

Original Article:

# Investigation of Cancer Risk Factors in the Lifestyle of Medical Students at Mashhad University of Medical Sciences

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## Abstract

**Introduction:** Every year, over 10 million new cases of cancer are diagnosed worldwide. Cancers tend to be closely associated with lifestyle. This study aimed to investigate the lifestyle-related cancer risk factors in the medical students of Mashhad University of Medical Sciences.

**Materials and Methods:** This descriptive cross-sectional study was performed on 270 students of Mashhad University of Medical Sciences in Iran, who were selected through convenience sampling. Data collection was performed using a lifestyle risk factor questionnaire, which was provided to students online. Data were analyzed with the statistical analysis software SPSS-21 by using descriptive statistics, Chi-square, and Mann-Whitney tests at the 0.05 significance level.

**Results:** All participants were in the age range of 22-25 years old. About 28% of the participants were male and 72% were female. Men showed higher awareness of cancer warning signs than women ( $p=0.046$ ). Women were more active in taking protection measures against chemical substances than men ( $p=0.042$ ). Men were in significantly better condition in terms of the use of hormones than women ( $p=0.048$ ). Married people were also more active in taking protection measures against chemical substances than single people ( $p=0.042$ ).

**Conclusion:** Compared to other lifestyle risk factors for cancer, the surveyed medical students had particularly poor "eating habits" and "solar radiation exposure". About half of the surveyed students had a high level of exposure to sunlight. Therefore, it is highly recommended to implement a program to raise students' awareness of cancer risk factors and promote healthy lifestyles in this population.

**Keywords:** Cancer, Lifestyle, Medical students, Risk factors

## 1. Introduction

Each year, over 20 million people worldwide are diagnosed with cancer and over 10 million die due to it. In Iran, the annual incidence of cancer is about 70,000 cases

and cancer-related mortality is about 30,000. However, with the aging of the Iranian population and the improvement life expectancy in the country, these figures are expected to increase significantly in the upcoming decades. In addition to its physical effects, cancer causes anxiety and depression in over one-third

of patients, which in turn can have devastating health and financial implications for families. Furthermore, a large part of national health budgets is spent on clinical care for cancer patients [1, 2]. Researchers have identified approximately 150 types of cancer in humans and at least 500 different types of cancerogenic factors. Cancers are often caused by the simultaneous action of multiple factors [3]. Only 10% of all cancer types are caused exclusively by genetic defects [4], and the remaining 90% are associated with environmental and lifestyle factors. The most important environmental and lifestyle factors for cancer are smoking, obesity, alcohol consumption, infectious agents, prolonged sunlight exposure, stress, environmental contaminants, and food [5]. A person's lifestyle tends to be closely associated with their social and economic status as well as other factors such as roles and activities, work and study habits, fun and relaxing activities, type and place of residence, the impact of cultural beliefs on nutrition and health, the extent of physical activity, follow-up treatment behaviors, and health habits such as the use of alcohol, drugs, nicotine, and recreational drugs, and stress levels [6, 7]. The increasing worldwide prevalence of many health problems such as obesity, cardiovascular diseases, cancers, and addiction, especially in developing countries, are somehow related to lifestyle changes [8, 9].

Lifestyle refers to routine daily life patterns of people. In a 2001 report by the American Heart Association, it was stated that lifestyle is one of the leading risk factors for morbidity and mortality in the United States and accounts for about 70% of all physical and mental illnesses in this country [10]. According to statistics, 53% of deaths are related to lifestyle, 21% to environmental factors, 16% to genetic factors, and 10% to the health care delivery system. With the growing urbanization of Iran, involving more people living in industrial areas and becoming more exposed to infectious diseases, together the changing age structure of the Iranian population, it is expected to see an increasing prevalence of non-communicable diseases such as cancer, cardiovascular disease, and diabetes and their risk factors in the country [11, 12].

Although lifestyle and health beliefs are mostly rooted in the earlier years of life, lifestyle behaviors that people engage in and experience while attending university can also have a significant impact on their health [13, 14].

The main cause of lifestyle-related disorders is unhealthy behaviors that occur in the early stages of life. Since university students make up a significant

portion of the adult population, it seems logical to take special measures for improving the health activities of this sample of the population and also study the relationship between their health, motivation to lead a healthy lifestyle, and different health habits. University students constitute a homogeneous and accessible population who tend to be fairly healthy and this reduces the bias caused by the effect of diseases on health behaviors [14]. Students who become sedentary in educational settings are expected to also be desk-bound at home. This period changes people's eating habits and individual behaviors; such changes could be transient or permanent depending on the person. Therefore, since lifestyle is one of the most important determinants of health, there should be some educational programs for teaching students about lifestyle-related health factors [15, 16].

