# Assessment of Knowledge of Cancer Risk Factors and Awareness of Early Cancer Warning Signs among University Students

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**ABSTRACT**

**Objective:** To predict the level of knowledge about cancer risk factors and the level of awareness of the most common warning symptoms of cancer among university students in Kyrenia, Northern Cyprus.

**Methods:** A cross-sectional descriptive study was conducted in Kyrenia, Northern Cyprus among university students from different academic disciplines, including medical and non-medical disciplines, using a structured questionnaire.

**Results:** A total of 150 students participated in this study, half of them were non-medical students (51.3%). There was a low level of knowledge of cancer risk factors reported by most of the respondents of both groups. The difference between the responses to risk factors between the medical and non-medical students was found to be statistically significant regarding alcohol consumption (9.6% vs. 13%; p=0.0004), consumption of processed red meat (12.3% vs. 54.5%; p<0.0001), family history of cancer (4.1% vs. 6.5%; p<0.0001), respectively. Permanent unexplained pain was significantly recognized by the respondents of the medical group compared to the non-medical group (48% vs. 18.2%; p<0.001). The medical and non-medical participants reported a low mean knowledge (2.24±1.52 vs. 3.11±1.60); and mean awareness (1.70±0.91 vs. 1.00±0.81), respectively.

**Conclusion:** There is a gap and low knowledge about cancer prevention and awareness of cancer signs among medical and non-medical undergraduates. Efforts should be made to increase cancer knowledge and awareness through continuing education programs for all university students at various levels to detect cancer early.

**Keywords:** Awareness, Cancer, Risk factors, Cancer signs, University students

## 1. INTRODUCTION

With an estimated 10 million deaths, Cancer is a major public health problem with an enormous burden worldwide with an estimated 10 million deaths in 2020 [1]. Despite significant progress in reducing cancer-related morbidity and mortality, cancer prevention remains a major challenge. According to the American Cancer Society (ACS) clinical guidelines, the increased incidence of cancer can be attributed to a combination of genetic, behavioural, and environmental risk factors, including sedentary lifestyles, insufficient fruit and vegetable consumption, low physical activity, obesity or overweightness, tobacco use, alcohol consumption, pollution, and viral infections [2, 3]. However, cancer fatalism, especially the belief that cancer development and prognosis are beyond control, hinders cancer prevention. Nearly half of cancer diagnoses are due to modifiable factors, according to a recent cancer report from the National Cancer Institute. Therefore, the incidence of many types of cancer can be significantly reduced by avoiding modifiable risk factors, such as tobacco use, a lack of exercise, or an unhealthy diet. Additionally, raising awareness of the early signs of cancer may contribute to an early diagnosis. In this line, it is important to recognise these factors early in life to make lifestyle changes that can prevent cancer later in life [4, 5].

Previous literature has mainly focused on cancer perceptions, knowledge, and cancer risk behaviours among adults and older age groups [8, 21]. For Example, a cross-sectional study by Hatem et al. [8] found knowledge gaps among Lebanese adults' knowledge and beliefs of cancer risk factors and early cancer. However, a dearth of studies are conducted among university students to assess knowledge of risk factors and awareness about the warning symptoms of cancer. University students constitute a vulnerable population of young adults to be involved in early cancer awareness and education.

This is crucial for university students because they are in the stages of development following puberty when they are establishing health behaviours that will have an impact on them to reduce the prevalence of harmful risk factors and delay long-term cancer incidence rates. In addition, raising the level of awareness of risk factors and warning signs of cancer among this group could disseminate knowledge to the population [12-14]. Meanwhile, university students may not perceive their behaviour as a cancer-related risk due to insufficient awareness of cancer and insufficient commitment to risky health behaviours. Earlier studies conducted on selected cancers, such as colorectal, cervical, and breast cancers, found significant differences between assessments of knowledge and awareness of cancer risk and the perceived cancer readiness and actual health outcomes among university students [9-11, 15, 16]. Therefore, this study specifically sought to predict the level of knowledge of cancer risk factors and awareness about the most common warning symptoms of cancer among undergraduate university-aged students in Northern Cyprus.

## 2. METHODS

### 2.1. Study Design and Participants

This cross-sectional descriptive study was conducted from January to April 2021 with a convenient sample of undergraduate university students in three provinces of Northern Cyprus, which are Famagusta, Nicosia, and Kyrenia. This study was approved by the Research Ethics Committee (2020-21/002) of the Girne American University, Kyrenia, Northern Cyprus. A total of 230 participants were approached for this study, but 150 participants responded to all items on the questionnaire, yielding a response rate of 65.2% using Cochran's sample size formula, ±5% accuracy, and a 95% confidence level for large populations whose degree of variability is unknown.

