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Authors: Ayfer Bayindir Cevik, Işıl Işık Andsoy, Hicran Yıldız

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Knowledge of esophageal cancer and preventive behaviors among nursing students – a cross-sectional study

Ayfer Bayindir Cevik ¹, Işıl Işık Andsoy ², Hicran Yıldız ³

¹ Department of Nursing, Health Science Faculty, Bartın University, Bartın, Turkey

² Department of Nursing, Health Science Faculty, Karabük, University, Karabük, Turkey

³ Department of Nursing, Health Science Faculty, Uludag University, Bursa, Turkey

Corresponding author: Ayfer Bayindir Cevik, e-mail: ayferbayindir@hotmail.com.tr,
ayfercevik@bartin.edu.tr

ORCID

ABC: <https://orcid.org/0000-0002-8667-4094>

IIA: <https://orcid.org/0000-0002-5271-4203>

HY: <https://orcid.org/0000-0003-4241-5231>

ABSTRACT

Introduction and aim. There is a gap in nursing student understanding, knowledge, and preventive behaviors concerning esophageal cancer. This study aimed to investigate knowledge, risk factors, and preventive behaviors among Turkish nursing students.

Material and methods. A descriptive cross-sectional survey was performed. The questionnaire was conducted online over a four-month period. A convenience sample of 688 undergraduate nursing students was recruited from health science faculty at three universities in Turkey. The survey was performed using a self-administered questionnaire. The reliability coefficients of the knowledge test were calculated, yielding Cronbach's alpha (0.952), KR-20 (0.952), and KR-21 (0.945), respectively. A significance level $p < 0.05$ was accepted.

Results. The mean age of the study group was 20 ± 1.86 (min: 17, max: 32). The study group consists of 487 women (70.8%) and 201 men (29.2%). Most of the study population report never using alcohol and smoking (88.4%, 73.1%, respectively), and reported paying attention to oral hygiene (88.5%). Nursing students had a low family history of EC (0.4%), obesity (10.2%), and vitamin deficiency (19.2%) which are risk factors. Knowledge of esophageal cancer risks was low ($\bar{x} = 14.34 \pm 9.53$; Min=0; Max=31). Total knowledge scores were higher for students with complaints of EC, vitamin deficiency, and diagnosis of Human Papilloma Virus disease ($p < 0.05$).

Conclusion. This study showed that there are significant gaps in the knowledge of nursing students and these need to be addressed through an improved nursing curriculum. In this context, the study can be used as important evidence and a resource in the issues that should be given priority to in the training and research needed to increase the knowledge and awareness of future nurses about esophageal cancer.

Keywords. esophageal cancer, esophageal cancer knowledge, esophageal cancer preventive behaviors, nursing students

Introduction

Esophageal cancer (EC) is the eighth most commonly diagnosed type of cancer. It is responsible for 5.5% of cancer-related mortality, and the five-year survival rate is less than 20%.¹⁻³ There has been a marked and steady increase in the incidence of EC in the Western world.¹ Esophageal cancer makes up about 1% of all cancers diagnosed in the United States, but it is much more common in some other parts of the world, such as Iran, northern China, India, and southern Africa.⁴ According to the cancer data from the Ministry of Health, EC is among the top 10 cancers in the Turkish community. Disease morbidity and mortality rate (3.8%, and 2.1% respectively) in Turkish society have been determined to be much lower than expected, which is attributed to the underreporting of cancer statistics in Turkey.⁵

Evidence suggests some potential risk factors for EC, although the principal risk factors and etiology are not fully understood.³ However, some risks such as male sex, family history, advanced age, low socioeconomic status in addition to *Helicobacter pylori* (HP), diseases such as gastroesophageal reflux, Barrett's esophagus (BE), head and neck cancer, scleroderma and hypertension and lifestyle habits such as smoking, alcohol use, unhealthy habits, and nutrition-related risks factors are known.^{2,6-8} Current studies suggest that smoking and drinking, use of hot beverages and low intake of fruits and vegetables may contribute to a high incidence of EC.⁷⁻¹⁰ Additionally, long-term use of proton pump inhibitors (7-10 times) and aspirin use (13%) increase the risk of EC.^{9,11}