One research has shown a direct relationship between lifestyle and cancer, and specifically the bold role of lifestyle factors in the incidence of more common cancers (e.g., breast, prostate, and colon cancers) compared to other risk factors [17-21]. Cancer prevention actions include primary prevention (preventing the disease) and secondary prevention (early detection of the disease). Regarding the former, it is necessary to know the causes and factors involved in the occurrence of cancer. Given the role of lifestyle in cancer incidence, which has been demonstrated in studies on the incidences before and after migration in different nationalities, cancer prevention can be achieved through lifestyle modification [22, 23]. Taking appropriate cancer prevention measures today can prevent millions of cancer deaths in the future [4]. In order to prevent cancer, it is necessary to improve people's lifestyles, and this cannot be done without knowing these lifestyles. With enough information about the lifestyles of university students, it will be possible to develop national programs for creating healthier education environments and also teaching students how to live a healthier life and adopt healthy lifestyles. Considering the importance of the identification of students' lifestyles for cancer prevention, this study attempted to determine the lifestyle risk factors for cancer in the students of Mashhad University of Medical Sciences.

## 2. Materials and Methods

This cross-sectional study was performed on 270 students of Mashhad University of Medical Sciences in Iran. The sample size was determined by the ratio estimation formula in one group.

$n = \frac{z^2 p(1-p)}{d^2}$  using the study of Goodarzi et al. [24], with  $p=0.31$ ,  $\alpha=0.05$ ,  $\beta=0.2$ , and  $d=0.003$  (0.03p). Using this method, the appropriate sample size was determined to be 270.

The inclusion criteria were 18 years of age, Iranian nationality, studying in a general medicine course for at least one year, consent to participate in the study, and no history of cancer at the time of research (self-report). The exclusion criterion was the withdrawal of consent for participating in the study.

The required data were collected using an online lifestyle risk factor questionnaire, the link of which was sent to the participating students.

The lifestyle risk factors for cancer were assessed using the questionnaire to assess risk factors related to lifestyle in cancer, the validity and reliability of which has been confirmed by Bahramnejad et al [25]. This questionnaire consists of two parts. The first part of the questionnaire is dedicated to demographic information (age, gender, education discipline, stage, and progress, native of Mashhad or non-native, parents' job, urban or rural, marital status, height, and weight). The second part, which includes questions about lifestyle risk factors, consists of several subsections:

Questions related to the risk factors of cancer (in the opinion of participants): 12 questions with three answers "Yes", "No" and "I do not know".

Questions related to the level of awareness about the warning signs of cancer: 9 questions with three answers "Yes", "No", and "I do not know".

Questions related to eating habits: 52 questions measuring eating styles for dairy products, starchy foods, oils, proteins, and other foods, with five answers "Never", "Once a month", "Two to three times a month", "Two to three times a week", and "Every day" based on the Likert scale

Questions related to smoking and alcohol use: 12 questions with two answers "Yes" and "No".

Questions related to exposure to sunlight, X-ray, microwave, and radioactive materials: 10 questions with five answers "N/A", "Never", "Once a month", "four times a month" "two to three times a week", and "every day" based on the Likert scale.

Questions related to exposure to chemical substances at home: 9 questions with five answers "Never", "Rarely", "Sometimes", "Most of the time", and "Always" based on the Likert scale.

Questions related to exposure to chemical substances at workplace: 28 questions with two answers "Yes" and "No".

Questions related to protection against chemical substances: 5 questions with five answers "Never", "Rarely", "Sometimes", "Most of the time", and "Always" based on the Likert scale.

Questions related to cancer protection measures: 13 questions with two answers "Yes" and "No".

Questions related to hormone use: 2 questions with two answers "Yes" and "No".

Questions related to exposure to stressors: 13 questions with five answers "Never", "Rarely", "Sometimes", "Most of the time", and "Always" based on the Likert scale.

In the lifestyle-related questions that were prepared on the Likert scale, the highest score (5) was given to the healthiest option and the lowest score (1) was given to the least healthy option. Also, the answer "N/A" was not scored. Questions that were negative were scored inversely.

All scores were scaled to 0-100. Scores from 80 to 100% were considered to be desirable; scores from 60 to 79.9% were regarded to be moderate, and scores below 60% (from 0 to 59.9%) were considered to be undesirable.

### Statistical analysis

Data were analyzed using SPSS software version 21. The characteristics of the subjects were analyzed through descriptive measures including centrality, dispersion, and frequency distribution in the form of tables and graphs. Qualitative intergroup comparisons were conducted using the Chi-square test. Quantitative intergroup comparisons were performed using the Mann-Whitney test. In all the tests, the significance level was set at  $p < 0.05$ .

## 3. Results

The study was conducted on 270 medical students of Mashhad University of Medical Sciences. Out of these 270 students, 33.2% (95) were in the internship stage; 33.5% (90) were in the clinical training stage, and the rest were in the pre-clinical stage and physiopathology stage. The majority of the participating students were single (65.9%) and about 2.2% of them were living in rural areas. A large percentage of the participants were in the age group of 22 to 25 years (57.4%) and belonged to Fars ethnic group (70.6%) (Table 1).