The inclusion criteria were undergraduate university-aged students from different academic disciplines. A student who agreed to participate in this study received written informed consent and verbal information about the purpose of the study. In addition, all participants were informed that participation was voluntary and that anonymity and confidentiality of responses were guaranteed. Those who declined to participate or gave incomplete responses to survey questions were excluded.

### 2.2. Questionnaire Design

The questionnaire was developed for the study after extensive literature research on well-known databases [3, 8, 20, 32, 33]. The structured items of the questionnaire were assessed for reconstruction and relevance by two academic experts in medicine and pharmacy faculties. The purpose of the survey was stated in the referral letter included with the questionnaire, which took approximately 10 minutes to complete. The final version of the questionnaire consisted of 26 questions divided into three parts. The first part consisted of eight items about the demographic characteristics of the participants (age, gender, nationality, family history of cancer, academic discipline, medical and non-medical discipline, and academic year). In the second part (11 items), data were collected to assess knowledge of cancer risk factors, and respondents were given the option to answer yes, no, or don't know. The third section included nine items assessing the respondent's knowledge of warning signs of cancer, with options to answer "yes," "no," or "don't know."

### 2.3. Statistical Analysis

The Statistical Program for Social Science Research, edition 23.0, and Microsoft Office Excel 2013 were used for analyzing the data. The descriptive data were presented as numbers, percentages, and means (standard deviations) to present comparisons of group proportions to items on the knowledge assessment questionnaire. A cut-off level of ≤50% was set for negative knowledge, awareness, and perceptions, and a cut-off level of ≥50% was set for positive knowledge, awareness, and perceptions. A score of 1 was given to positive knowledge and awareness, while a score of 0 was given to negative knowledge and awareness towards every statement. Knowledge and awareness scores for individual statements were summed up and calculated as means (standard deviations) to give the total knowledge, awareness, and perceptions score of a participant. Data were subjected to the Shapiro test to confirm their normality. Independent t-test was used to assess the differences in means between the two groups. The chi-square test was used to assess the association among groups. The p-value was considered significant at ≤0.05 and highly significant at ≤0.01.

## 3. RESULTS

The demographics of study participants are shown in Table 1. With a mean age of 21.1±2.6 years, nearly half of the participants (56%) were female. Most students are from Nigeria (30%), followed by Turkey (15.3%). 92.7% of participants reported no family history of cancer. In terms of academic fields, more than half of the participants were non-medical students (51.3%). Pharmacy students (39.7%) followed by medical students (23.3%) constituted the most common participants in the medical group. Students from the engineering faculties (42.9%), followed by students from the economics faculties (20.8%) constituted the most common participants among the non-medical group. Most of the participants were from the 4-5 grade year (66.7%).

*Table 1. Demographic characteristics of the study participants*

| Variables | Number (n) | Percentage (%) |
|---|---|---|
| **Gender** | | |
| Males | 66 | 44 |
| Females | 84 | 56 |
| **Nationality** | | |
| Cameroon | 11 | 7.3 |
| Egypt | 8 | 5.3 |
| Ghana | 8 | 5.3 |
| Iran | 11 | 7.3 |
| Iraq | 7 | 4.7 |
| Nigeria | 45 | 30 |
| Sudan | 21 | 14 |
| Türkiye | 23 | 15.3 |
| Others | 16 | 10.7 |
| **Family history of cancer** | | |
| Yes | 139 | 7.3 |
| No | 11 | 92.7 |
| **Academic discipline** | | |
| Medical | 73 | 48.7 |
| Non-medical | 77 | 51.3 |
| **Medical discipline (N=73)** | | |
| Medicine | 17 | 23.3 |
| Dentistry | 9 | 12.3 |
| Pharmacy | 29 | 39.7 |
| Nursing | 18 | 24.7 |
| **Non-medical discipline (N=77)** | | |
| Art and design | 4 | 5.2 |
| Chemistry | 11 | 14.3 |
| Economics | 16 | 20.8 |
| Engineering | 33 | 42.9 |
| Information Technology | 7 | 9.0 |
| Law | 3 | 3.9 |
| Psychology | 3 | 3.9 |
| **Academic year** | | |
| 1-2 year | 50 | 33.3 |
| 3-5 year | 100 | 66.7 |