Knowing the epidemiology, risks, screening methods, signs, and symptoms of EC is the cornerstone for developing a prevention strategy. Dysphagia, weight loss, unexplained abdominal discomfort, and stool changes are common symptoms of EC.² Chemotherapy, radiotherapy, and surgery are the methods used for treatment. Furthermore, only 20-30% of patients are eligible for curative surgery at diagnosis.¹² Many treatments, including targeted therapy and immunotherapy do not provide satisfactory survival advantages as in other cancer populations.² Additionally, the recurrence rate after all treatments is quite high. Therefore, preventive initiatives are vital.¹³ In the prevention of EC, avoiding risk factors and adopting a healthy lifestyle is the most important point.¹⁴

Esophageal cancer is a type of cancer in which the least information is known about risk factors, symptoms, diagnosis, and treatment among cancer types by the public.^{12,13} Nurses play a vital role in educating and giving care needed to cope with the late and long-term consequences of cancer diseases.¹⁵ In this framework, nurses have a great responsibility to raise public awareness about EC and creating action groups.¹⁶ Due to their profession, nurses take responsibility for early diagnosis, prevention, and screening programs for cancer. Student nurses can inform patients about risk factors, prevention methods, and prevention programs to healthy individuals, and direct risky individuals to screening programs. In screening programs, they can undertake behaviors such as participating in screening tests with nurses and communicating the results to individuals. They

can also provide education and counseling on lifestyle changes and regular health checks. In individuals with cancer, they can play a role as an assistant in diagnosis, treatment, and care processes. Therefore, it is important that nursing students, who can play a key role in these programs in the future, have the right knowledge and positive behaviors regarding cancer. Additionally, although there are some studies on the risk factors of EC, as far as we know, no study has evaluated nursing student knowledge about EC risk factors, diagnosis, symptoms, and treatment.^{3,6}

Aim

This study aimed to determine preventive behaviors, risks, and knowledge of EC among nursing students.

Material and methods

Ethics approval

The institutional permits and approval from the University Ethics Committee (Decision Number: 2021-SBB-0320) were obtained before the study. All participants gave written consent. The participants were told that they were not obligated to participate in the study and had the right to withdraw from the study. Questionnaires were anonymous, and data remained confidential throughout the study.

Study participants

This descriptive, cross-sectional study was conducted with nursing students from three health schools in the West Black Sea area in Turkey. There were 1517 students in three schools. The margin of error (d) was determined as 5%, confidence level 95%, and response rate 50%, and the sample number was 307 with the Raosoft Sample Calculator.¹⁷ The inclusion and exclusion criteria are as follows: Inclusion Criteria: being 18 years of age and over, and registered in the 2022 academic year. Exclusion Criteria were being under 18 years of age. All 1517 students who met the inclusion criteria were enrolled, and the study was completed with 688 students who agreed to participate in the study.

Data collection

This study was conducted between February and May 2022. The questionnaire was prepared by researchers based on the literature. A pilot test was conducted with 10 nursing students from each school to eliminate bias, validate the questionnaire, and assess and administer the survey. Minor revisions were made after the pilot testing by the researchers. Completion of the questionnaire took an average of 15 minutes. The questionnaires were filled out, via the Google Forms link. The researchers stayed with students while they completed the questionnaire in the classroom. There were no missing data in the completed questionnaire.