Table 1: Participants' personal demographic characteristics

Characteristic	Sub-characteristic	Gender		Total Frequency (percentage)
		Male Frequency (percentage)	Female Frequency (percentage)	
Education stage (in general medicine)	Pre-clinical courses	10 (13.2%)	31 (16%)	41 (15.2%)
	Physiopathology	12 (15.8%)	32 (16.5%)	44 (16.3%)
	Clinical training	27 (35.5%)	63 (32.5%)	90 (33.3%)
	Internship	27 (35.5%)	68 (35.1%)	95 (35.2%)
Marital status	Single	54 (71.1%)	124 (63.9%)	178 (65.9%)
	Married	22 (28.9%)	70 (36.1%)	92 (34.1%)
Place of residence	Urban	76 (100%)	188 (96.9%)	264 (97.8%)
	Rural	0 (0%)	6 (3.1%)	6 (2.2%)
Ethnicity	Fars	52 (68.4%)	137 (70.9%)	182 (70.6%)
	Lor	12 (15.8%)	22 (11.4%)	20 (7.4%)
	Shomali	11 (14.5%)	21 (10.9%)	32 (11.9%)
	Turk	1 (1.3%)	13 (6.7%)	14 (5.2%)
Age	18-19	3 (3.9%)	8 (4.1%)	11 (4.1%)
	20-21	11 (14.5%)	32 (16.5%)	43 (15.9%)
	22-23	21 (27.6%)	56 (28.9%)	77 (28.5%)
	24-25	25 (32.9%)	53 (27.3%)	78 (28.9%)
	26-30	16 (21.1%)	43 (22.2%)	59 (21.9%)
	31 or up	0 (0%)	2 (1%)	2 (0.7%)
Weight	40-49	1 (1.3%)	14 (7.2%)	15 (5.6%)
	50-59	2 (2.6%)	68 (35.1%)	70 (25.9%)
	60-69	14 (18.4%)	82 (42.3%)	96 (35.6%)
	70-79	30 (39.5%)	11 (5.7%)	41 (15.2%)
	80-89	21 (27.6%)	16 (8.2%)	37 (13.7%)
	90-99	8 (10.5%)	3 (1.5%)	11 (4.1%)
	100-150	0 (0%)	0 (0%)	0 (0%)
Height	150-159	1 (1.3%)	39 (20.1%)	40 (14.8%)
	160-169	15 (19.7%)	106 (54.6%)	121 (44.8%)
	170-179	33 (43.4%)	45 (23.2%)	78 (28.9%)
	180-189	25 (32.9%)	3 (1.5%)	28 (10.4%)
	190-199	2 (2.6%)	1 (0.5%)	3 (1.1%)
Informed about cancer prevention measures	Yes	73 (96.1%)	181 (93.3%)	254 (94.1%)
	No	3 (3.9%)	13 (6.7%)	16 (5.9%)

About 37% of the fathers of the surveyed students were retired; 29.3% were government employees, and 31.5% were self-employed. The mothers of the surveyed students were mostly either housewives (47.8%) or government employees (27.8). About 57.4% of fathers and 48.1% of mothers of the students had a university education.

About 57% of the surveyed students reported a history of cancer-related death in their relatives, and 27% of them had a relative with cancer at the time of the study (Table 2).

As shown in Table 3, participants believed that "smoking" and "parasites" are the most and least important risk factors for cancer, respectively.

About 15.2% of the participating students had poor awareness about the warning signs of cancer and the rest had moderate or good levels of awareness about these signs (Table 4). The level of awareness about these warning signs was significantly higher among men than women ( $p=0.046$ ).

The majority of participating students had moderate eating habits (79.2%) and none of them were in good condition in this respect. In terms of smoking and alcohol use, 95.2% of the students were in good condition. Regarding solar radiation exposure, 46.5% of the students were in poor conditions. About 60% of

Table 2: Participants' family characteristics

Total Frequency (percentage)	Gender		Sub-characteristic	Characteristic
	Female Frequency (percentage)	Male Frequency (percentage)		
6 (2.2%)	4 (2.1%)	2 (2.6%)	Unemployed	Father's employment status
79 (29.3%)	58 (29.9%)	21 (27.6%)	government employee	
85 (31.5%)	66 (34%)	19 (25%)	Self-employed	
100 (37%)	66 (34%)	34 (44.7%)	Retired	Mother's employment status
129 (47.8%)	93 (47.9%)	36 (47.4%)	Housewife	
75 (27.8%)	49 (25.3%)	26 (34.2%)	Government employee	
29 (10.7%)	23 (11.9%)	6 (7.9%)	Self-employed	Father's education level
37 (13.7%)	29 (14.9%)	8 (10.5%)	Retired	
1	1	0	Illiterate	Mother's education level
11 (4.1%)	8 (4.1%)	3 (3.9%)	Elementary school	
18 (6.7%)	13 (6.7%)	5 (6.6%)	Middle school	
20 (7.4%)	10 (5.2%)	10 (13.2%)	High school	
65 (24.1%)	46 (23.7%)	19 (25%)	Diploma	
155 (57.4%)	116 (59.8%)	39 (51.3%)	University	History of cancer-related death in relatives
1	1	0	Illiterate	
15 (5.6%)	13 (6.7%)	2 (2.6%)	Elementary school	
25 (9.3%)	18 (9.3%)	7 (9.2%)	Middle school	
20 (7.4%)	15 (7.7%)	5 (6.6%)	High school	
79 (29.3%)	55 (28.4%)	24 (31.6%)	Diploma	Any relative currently suffering from cancer
130 (48.1%)	92 (47.4%)	38 (50%)	University	
154 (57%)	108 (55.7%)	46 (60.5%)	Yes	
116 (43%)	86 (44.3%)	30 (39.5%)	No	
73 (27%)	51 (26.3%)	22 (28.9%)	Yes	
196 (73%)	142 (73.7%)	54 (71.1%)	No	

