide in their nutritional programs the opportunity to learn more about their own dietary and lifestyle behaviors, to be more knowledgeable and persuasively counselors for their future patients (Jovanović et al., 2011). Regarding knowledge about hormonal risk factors of cancer by using OCP, in the present study, Jeddah's students obtained a better knowledge score (71.3%) compared to their counterparts from the other university (54.7%). Similarly, another Indian study reported that 74.1% of medical students from urban and 66.4% from rural areas agreed that contraceptive pills might cause cancer (Hogmark et al., 2013).

Concerning the protective factors of cancer, an observational study conducted over five years concluded that cancer survivors should eat a well-balanced diet rich in dietary fiber and micronutrients; including vitamin B12 and vitamin C (Ricci et al., 2020). In the present study, a high percentage of our participants correctly recognized the role of dietary fiber in cancer prevention. More than two-fifths of them identified the protective role of vitamin C and E, and vitamin B12.

In the present study, about 80 % of the participants correctly documented the role of vegetables and fruits in cancer prevention. Another Australian study assessed the students' nutritional knowledge of the first-year medical students, 2017, reported that the majority of their students were mindful of the health risks associated with the consumption of insufficient amounts of fruit and vegetables (Perlstein et al., 2017). Only 16% of the medical students from Riyadh and 30.7% from Jeddah stated that they have lectures or discussions about the association of nutrition with cancer with their staff. The higher percentage from Jeddah due to the curriculum reform (Ibrahim et al., 2014). Similarly, a qualitative study, 2018, was done among 23 clinical-years medical students

from the 5th to the final year from Ghana. Students expressed the insufficiency of nutritional education in their curriculum (Mogre et al., 2018). Yet, the study of Luckman et al., (2017) found that 78% of medical students reported that teaching curriculum of lifestyle and cancer is taking place in their university.

A recently published feasibility study established the possible impact of a 3-hour online, self-paced nutrition course given to medical residents. It resulted in a significant and continued upsurge in nutrition knowledge concerning nutrition's role in clinical rehearsal (Shafto et al., 2020).

## 5. CONCLUSION

Medical students from both universities had fair knowledge scores about the relationship between nutrition, lifestyle & hormonal factors with cancer. Students from Jeddah had significantly higher levels of knowledge than students from Riyadh. Knowledge about the increased cancer risks by consumption of alcohol, processed meat, and salty food attained a high percentage of correct answers among both groups. Furthermore, about 80 % of the participants correctly documented the role of vegetables and fruits in cancer prevention. A significantly much higher percentage of students from Jeddah compared to those from Riyadh identified the role of seafood and green tea in cancer prevention. A higher percentage of students from Jeddah reported studying the relationship between cancer and nutrition. However, the rates are still low.

Medical students are the future physicians, they need more interventions in their curricula regarding the value of nutritional and lifestyle factors and its relation to cancer risks or prevention. Spreading out nutrition topics, especially those related to cancer, over a longer period of time allows for the opportunity to strengthen, apply, and practice counseling skills along with the curriculum. There is a need to identify research gaps and other roadblocks to the successful adoption of medical nutrition education curriculum in relation to chronic diseases such as cancer. Additional research is needed to assess the long-term impact of nutrition education curricula on medical students and primary care physicians' real-time.

### Limitations

Detailed information about nutritional status and food consumption among medical students were not collected. In addition more universities representing different cultures and geographical areas were not encompassed in the study.

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### Authors' contributions

MAA, KHF analyzed and interpreted the data. RHA, DAM collected the data; MAA, NKI and KHF writing the manuscript. All authors read and approved the final manuscript.

### Ethical approval

The study was approved by the Medical Ethics Committee of the College of Medicine at King Saud University (Ethical approval code: E-19-4431).

### Funding

This study has not received any external funding.

### Conflicts of interest

The authors declare that there are no conflicts of interests.

### Data and materials availability

All data associated with this study are present in the paper.

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