Study tools and scoring systems

The questionnaire consisted of three parts with a total of fifty-three items. Part 1 consisted of 8 items on socio-demographic data (e.g., age, gender, class, income status, education about EC, and educational resources). Part 2 consisted of 14 items to evaluate nursing student knowledge about preventive behaviors (harmful behavior in nutrition, unhealthy habits such as alcohol use, smoking, and lack of exercise) and risks (family history of EC, Barrett's esophagus, high body mass index, head/neck surgery cancer, HP, HPV virus, vitamin deficiencies such as A, B, C, E, Folic acid) for EC. The questions were multiple-choice and closed-ended questions. Part 3 consisted of 31 items (socio-demographic risk factors (4 items) and diseases associated with EC (6 items), risks associated with health habits (7 items), risks related to nutrition (7 items), and symptoms, diagnosis, and treatment (7 items)) used to determine nursing student's knowledge about EC.

Scores from the knowledge test range from 0 to 31, "1" was given to the true answer, "0" to the false answer and "0" to the "I have no idea" answer. The number of correct answers was divided by the number of questions, their percentages were calculated and a knowledge index was obtained. In addition, the total number of items of each dimension of the Esophageal Cancer Risk Knowledge Test was averaged and used in statistical analyses. Since the answers to the questions were "1" true and "0" false, internal consistency was calculated by Cronbach alpha and the Kuder-Richardson methods (KR-20, and 21). The Cronbach α -values were found to be 0.738, 0.814, 0.883, 0.873, and 0.858, respectively with total reliability Cronbach alpha (0.952). Additionally, psychometric and validity studies were not conducted. Reliability coefficients for the knowledge test were KR-20, and 21 (0.952, 0.945; respectively), and found to be high.^{18,19}

Statistical analysis

Data were analyzed using SPSS V.25.0 (IBM, Armonk, New York, USA). Categorical variables were presented as frequencies, percentages, means and standard deviations. Reliability coefficients for the knowledge test were Cronbach's alpha and KR-20, 21. Data distribution was evaluated using the Kurtosis, Skewness, and Shapiro-Wilks Test. A t-test was used to examine differences in knowledge score levels according to the descriptive characteristics of the students. Statistical significance was set at $p < 0.05$.

Results

The mean age of the study group was 20 ± 1.86 (min: 17, max: 32). The study group consists of 487 women (70.8%) and 201 men (29.2%). Table 1 shows nursing student preventive behaviors against EC in the study of 688 participants. About half of students (44.3%) reported eating a diet rich in fresh fruit/vegetables at least 3 days a week, rarely consuming meat (70.9%), never using alcohol (88.4%), and never smoking (73.1%), and paying attention to oral hygiene (88.5%). More than half of the students consumed very hot beverages (58.4%) and cold beverages (71.5%), did not use protective drugs (70.6%), and never used aspirin (82.8%).

Table 1. Preventive behaviors of nursing students

	Yes n (%)	Rare n (%)	None n (%)
Nutrition rich in fresh fruits/vegetables at least three days a week	305 (44.3)	343 (49.9)	40 (5.8)
Frequent consumption of highly salted and spicy foods	204 (29.7)	361 (52.5)	123 (17.9)
Consuming meat too frequent and in enormous amounts	78 (11.3)	488 (70.9)	122 (17.7)
Drinking more than four glasses of alcohol a day	9 (1.3)	71 (10.3)	608 (88.4)
Smoking	110 (16)	75 (10.9)	503 (73.1)
Regular exercise (30 minutes, three days a week at least)	132 (19.2)	394 (57.3)	162 (23.5)
Taking care of oral hygiene	609 (88.5)	72 (10.5)	7 (1)
Frequent use of stomach protective medicines	34 (4.9)	168 (24.4)	486 (70.6)
Frequent use of aspirin	6 (0.9)	112 (16.3)	570 (82.8)
Frequent weight tracking	167 (24.3)	276 (40.1)	245 (35.6)
Extremely hot beverage consumption	199 (28.9)	402 (58.4)	87 (12.6)
Very cold beverage consumption	116 (0.9)	492 (71.5)	80 (11.6)
Using drugs (such as opium)	6 (0.9)	17 (2.5)	665 (96.7)
Nutrition with foods rich in vitamins A, B, C, E, and folic acid	244 (35.5)	409 (59.4)	35 (5.1)

Table 2 reports nursing students' risky conditions related to EC. Obesity (10.2%) and vitamin deficiency (A, C, E, and folate) (19.2%) were found to be the riskiest conditions for nursing students.