Table 3: Participants' rating of cancer risk factors

Do not Know	Cause/Predisposing factor		Factor
	NO	Yes	
7 (2.6%)	3 (1.1%)	260 (96.3%)	Smoking
4 (1.5%)	8 (3%)	258 (95.6%)	Chemical substances
4 (1.5%)	10 (3.7%)	256 (94.8%)	X-Ray
11 (4.1%)	3 (1.1%)	256 (94.8%)	Additives in canned foods
9 (3.3%)	8 (3%)	253 (93.7%)	Radioactive materials (for nuclear medicine)
26 (9.6%)	10 (3.7%)	234 (86.7%)	Alcoholic beverages
12 (4.4%)	32 (11.9%)	226 (83.7%)	Sunlight
28 (10.4%)	17 (6.3%)	225 (83.3%)	Fatty foods and obesity
36 (13.3%)	9 (3.3%)	225 (83.3%)	Stress and anxiety
41 (15.2%)	18 (6.7%)	210 (78.1%)	Hormones
41 (15.2%)	22 (8.1%)	207 (76.7%)	Viruses
70 (25.9%)	42 (15.6%)	158 (58.5%)	Parasites

**Table 4:** Participants’ awareness of cancer warning signs by gender

P-Value	Total		Gender				Awareness level
	Percentage	Frequency	Female		Male		
			Percentage	Frequency	Percentage	Frequency	
0.046	15.2%	41	18.7%	36	6.6%	5	Poor
	25.7%	69	24.9%	48	27.6%	21	Good
	59.1%	159	56.5%	109	65.8%	50	Excellent

\*Comparison was performed using the Chi-square test

the participants had a moderate level of exposure to chemical substances at home and 99.6% of them had a good (low) level of exposure to chemical substances at workplace. However, out of those who were exposed to chemical substances, 28.4% had poor protection and 48% had moderate protection against them. Concerning cancer protection measures (regular tests for early detection), 34% of the students were in poor condition. About 23% of the students had poor levels of stress response, while the majority of them (60.8%)

were in moderate conditions in this respect (Table 5).

Considering the importance of eating habits, its sub-factors were also analyzed (Table 6). This analysis showed that, in the population of surveyed medical students, the best condition in terms of eating habits was for dairy products (35% good and 59.1% moderate) and the worst was for starchy foods (94.4% poor and 5.6% moderate) and oils (62% poor and 37.2% moderate).

**Table 5:** Participants’ condition in terms of lifestyle risk factors

desirable	Condition				undesirable	Lifestyle risk factors
	Percentage	Frequency	Moderate	Frequency		
%0	0	79.20%	213	20.80%	56	Eating habits
95.20%	256	3.00%	8	1.90%	5	Smoking and alcohol use
14.90%	40	38.70%	104	46.50%	125	Solar radiation exposure
27.10%	73	59.90%	161	13.00%	35	Exposure to chemical substances at home
99.60%	268	0.00%	0	0.40%	1	Exposure to chemical substances at workplace
23.60%	59	48.00%	120	28.40%	71	Protection against chemical substances
33.60%	90	32.50%	87	34.00%	91	Cancer protection measures
86.00%	228	10.60%	28	3.40%	9	Use of hormones
16.20%	43	60.80%	161	23.00%	61	Stress response

**Table 6:** participants’ condition in terms of sub-factors of eating habits

Good	Condition				Poor	Sub-factors of eating habits
	Percentage	Frequency	moderate	Frequency		
6.3%	17	74.0%	199	19.7%	53	Proteins
35.7%	96	59.1%	159	5.2%	14	Dairy products
0.0%	0	5.6%	15	94.4%	254	Starchy substances
0.0%	0	37.2%	100	62.8%	169	Oils
4.5%	12	82.2%	221	13.4%	36	Other foods

Comparison of lifestyle risk factors in men and women showed that women are significantly more likely to take protective measures against chemical substances (p=0.042), as a higher percentage of women were in good condition and a lower percentage of them were in poor condition in this respect. Regarding the use of hormones, men were in

significantly better condition than women (p=0.048). There were no significant differences between genders in terms of other factors (Table 7).

Comparing the lifestyle risk factors of married students with those of single students showed that married people were more likely to take protective

measures against chemical substances than single people ( $p=0.042$ ). A higher percentage of married people were in good condition and a lower percentage of them were in poor condition in this respect. Married students were also in significantly better conditions in

terms of hormone use than single students ( $p=0.048$ ). There were no significant differences between married students and single students concerning other factors (Table 8).