*Table 2. Knowledge of cancer risk factors among the study participants*

| Variable | Medical students N=73 n (%) | Non-medical students N=77 n (%) | P-value |
|---|---|---|---|
| **Cigarettes smoking** | | | 0.52 |
| Yes | 48 (65.8) | 44 (57.1) | |
| No | 17 (23.3) | 21 (27.3) | |
| Do not Know | 8 (10.9) | 12 (15.6) | |
| **Second-hand smoking** | | | 0.23 |
| Yes | 55 (75.3) | 53 (68.8) | |
| No | 15 (20.5) | 15 (19.5) | |
| Do not Know | 3 (4.1) | 9 (11.7) | |
| **Alcohol consumption (more than 1 unit/day)** | | | **0.0004** |
| Yes | 7 (9.6) | 10 (13) | |
| No | 62 (84.9) | 45 (58.4) | |
| Do not Know | 4 (5.5) | 22 (28.6) | |
| **Fruit and vegetable consumption (1 unit of a day)** | | | 0.58 |
| Yes | 20 (27.4) | 26 (33.7) | |
| No | 45 (61.6) | 41 (53.2) | |
| Do not Know | 8 (11) | 10 (13) | |
| **Processed red meat consumption (more than once/day)** | 9 (12.3) | 42 (54.5) | **<0.0001** |
| Yes | 61 (83.6) | 31 (40.3) | |
| No | 3 (4.1) | 4 (5.2) | |
| Do not Know | | | |
| **Elder age (over 70 years old)** | | | 0.90 |
| Yes | 2 (2.7) | 3 (3.9) | |
| No | 64 (87.7) | 66 (85.7) | |
| Do not Know | 7 (9.6) | 8 (10.4) | |
| **Family history of cancer** | | | **<0.0001** |
| Yes | 3 (4.1) | 5 (6.5) | |
| No | 39 (53.4) | 71 (92.2) | |
| Do not Know | 31 (42.5) | 1 (1.3) | |
| **Getting sunburnt as a child (more than 1)** | | | 0.24 |
| Yes | 14 (19.2) | 14 (18.2) | |
| No | 44 (60.3) | 38 (49.4) | |
| Do not Know | 15 (20.5) | 25 (32.4) | |
| **Human papillomavirus infection** | | | 0.18 |
| Yes | 4 (5.5) | 2 (2.6) | |
| No | 9 (12.3) | 4 (5.1) | |
| Do not Know | 60 (82.2) | 71 (92.2) | |
| **Obesity and overweight (BMI greater than 25 Kg/M²)** | | | 0.25 |
| Yes | 9 (12.3) | 17 (22) | |
| No | 62 (85) | 57 (74) | |
| Do not Know | 2 (2.7) | 3 (4) | |
| **Physical inactivity (less than 30 min. of 5 times/week)** | | | 0.27 |
| Yes | 16 (21.9) | 9 (11.7) | |
| No | 53 (72.6) | 51 (66.2) | |
| Do not Know | 4 (5.5) | 7 (9.1) | |

Although there were no significant findings, most of the medical and non-medical participants reported a low knowledge level of cancer risk factors regarding low consumption of fruits and vegetables (27.4% vs. 33.7%), being over 70 years old (2.7% vs. 3.9%), history of human papillomavirus infection (5.5% vs. 2.6%), obesity and overweight >25 kg/m² (12.3% vs. 22%), and physical inactivity less than 30 min. of 5 times per week (21.9% vs. 11.7% respectively. Nevertheless, the non-medical students reported a significant rate of poor knowledge level regarding family history of cancer than the medical students (p<0.0001). On the other hand, the medical students reported a significant rate of poor knowledge level regarding alcohol consumption (p=0.0004) and processed meat consumption (p<0.0001) than the non-medical students. Meanwhile, very few risk factors were known correctly by the participants, particularly smoking (65.8% vs. 57.1%), and second-hand smoke (75.3% vs. 68.8%), respectively, but were found to be statistically insignificant between the medical and non-medical students, as shown in Table 2.