Table 2. Risky conditions related to EC of nursing students*

Risky conditions	In the past (n%)	Current (n%)	Never happened (n%)
Gastroesophageal reflux disease	54 (7.8)	63 (9.2)	571 (83)
Esophageal complaints	12 (1.7)	11 (1.6)	665 (96.7)
Obesity	65 (9.4)	70 (10.2)	553 (80.4)
Family history of EC	10 (1.5)	3 (0.4)	675 (98.1)
Family history of having head neck cancer	6 (0.9)	5 (0.7)	677 (98.4)
Diagnosis of HP in the stomach	42 (6.1)	10 (1.5)	636 (92.4)
HPV infection (such as herpes)	312 (45.3)	19 (2.8)	357 (51.9)
Vitamin deficiency (such as A, C, E, and folate)	242 (35.2)	132 (19.2)	314 (45.6)

* EC – esophageal cancer, HP – *H. pylori*, HPV – human papilloma virus

Table 3 shows the nursing students' correct answers to the statements on EC. Nursing students mostly reported a low socioeconomic status (52.5%), long-term reflux complaints (66.7%), alcohol use (69.6%), and

consumption of very cold and hot beverages (58.9%) as causing EC. Additionally, difficulty swallowing (56.7%) was given mostly as a symptom of EC.

Table 3 Descriptive analysis of knowledge about EC of nursing students

	True n (%)
Non-modifiable risk factors	
<i>Sociodemographic risks</i>	
EC is more common at advanced ages	272 (39.5)
EC is more common in men	207 (30.1)
Low socioeconomic status increases the risk of EC	361 (52.5)
People with a family history of EC may develop EC	357 (51.9)
Modifiable Risk Factors	
<i>Diseases associated with EC</i>	
Diseases that cause enlargement of the esophagus, such as achalasia, predisposed to cancer	372 (54.1)
Long-standing reflux can damage the esophagus and increase the risk of cancer	459 (66.7)
The risk of developing EC is higher in scleroderma (hardening of the skin) disease	179 (26)
Hypertension increases the risk of EC	163 (23.7)
EC is more common in people who had head and neck cancer in the past	242 (35.2)
<i>H. pylori</i> microbe increases the risk of EC	347 (50.4)
<i>Harmful habits</i>	
Long-term alcohol use may increase the risk of EC	447 (65)
Long-term and excessive smoking increases the risk of developing EC	479 (69.6)
Regular exercise may help reduce the risk of EC	413 (60)
Poor oral hygiene paves the way for the development of EC	461 (67)
The use of some medications like opium increases the risk of EC	402 (58.4)
Frequent use of some stomach protective drugs (proton pump inhibitors) may increase the risk of EC	317 (46.1)
Long-term and frequent use of aspirin may increase the risk of EC	304 (44.2)
<i>Nutrition</i>	
Consuming hot and cold beverages increases the risk of EC	405 (58.9)
A diet poor in fresh fruits and vegetables increases the risk of EC	294 (42.7)
Less meat consumption reduces the risk of EC	154 (22.4)
Eating too much red meat and processed foods such as sausages, hamburgers, and ham can increase the risk of EC	336 (48.8)
Consuming high salty and spicy foods may increase the risk of EC	394 (57.3)