**Table 7:** Comparison of participants' condition in terms of lifestyle risk factors based on gender

Lifestyle risk factors	Condition	Gender		P-Value
		Male Frequency (percentage)	Female Frequency (percentage)	
Eating habits	Poor	16(21.1%)	40(20.7%)	0.531
	Moderate	60(78.9%)	153(79.3%)	
	Good	0(0%)	0(0%)	
Smoking and alcohol use	Poor	3(3.9%)	2(1%)	0.102
	Moderate	4(5.3%)	4(2.1%)	
	Good	69(90.8%)	187(96.9%)	
Solar radiation exposure	Poor	40(52.6%)	85(44%)	0.445
	Moderate	26(34.2%)	78(40.4%)	
	Good	10(13.2%)	30(15.5%)	
Exposure to chemical substances at home	Poor	9(11.8%)	26(13.5%)	0.756
	Moderate	44(57.9%)	117(60.6%)	
	Good	23(30.3%)	50(25.9%)	
Exposure to chemical substances at workplace	Poor	1(1.3%)	0(0%)	0.283
	Moderate	0(0%)	0(0%)	
	Good	75(98.7%)	193(100%)	
Protection against chemical substances	Poor	25(35.2%)	46(25.7%)	0.042
	Moderate	36(50.7%)	84(46.9%)	
	Good	10(14.1%)	49(27.4%)	
Cancer protection measures	Poor	19(25%)	72(37.5%)	0.120
	Moderate	26(34.2%)	61(31.8%)	
	Good	31(40.8%)	59(30.7%)	
Use of hormones	Poor	0(0%)	9(4.7%)	0.048
	Moderate	5(6.7%)	23(12.1%)	
	Good	70(93.3%)	158(83.2%)	
Stress response	Poor	18(24%)	43(22.6%)	0.972
	Moderate	45(60%)	116(61.1%)	
	Good	12(16%)	31(16.3%)	

\*Comparison was performed using the Chi-square test

**Table 8:** Comparison of participants' condition in terms of lifestyle risk factors based on marital status

Lifestyle risk factors	Condition	Marital status		P-Value
		Single Frequency (percentage)	Married Frequency (percentage)	
Eating habits	Poor	34(19.2%)	22(23.9%)	0.429
	Moderate	143(80.8%)	70(76.1%)	
	Good	0(0%)	0(0%)	
Smoking and alcohol use	Poor	4(2.3%)	1(1.1%)	0.512
	Moderate	4(2.3%)	4(4.3%)	
	Good	169(95.5%)	87(94.6%)	
Solar radiation exposure	Poor	82(46.3%)	43(46.7%)	0.860
	Moderate	70(39.5%)	34(37%)	
	Good	25(14.1%)	15(16.3%)	
Exposure to chemical substances at home	Poor	22(12.4%)	13(14.1%)	0.508
	Moderate	103(58.2%)	58(63%)	
	Good	52(29.4%)	21(22.8%)	

Exposure to chemical substances at workplace	Poor	1(0.6%)	0(0%)	0.514
	Moderate	(0%)	(0%)	
	Good	176(99.4%)	92(100%)	
Protection against chemical substances	Poor	53(32.1%)	18(21.2%)	0.027
	Moderate	81(49.1%)	39(45.9%)	
	Good	31(18.8%)	28(32.9%)	
Cancer protection measures	Poor	60(33.9%)	31(34.1%)	0.891
	Moderate	56(31.6%)	31(34.1%)	
	Good	61(34.5%)	29(31.9%)	
Use of hormones	Poor	4(2.3%)	5(5.6%)	0.018
	Moderate	14(8%)	14(15.6%)	
	Good	157(89.7%)	71(78.9%)	
Stress response	Poor	39(22.3%)	22(24.4%)	0.580
	Moderate	110(62.9%)	51(56.7%)	
	Good	26(14.9%)	17(18.9%)	

\*Comparison was performed using the Chi-square test

Comparison of students who had had cancer-related death in their relatives with other students showed no significant differences between them in terms of lifestyle risk factors (Table 9).

As shown in Table 10, comparing the lifestyle risk

factors of the students based on their mothers' education levels showed that the students whose mothers had high school diploma or lower degrees were in significantly better conditions than the students whose mothers had higher education (p=0.026).

**Table 9:** Comparison of participants' condition in terms of lifestyle risk factors based on the history of cancer-related death in relatives