*Table 3. Awareness of warning cancer signs among the study participants*

| Variable | Medical students N=73 n (%) | Non-medical students N=77 n (%) | P-value |
|---|---|---|---|
| **Change in mole appearance** | | | |
| Yes | 2 (2.7) | 0 (0) | 0.20 |
| No | 16 (21.9) | 23 (29.9) | |
| Do not Know | 55 (75.3) | 54 (70.1) | |
| **Permanent change in bowel or bladder habits** | | | |
| Yes | 6 (8.2) | 3 (3.9) | 0.30 |
| No | 35 (48) | 32 (41.6) | |
| Do not Know | 32 (43.8) | 42 (54.5) | |
| **Permanent coughing or hoarseness** | | | |
| Yes | 11 (15.1) | 9 (11.7) | 0.71 |
| No | 42 (57.5) | 43 (55.8) | |
| Do not Know | 20 (27.4) | 25 (32.5) | |
| **Permanent swallowing difficulty** | | | |
| Yes | 4 (5.5) | 3 (3.9) | 0.44 |
| No | 45 (61.6) | 41 (53.2) | |
| Do not Know | 24 (31.1) | 33 (42.9) | |
| **Permanent unexplained pain** | | | |
| Yes | 35 (48) | 14 (18.2) | **<0.001** |
| No | 12 (16.4) | 20 (26) | |
| Do not Know | 26 (35.6) | 43 (55.8) | |
| **Unhealed sore** | | | |
| Yes | 8 (11) | 6 (7.8) | 0.79 |
| No | 19 (26) | 20 (26) | |
| Do not Know | 46 (63) | 51 (66.2) | |
| **Unexplained bleeding** | | | |
| Yes | 7 (9.6) | 4 (5.2) | 0.36 |
| No | 45 (61.6) | 44 (57.1) | |
| Do not Know | 21 (28.8) | 29 (37.7) | |
| **Unexplained losing weight** | | | |
| Yes | 8 (11) | 5 (6.5) | 0.36 |
| No | 25 (34.2) | 34 (44.1) | |
| Do not Know | 40 (54.8) | 38 (49.4) | |
| **Unexplained swelling or lump appearance** | | | |
| Yes | 41 (56.2) | 31 (40.3) | 0.14 |
| No | 10 (13.7) | 13 (16.9) | |
| Do not Know | 22 (30.1) | 33 (42.8) | |

Similarly, most of the medical and non-medical participants also reported a low level of awareness and unable to recognize the common warning signs of cancer, including permanent change in bowel or bladder habits (8.2% vs. 3.9%), permanent coughing (15.1% vs. 11.7%), permanent swallowing difficulty (5.5% vs. 3.9%), unhealed sore (11% vs. 7.8%), unexplained bleeding (9.6% vs. 5.2%), unexplained losing weight (11% vs. 6.5%). However, permanent unexplained pain was significantly recognized by the

respondents of the medical group compared to the non-medical group (48% vs. 18.2%; p<0.001). Although there were no significant findings, respondents were also able to recognize unexplained lump appearance as a warning cancer symptom (56.2% vs. 40.3%), as shown in Table 3. In addition, although there were no significant findings, the medical and non-medical participants reported a low mean knowledge of cancer risk factors (2.24±1.52 vs. 3.11±1.60); and mean awareness of cancer warning signs (1.70±0.91 vs. 1.00±0.81), respectively, as shown in Table 4.

*Table 4. Comparison of mean knowledge and awareness among the study participants*

| Variable | Medical students | Non-medical students | P-value |
|---|---|---|---|
| Knowledge of cancer risk factors | 2.24±1.52 | 3.11±1.60 | 0.69 |
| Awareness of warning cancer signs | 1.70±0.91 | 1.00±0.81 | 0.56 |

## 4. DISCUSSION

Understanding cancer knowledge and awareness among university students can be viewed as a valuable tool for improving cancer prevention, early detection, and survival. In this context, knowledge of cancer risk factors and awareness of symptoms are not isolated events. Most of the students who participated in this study correctly identified certain cancer risk factors, such as smoking and second-hand smoking. These results are consistent with a study conducted by Merten et al. [12] to examine cancer risk factor knowledge among college students. The study found that smoking and second-hand smoke were the most prominent risk factors.