Obesity increases the risk of EC	383 (55.7)
A, B, C, E, and folic acid's poor diet increases the risk of EC	340 (49.4)
Symptoms, diagnosis, and treatment	
Weight loss is one of the common symptoms of EC	249 (36.2)
Black or tar-colored stool is one of the symptoms seen in EC	233 (33.9)
Difficulty in swallowing and pain during feeding are common early symptoms of EC	390 (56.7)
Complaints such as unexplained discomfort and bloating in the abdomen are among the symptoms seen in EC	274 (39.8)
Changes in defecation habits are common in EC	243 (35.3)
Surgery is the most used treatment method in the initial period of EC	165 (24)
Chemotherapy is the most used treatment method in the late period	225 (32.7)

* EC – esophageal cancer

Table 4 shows the scores on the EC knowledge questionnaire and its sub-dimensions. Nursing students in the study had a low level of knowledge, scoring an average of 14.34±9.53 (range 0–31) on the questionnaire.

Table 4. Esophageal cancer risk knowledge scores

	Mean±SD	Min–Max
EC risk knowledge total score	14.34±9.53	0–31
Sociodemographic risks	1.74±1.45	0–4
Diseases associated with EC risks	2.56±2.02	0–6
Harmful habits risks	4.10±2.59	0–7
Nutritional risks	3.35±2.56	0–7
Symptoms, diagnosis, and treatment score	2.58±2.43	0–7

Table 5 presents the differentiation of EC Risk knowledge scores. Nursing students without esophageal complaints had higher demographic information ($p=0.042$), related diseases ($p=0.017$), and harmful habits ($p=0.046$) knowledge scores than those with esophageal complaints. Those with EC in the past or now in their family and who were diagnosed with HP had more information about the symptoms, diagnosis, and treatment of the disease than those who do not ($p=0.035$ and $p=0.01$, respectively). The knowledge of esophageal cancer was higher in those with HPV diagnosis in the past or present than in those who have never had it ($p=0.001$). The EC knowledge scores of those who have had or have a vitamin deficiency problem in the past or now were higher than those who did not ($p=0.028$).

Table 5. Differentiation of EC knowledge score by risky conditions*

Characteristics	n	EC risk knowledge total score	Demographic risks knowledge score	Diseases-owned knowledge score	Harmful habits knowledge score	Nutrition-associated risk factors knowledge score	Symptoms, diagnosis, and treatment knowledge score
Gastroesophageal reflux disease							
		Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
Present or past	117	15.103±9.652	1.880±1.549	2.598±1.992	4.103±2.601	3.727±2.589	2.795±2.561
Never happened	571	14.186±9.514	1.711±1.440	2.553±2.039	4.103±2.598	3.275±2.555	2.543±2.41
t		0.947	1.144	0.218	-0.003	1.738	1.019
p		0.344	0.253	0.828	0.998	0.083	0.309
Esophageal complaints							
Present or past	23	10.609±9.423	1.130±1.392	1.565±1.727	3.044±2.755	2.435±2.727	2.435±2.465
Never happened	665	14.471±9.522	1.761±1.458	2.596±2.031	4.140±2.585	3.384±2.555	2.591±2.437
t		-1.913	-2.042	-2.402	-1.995	-1.747	-0.302
p		0.056	0.042	0.017	0.046	0.081	0.763
Obesity							
Present or past	135	14.126±9.534	1.756±1.438	2.482±1.988	4.059±2.515	3.311±2.616	2.519±2.428
Never happened	553	14.394±9.545	1.736±1.465	2.581±2.041	4.114±2.618	3.362±2.554	2.602±2.441
t		-0.293	0.140	-0.508	-0.219	-0.205	-0.357
p		0.770	0.889	0.612	0.827	0.837	0.721
Family history of EC							
Present or past	13	17.923±7.533	2.308±1.377	2.923±1.706	4.539±2.106	4.154±2.410	4.000±2.236
Never happened	675	14.273±9.563	1.729±1.459	2.554±2.036	4.095±2.606	3.336±2.566	2.559±2.434