P-Value	History of cancer-related death in relatives		Condition	Lifestyle risk factors
	No Frequency (percentage)	Yes Frequency (percentage)		
0.431	25(21.7%)	31(20.1%)	Poor	Eating habits
	90(78.3%)	123(79.9%)	Moderate	
	(0%)	(0%)	Good	
0.946	2(1.7%)	3(1.9%)	Poor	Smoking and alcohol use
	3(2.6%)	5(3.2%)	Moderate	
	110(95.7%)	146(94.8%)	Good	
0.517	50(43.5%)	75(48.7%)	Poor	Solar radiation exposure
	49(42.6%)	55(35.7%)	Moderate	
	16(13.9%)	24(15.6%)	Good	
0.391	15(13%)	20(13%)	Poor	Exposure to chemical substances at home
	64(55.7%)	97(63%)	Moderate	
	36(31.3%)	37(24%)	Good	
0.428	1(0.9%)	0(0%)	Poor	Exposure to chemical substances at workplace
	(0%)	(0%)	Moderate	
	114(99.1%)	154(100%)	Good	
0.421	31(29.2%)	40(27.8%)	Poor	Protection against chemical substances
	51(48.1%)	69(47.9%)	Moderate	
	24(22.6%)	35(24.3%)	Good	
0.411	44(38.3%)	47(30.7%)	Poor	Cancer protection measures
	36(31.3%)	51(33.3%)	Moderate	
	35(30.4%)	55(35.9%)	Good	
0.470	4(3.5%)	5(3.3%)	Poor	Use of hormones
	9(7.9%)	19(12.6%)	Moderate	
	101(88.6%)	127(84.1%)	Good	
0.683	29(25.4%)	32(21.2%)	Poor	Stress response
	68(59.6%)	93(61.6%)	Moderate	
	17(14.9%)	26(17.2%)	Good	

\*Comparison was performed using the Chi-square test

**Table 10:** Comparison of participants' condition in terms of lifestyle risk factors based on mother's education level

P-Value	Mother's education level		Condition	Lifestyle risk factors
	Higher education Frequency (percentage)	High school diploma or lower Frequency (percentage)		
0.050	34(26.2%)	22(15.8%)	Poor	Eating habits
	96(73.8%)	117(84.2%)	Moderate	
	0(0%)	0(0%)	Good	
0.618	3(2.3%)	2(1.4%)	Poor	Smoking and alcohol use
	5(3.8%)	3(2.2%)	Moderate	
	122(93.8%)	134(96.4%)	Good	
0.177	67(51.5%)	58(41.7%)	Poor	Solar radiation exposure
	48(36.9%)	56(40.3%)	Moderate	
	15(11.5%)	25(18%)	Good	
0.136	18(13.8%)	17(12.2%)	Poor	Exposure to chemical substances at home
	84(64.6%)	77(55.4%)	Moderate	
	28(21.5%)	45(32.4%)	Good	
0.517	0(0%)	1(0.7%)	Poor	Exposure to chemical substances at workplace
	0(0%)	0(0%)	Moderate	
	130(100%)	138(99.3%)	Good	
0.323	38(31.1%)	33(25.8%)	Poor	Protection against chemical substances
	60(49.2%)	60(46.9%)	Moderate	
	24(19.7%)	35(27.3%)	Good	
0.026	34(26.2%)	57(41.3%)	Poor	Cancer protection measures
	45(34.6%)	42(30.4%)	Moderate	
	51(39.2%)	39(28.3%)	Good	
0.205	3(2.3%)	6(4.4%)	Poor	Use of hormones
	10(7.8%)	18(13.2%)	Moderate	
	116(89.9%)	112(82.4%)	Good	
0.759	29(22.5%)	32(23.5%)	Poor	Stress response
	81(62.8%)	80(58.8%)	Moderate	
	19(14.7%)	24(17.6%)	Good	

\*Comparison was performed using the Chi-square test

Comparing the lifestyle risk factors of the students based on the education level of their fathers (Table 11) showed no significant differences between the students whose fathers had high school diploma or lower degrees and those whose fathers had higher education (p=0.026).

Comparing the students in different stages of their education showed a significant difference between them in terms of stress response (p=0.042), but no significant differences in terms of other factors (Table 12).

**Table 11:** Comparison of participants' condition in terms of lifestyle risk factors based on father's education level

P-Value	Father's education level		Condition	Lifestyle risk factors
	Higher education Frequency (percentage)	High school diploma or lower Frequency (percentage)		
0.257	36(23.2%)	20(17.5%)	Poor	Eating habits
	119(76.8%)	94(82.5%)	Moderate	
	0(0%)	0(0%)	Good	
0.347	4(2.6%)	1(0.9%)	Poor	Smoking and alcohol use
	6(3.9%)	2(1.8%)	Moderate	
	145(93.5%)	111(97.4%)	Good	

0.178	68(43.9%)	57(50%)	Poor	Solar radiation exposure
	67(43.2%)	37(32.5%)	Moderate	
	20(12.9%)	20(17.5%)	Good	
0.353	24(15.5%)	11(9.6%)	Poor	Exposure to chemical substances at home
	89(57.4%)	72(63.2%)	Moderate	
	42(27.1%)	31(27.2%)	Good	
0.390	1(0.6%)	0(0%)	Poor	Exposure to chemical substances at workplace
	0(0%)	0(0%)	Moderate	
	154(99.4%)	114(100%)	Good	
0.190	44(30.6%)	27(25.5%)	Poor	Protection against chemical substances
	72(50%)	48(45.3%)	Moderate	
	28(19.4%)	31(29.2%)	Good	
0.928	51(33.1%)	40(35.1%)	Poor	Cancer protection measures
	50(32.5%)	37(32.5%)	Moderate	
	53(34.4%)	37(32.5%)	Good	
0.406	7(4.6%)	2(1.8%)	Poor	Use of hormones
	17(11.2%)	11(9.7%)	Moderate	
	128(84.2%)	100(88.5%)	Good	
0.239	31(20.4%)	30(26.5%)	Poor	Stress response
	99(65.1%)	62(54.9%)	Moderate	
	22(14.5%)	21(18.6%)	Good	