Although there were no significant findings, the medical and non-medical participants reported a low mean knowledge of cancer risk factors. Nevertheless, the non-medical students reported a significant rate of poor knowledge level regarding family history of cancer than the medical students. On the other hand, the medical students reported a significant rate of poor knowledge level regarding alcohol consumption and processed meat consumption than the non-medical students. A possible explanation for the responses displayed by this sample of medical participants regarding these two risk factors might be related to previous data reported that eating more than 90g of red or processed meat each day is considered carcinogenic or drinking two units of alcohol per day could increase the risk of cancer incidence [35, 36]. Although the literature on cancer risk factors is extensive [16, 18], these factors are not well recognised in the current study, and knowledge of cancer risk factors is low in many areas reported by most participants, including medical and non-medical students. Our results are consistent with a previous study conducted by Xu et al. [20] in the USA to examine college students' cancer-preventative knowledge and health behaviours. The study found that participants recognized an average of 6.69 out of 11 risk factors. Similarly, White et al. [21] in a study to assess the prevalence of several cancer risk

factors among young adults reported that obesity, physical inactivity, binge drinking, cigarette smoking, and frequent consumption of red meat were the most common cancer risk factors.

As expected, awareness of cancer signs was no better than knowledge of cancer risk factors, and participants generally had low or no awareness of the most common warning signs of cancer. This is also observed by a low mean awareness of cancer warning signs and symptoms. Recognition of cancer indications in the current study is believed to be low compared to previous studies conducted by Radi et al. [22], Al Qadire et al. [23], and Al-Azri et al. [24]. Generally, the results from these studies found that the majority of respondents were unable to identify the common signs and symptoms of cancer. Moreover, the results of the present study are also consistent with a previous study by Al-Zalabani et al. [25] to explore women's breast cancer knowledge, practices, and screening in primary health care. The findings of this study reveal a lack of knowledge about the warning signs of breast cancer. Another large study conducted by Ahmad MM [26] in Jordan examined the knowledge of cancer among the Jordanian population and found knowledge gaps and inappropriate practices.

Low levels of knowledge and awareness of cancer risk factors and symptoms can be explained by low levels of education. This is supported by the fact that lower educational attainment has been reported to be associated with lower cancer awareness among patients [27, 28]. A study conducted by Macleod et al. [27] found that there is strong evidence of an association between lower education level and delay in breast and colorectal cancers. Many previous studies have shown that the higher the level of education (school and college), the higher the knowledge and awareness [29-31]. However, risk factor knowledge and cancer symptom awareness are low in the current study sample. This is consistent with a previous study reported in Jordan by Mhaidat et al. [32] to assess undergraduate awareness of colon cancer (CRC) warning signs and risk factors. The study included undergraduates from various universities in Jordan, divided into medical and non-medical majors. The study found that CRC perceptions of both warning signs and risk factors were most strongly associated with the educational group of participants. Medical students were significantly more aware of both warning signs and risk factors than other students. In our study, permanent unexplained pain was significantly recognized by the respondents of the medical group compared to the non-medical group (p<0.001).

As cancer is a major problem worldwide, there is a need to raise public awareness about early detection and diagnosis of this disease. Therefore, more attention should be paid to health promotion programs. Future health education and health promotion programs should emphasize the links between risk factors and cancer and provide more evidence-based interventions to university students. In addition, more attention should be paid to undergraduate education by improving study programs and involving students in health promotion campaigns. This allows most medical students to disseminate knowledge to other students and includes awareness programs in their education to educate students.

To our knowledge, this study was the first attempt to assess knowledge of cancer risk factors and awareness of the cancer warning signs among university students in Northern Cyprus. However, some limitations should be pointed out. First, this study included some academic disciplines without taking into account other academic professions among universities in Northern Cyprus. Second, because the survey was self-reported, students' understanding of the questions may have been inconsistent. Given these limitations, more research is needed to assess knowledge and awareness of cancer risk factors and warning signs.

## 5. CONCLUSION

The results of this study revealed gaps in cancer risk factors and cancer warning signs among medical and non-medical students as the participants' knowledge level about the majority of cancer risk factors and warning signs was low. There were very few risk factors correctly known by the participants of both groups, particularly about smoking and second-hand smoking. There is a statistical difference between non-medical students and medical students in terms of knowing risk factors regarding alcohol consumption, consumption of processed red meat, and family history of cancer. Therefore, efforts to focus more attention on increasing cancer knowledge and awareness through continuing education programs involving all university students at various levels that encourage early detection of cancer are necessary.

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*Research idea: AA*
*Design of the study: AA*
*Acquisition of data for the study: AB*
*Analysis of data for the study: AA, AB*
*Interpretation of data for the study: AA*
*Drafting the manuscript: AA*
*Revising it critically for important intellectual content: AA, AB*
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