t		1.368	1.418	0.649	0.610	1.139	2.118
p		0.172	0.157	0.516	0.542	0.255	0.035
Family history of head neck cancer							
Present or past	11	11.364±7.788	1.455±1.440	2.000±1.789	2.818±2.483	2.546±2.464	2.546±2.162
Never happened	677	14.390±9.560	1.745±1.460	2.570±2.033	4.124±2.595	3.365±2.565	2.586±2.442
t		-1.044	-0.653	-0.924	-1.657	-1.051	-0.055
p		0.297	0.514	0.356	0.098	0.293	0.956
Diagnosis of HP in stomach							
		Ort ± SS	Ort ± SS	Ort ± SS	Ort ± SS	Ort ± SS	Ort ± SS
Present or past	52	15.577±9.477	1.827±1.451	2.519±1.925	3.942±2.570	3.865±2.536	3.423±2.652
Never happened	636	14.241±9.542	1.733±1.461	2.565±2.039	4.116±2.600	3.310±2.564	2.517±2.408
t		0.971	0.447	-0.154	-0.464	1.504	2.588
p		0.332	0.655	0.877	0.642	0.133	0.01
HPV infection (such as herpes)							
Present or past	331	15.625±9.173	1.837±1.445	2.776±1.978	4.423±2.495	3.701±2.474	2.888±2.445
Never happened	357	13.151±9.725	1.650±1.468	2.361±2.058	3.807±2.656	3.028±2.607	2.305±2.398
t		3.426	1.682	2.693	3.130	3.467	3.155
p		0.001	0.093	0.007	0.002	0.001	0.002
Vitamin deficiency (Such as A, C, E, and folate)							
Present or past	374	15.075±9.277	1.818±1.399	2.754±1.996	4.297±2.522	3.524±2.505	2.682±2.431

Never happened	314	13.468±9.781	1.647±1.525	2.331±2.049	3.873±2.669	3.147±2.622	2.471±2.442
t		2.207	1.539	2.735	2.140	1.928	1.129
p		0.028	0.127	0.006	0.034	0.054	0.259

* t – independent groups t-test, EC – esophageal cancer, HP – H. pylori, HPV – human papilloma virus

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Discussion

This study assessed nursing student preventive behaviors, risks, and knowledge of EC. Additionally, the differentiation between risk and knowledge scores was evaluated. We found that most nursing students have preventive behaviors, very few had risks, and their level of knowledge about EC was low.

Esophageal cancer is a crucial health issue with high mortality due to the advanced character of the disease; thus, detection at an early stage of diagnosis improves treatment success and preventive behaviors.²⁰ The literature reported that EC risk factors in Eastern and Western societies, such as age, gender, race, alcohol consumption, smoking, poor oral hygiene, and gastroesophageal reflux disease.²¹ Additionally, Barrett's esophagus, low fruit/vegetable consumption, high meat intake, family history, head /neck cancer, diseases causing motor disorders of the esophagus (scleroderma, achalasia), and high-temperature beverage intake EC have been reported as most essential predominant risk factors.^{22,23} Overall, most of the nursing students in our study had inadequate preventive behaviors against EC. Nursing students had not performed fully desirable behaviors such as consuming meat, never consuming alcohol, never smoking, paying attention to oral hygiene, not using stomach protective drugs, not taking aspirin, and consuming fresh fruit/vegetables (at least 3 days a week). In addition, they had undesirable behaviors like consuming very hot and cold beverages, and don't exercise regularly.

Recurrent long-term reflux complaints are the most important risk factors for the development of Barrett's and EC. In addition, some studies have indicated that obesity reflux complaints pose a risk for EC in individuals over the age of 20 years. On the other hand, deficient nutrition in terms of A, C, E, and folate also increases the risk of EC.^{15,24} In this study, a few students also had risky conditions related to EC including gastroesophageal reflux complaints, obesity, and vitamin deficiency (vitamin C, E, and folate). It is important to correct these unwanted health habits of students. Nursing students should be increases of aware unhealthy behaviors that cause EC cancer.