\*Comparison was performed using the Chi-square test

**Table 12:** Comparison of participants' condition in terms of lifestyle risk factors based on the stage of medical education

P-Value	Chi-square statistic	75th percentile	Median	25th percentile	Frequency	Stage of medical education	Lifestyle risk factors
0.364	3.185	69.90	65.10	60.80	40	Pre-clinical courses	Eating habits
		65.44	63.20	60.38	44	Physiopathology	
		67.45	62.80	60.00	90	Clinical training	
		67.06	64.49	61.96	95	Internship	
0.994	0.083	100.00	100.00	100.00	40	Pre-clinical courses	Smoking and alcohol use
		100.00	100.00	100.00	44	Physiopathology	
		100.00	100.00	100.00	90	Clinical training	
		100.00	100.00	100.00	95	Internship	
0.857	0.769	68.33	60.83	57.50	40	Pre-clinical courses	Solar radiation exposure
		69.17	59.17	55.83	44	Physiopathology	
		71.67	58.33	56.67	90	Clinical training	
		68.33	61.67	58.33	95	Internship	
0.980	0.182	81.11	75.56	64.44	40	Pre-clinical courses	Exposure to chemical substances at home
		80.00	75.56	62.22	44	Physiopathology	
		80.00	73.33	64.44	90	Clinical training	
		80.00	71.11	64.44	95	Internship	
0.478	2.486	100.00	100.00	96.55	40	Pre-clinical courses	Exposure to chemical substances at workplace
		100.00	100.00	94.83	44	Physiopathology	
		100.00	98.28	96.55	90	Clinical training	
		100.00	98.28	96.55	95	Internship	

0.080	6.770	78.00	70.00	60.00	40	Pre-clinical courses	Protection against chemical substances
		80.00	68.00	52.00	44	Physiopathology	
		80.00	72.00	60.00	90	Clinical training	
		72.00	65.00	50.00	95	Internship	
0.149	5.337	73.72	60.26	47.44	40	Pre-clinical courses	Cancer protection measures
		83.01	69.96	51.28	44	Physiopathology	
		83.33	71.79	53.21	90	Clinical training	
		82.69	67.42	54.17	95	Internship	
0.432	2.750	101.00	100.00	98.00	40	Pre-clinical courses	Use of hormones
		102.00	100.00	97.00	44	Physiopathology	
		100.00	100.00	99.00	90	Clinical training	
		101.00	100.00	96.00	95	Internship	
0.042	7.710	80.00	69.23	61.54	40	Pre-clinical courses	Stress response
		76.92	69.23	63.85	44	Physiopathology	
		70.94	64.62	58.46	90	Clinical training	
		63.85	63.69	60.00	95	Internship	

\*Comparison was performed using the Chi-square test

#### 4. Discussion

In this study, the goal was to determine the frequency of lifestyle risk factors for cancer in the medical students of Mashhad University of Medical Sciences. The results of this study showed that the majority of the participating students had moderate eating habits (79.2%), but none of them were in good condition in this respect. In terms of smoking and alcohol use, 95.2% of the students were in good condition, while less than 5% of them were in poor conditions. About 46.5% of the surveyed students were in poor conditions in terms of solar radiation exposure. Around 60% of the students had a moderate level of exposure to chemical substances at home and 99.6% of them had a good (low) level of exposure to chemical substances at workplace. However, out of those who were exposed to chemical substances, 28.4% had poor protection whereas 48% had moderate protection against these substances. About 34% of the surveyed students were in poor conditions in terms of cancer protection measures (regular tests for early detection). While 23% of the students had poor levels of stress response, the majority of them (60.8%) were in moderate conditions in this respect.

In the population of the surveyed medical students, the best condition in terms of eating habits was for dairy products (35% good and 59.1% moderate) and the worst was for starchy foods (94.4% poor and 5.6% moderate) and oils (62% poor and 37.2% moderate).

The results also showed that women and married people take more protective measures against chemical substances, and that men are in a better condition in terms of hormone use than women.

Cancer protection measures were better in the students whose mothers had high school diploma or lower degrees than those whose mothers had higher education. Also, medical students who were at later stages of their education were in better condition in terms of stress response.

In a 2013 study by Zolfaghari et al. on the lifestyle risk factors of citizens of Tehran, their findings showed that 40.4% of their subjects had no direct sunlight exposure; 62% were exposed to bleach products; 45.8% were anxious, and 46.7% of them had a poor BMI, reflecting an unhealthy lifestyle. Based on these findings, these researchers concluded that the majority of Tehran citizens have poor lifestyle in terms of cancer prevention, which needs to be somehow altered to boost cancer prevention in this population [25]. The results of our study are consistent with Zolfaghari's findings in the area of poor eating habits, but not in other areas, especially in the extent of the undesirability of the results.