Although nursing students demonstrated a profound understanding of the adverse effects of deleterious behaviors on EC, their familiarity with EC-related diseases, symptoms, diagnoses, and treatments was notably deficient. The scholarly literature underscores tobacco smoking and excessive alcohol consumption as the primary risk factors contributing to the development of EC.^{22,23} Since, smoking, alcohol consumption, and lack of exercise are reasons for all types of cancer, approximately two-thirds of the students also know the relationship between these factors and EC. The literature reports that lower socioeconomic status is associated with a lower sanitation standard, dietary habits, a poorer lifestyle, and a higher degree of carcinogen exposure.^{24,25} Additionally, it was shown that Barrett's esophagus increases the risk of development of EC (OR 3.0 and 6.4 respectively).²⁵ Furthermore, poor oral hygiene, consumption of extremely hot beverages, and high salty and spicy food are reported to increase the risk of Barrett's esophagus, thus increasing the risk of EC.^{22,25} Esophageal cancer has frequently been observed in some parts of Turkey due to traditional hot tea consumption culturally. However, reliable incidence data for EC

are lacking due to insufficient cancer reporting in Turkey.²⁵ In this study, about half of the students had not responded correctly when asked whether low socioeconomic status, excessive alcohol use, long-term reflux complaints, and consumption of cold and hot beverages may increase EC risk. Some nursing students are also aware of the most well-known risk factors for EC. Additionally, students have insufficient knowledge about the diseases and drugs that EC may be associated with. It has been reported that diseases such as reflux, HP, achalasia, Barrett's esophagus, scleroderma, head and neck cancers, and hypertension cause EC.^{7,21,25} Not surprisingly, reflux, HP, achalasia, and Barrett's esophagus are the most well-known causes and diseases among nursing students. Similarly, in a study conducted with nurses, it was found that nurses were most familiar with reflux and HP.²⁶ Although there are different views in the literature regarding the risk of EC development with long-term use of opium, proton pump inhibitors, and aspirin, some studies have reported that aspirin and proton pump inhibitors increase the risk of EC in recent years.^{3,9,10,27} Therefore, as expected, the knowledge level of our working group on this topic is low.

In the literature, complaints such as dysphagia, GI bleeding, persistent vomiting, and weight loss are defined as alarm symptoms in the recognition of a significant number of gastrointestinal cancers.^{28,29} In this study, one-third of the nursing student knew the alarm symptoms required for the diagnosis for EC. This suggests that awareness of common risk factors in Turkey are not well understood by nursing students. Awareness and adequate knowledge of risk factors are substantial issues in the early detection and successful treatment of EC. Nursing schools play a key role, and health education is an indispensable part of a comprehensive program. Moreover, nursing students might be responsible for the care multiple patients with diverse needs, interact with many healthcare team members, and connecting with the extended network of family and close associates of their patients.³⁰ Additionally, nurses roles have evolved over time to encompass health promotion, disease management, and disease prevention.³¹ For this reason, Turkish nursing students must be qualified to provide give accurate information to their patients or healthy people after graduation.

The current study found that nursing students who had complaints related to esophageal diseases had significantly higher knowledge scores regarding demographic risks, related diseases, and harmful habits than other students. Additionally, students with a family history of EC had more knowledge of symptoms, diagnosis, and treatment. Similarly, in a case-control study conducted in China, young people with a family history of EC had better knowledge. Having a family history of EC might be related to higher knowledge gained during their involvement in the treatment process and their interaction with healthcare providers, and might promote awareness about EC. In other words, exposure to high-risk factors increases knowledge.³²

Students with HP in the stomach had higher symptom, diagnosis, and treatment knowledge scores. Additionally, students with HPV had high knowledge of nutrition-associated risk factors and symptoms, diagnosis, and treatment. It is usual for students who have had reflux or HPV complaints in the past and received treatment to know symptoms, diagnosis, and treatment. Students can also use internet resources

to obtain detailed information about their diseases such as HPV or reflux. They may have read that they are at risk for EC, which may have prompted them to learn more about the disease. Only one study reported that Turkish nurses have a moderate level of knowledge about diagnosis and screening of esophageal cancer, and a low level of knowledge about treatment.³³ On the other hand, no studies have evaluated the esophageal cancer knowledge of nursing students in Turkey and other countries. These results highlight the importance of increasing awareness through nursing education, particularly regarding the prevention and health promotion of EC.

Furthermore, the literature reported that nursing student preventive health behaviors, knowledge, and optimistic attitudes are effective for national cancer prevention practices.¹⁶ Nurses, one of the largest groups of health professionals, have responsibilities to identify risk groups, promote healthy lifestyles, prevent complications, and improve positive outcomes in health care through education and counseling in community health.²¹ Additionally, previous studies have shown that supportive care, and consulting interviews could be effective in improving patient quality of life with EC.^{34,35} In this context, developing preventive behaviors and knowledge for nursing students may provide several benefits to both them and the community. Nursing students may give provide training, plan comprehensive care, and contribute to health policies regarding EC. In line with this, in the future, nurses may contribute to the national prevention of EC. Furthermore, if the relationship between healthy behaviors and the prevention of EC in nursing is better understood, nurse educators and researchers could study ways to create awareness of the prevention of EC and improve nursing student knowledge. This result reflects the need to develop intervention guidelines to enhance student EC knowledge.

Study limitations

This study has potential limitations and strengths. Firstly, data are subjective, as they are based on student self-reporting. Second, data were obtained from participants in three regions of Turkey, therefore it cannot be generalized to other areas of the country. Third, the lack of information in the literature on the knowledge levels of nursing students on EC may have limited the discussion of the study findings in a broad way. There is also a lack of standardized, and validated questionnaires to compare results from different populations. On the other hand, the current study is the first comprehensive study to evaluate nursing student knowledge and preventive behaviors toward EC in literature. This is also a strength of the study as it brings new outputs to the literature. In this context, this study fills a gap in literature. Secondly, the strength of this study is that it was conducted in schools in three different cities of Turkey, it has an appropriate sampling method and large sample size. Third, the reliability (Cronbach's alpha) of the knowledge test questionnaire prepared by the researchers was found to be high. The study was conducted with a measurement tool with high reliability.

Conclusion

This study indicated that nursing students had had low levels of knowledge about EC. In this context, the study can be used as important evidence and resource in determining the issues that should be given priority in the studies planned to determine the knowledge and awareness of EC that can be improved in the future. Thus, our study has a high potential to pave the way for new studies on education and action plans to increase the risk and protective behaviors of nursing students for esophageal cancer. It is essential to increase the knowledge and awareness of nurses who will educate the society about EC during their university education. In this context, it is recommended to conducting action-oriented training to increase student EC knowledge and awareness in nursing education, to include EC in their curriculum extensively, and to plan experimental studies for future studies.

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Declarations

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Author contributions

Conceptualization, A.B.Ç., I.I.A. and H.Y.; Methodology, A.B.Ç. and I.I.A.; Investigation, A.B.Ç., I.I.A. and H.Y.; Data Curation, A.B.Ç., I.I.A. and H.Y.; Data Analysis, A.B.Ç., I.I.A., and H.Y.; Writing – Original Draft Preparation, A.B.Ç., I.I.A. and H.Y.; Writing – Review & Editing, A.B.Ç. and I.I.A.; Supervision, A.B.Ç., I.I.A. and H.Y.

Conflicts of interest

The authors have no competing interest to declare.

Data availability

Data are available upon request from the correspondence author.

Ethics approval

The institutional permits and approval from the University Ethics Committee (Decision Number: 2021-SBB-0320) were obtained before the study.

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