In the 2014 study of Momayezi et al. on the cancer prevention-related lifestyle patterns of students in Yazd, the results showed that married people had significantly higher scores in eating habits and single

people had significantly higher scores in physical activity. They also reported that people with a BMI of less than 20 (lean individuals) were more likely to be in poor conditions in terms of mental and physical health and physical activity than others. Also, people with higher education levels had higher levels of physical activity and employed people earned a higher score in this area than unemployed people. In terms of living conditions, students who were living in their own homes had better scores regarding mental and physical health. Ultimately, Momayezi et al. concluded that the cancer prevention lifestyle of their subjects in its various dimensions can be described as relatively desirable [26]. Contrary to the study of Momayezi et al., this study observed no difference between married and single people in terms of cancer prevention lifestyle.

After studying the existing evidence on the role of environmental factors and how they affect the incidence of cancer, Amereh et al. reported that smoking, obesity, sedentary lifestyle, unhealthy diet, water, air, and food pollution, and chronic viral infections are among the major risk factors for various cancers [27].

The results of the present study showed that none of the students were in a good condition in terms of eating habits and about 20% of them were in poor condition in this respect. This finding is consistent with the findings of many other studies on the relationship between cancer and diet.

Can et al. found that regular consumption of non-starchy fruits and vegetables is associated with a reduced risk of cancer, especially cancers of the colon, mouth, and esophagus. They showed that the consumption of red meat and canned meat increases the risk of colorectal cancer and the excessive consumption of salt increases the risk of stomach cancer [28]. According to Baner et al., the regular consumption of sweets and beverages is also a risk factor for colorectal cancer [29]. Data et al. stated that the excessive consumption of fried foods, protein, and fatty foods is a risk factor for breast cancer [30]. In a study by Gupta et al., they stated that yellow and orange fruits, green cabbage, and olive oil reduce the risk of upper gastrointestinal cancer [31].

Fortunately, 95.2% of the students who participated in this study were in good condition in terms of alcohol use and smoking. The results of many studies on this subject have demonstrated that smoking and alcohol use are risk factors for a variety of cancers. This association has shown to be significant in cases of lung cancer, colorectal cancer, stomach cancer, esophagus cancer, and cervical cancer [25].

In the presents study, 46.5% of the participating students were in poor condition in terms of solar radiation exposure. Considering that Mashhad is located in an area with high sunlight exposure, the promotion of skin protection measures can be very effective in preventing skin cancers in people living in this area. Since prolonged sunlight exposure during youth can greatly contribute to the development of skin cancer in later stages of life and the youth spend most of their time in education settings, centers of higher education can play a key role in teaching the youth to protect their skin.

The results of this study showed that 34% of the surveyed students were in poor condition in terms of protection measures. Currently, workplace safety is one of the most important dimensions of safety, protection, and prevention programs around the world. Chemical substances constitute an essential part of everyday life and have a wide array of benefits and applications ranging from pesticides that improve the quantity and quality of food production to the drugs that are vital for treating diseases and cleansing products that are essential for sanitizing living spaces. Chemical substances play a key role in our modern health and welfare. They are also essential for numerous industrial processes that are of great importance for raising global living standards. Nevertheless, limiting exposure to chemical substances in workplaces and also their release into the environment are among the primary health and safety duties of governments as well as employers [24, 25].

The results of this study also showed that women and married people take more protective measures against chemical substances. It was also found that men were in a better condition in terms of hormone use than women. This is probably because of the consumption of contraceptives and other hormone control pills by women.

One of the limitations of this study was the possibility of respondents giving inaccurate answers to some questions. To minimize this issue, the researchers tried to emphasize the confidentiality of any personal information provided via the questionnaire. One of the strengths of this study was the good participation of students from all stages of medical education.

## 5. Conclusion

The medical students of Mashhad University of Medical Sciences were found to have poor “eating habits” and “solar radiation exposure”. About half of the surveyed students had an unfavorably high level of exposure to sunlight. The surveyed students had lower

exposure to chemical substances at workplaces than at home. About 30% of the students were not taking adequate cancer protection measures and were performing poorly in this respect. Implementing a program to raise students' awareness of cancer risk factors and promote healthy lifestyle with a focus on a diet with more vegetables, fruits, fiber, milk, and dairy products and less meat and antioxidants and also on physical activity should be part of primary prevention agenda. Thus, health officials and staff, especially community health nurses, need to develop appropriate plans to change students' lifestyle, health behaviors, and habits.

## Ethical Considerations

### Compliance with ethical guidelines

In terms of ethical considerations, the present study was ethical in two respects: first, all the participants volunteered to participate in the study, and secondly, keeping in mind the principles of confidentiality and secrecy, participants were assured that all information would remain confidential and that the results would be reported in a general manner. All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1975 Helsinki declaration and its later amendments or comparable ethical standards. This article reports the results of a research project approved by Mashhad University of Medical Sciences with the code of ethics (IR.MUMS.MEDICAL.REC1398.116).

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### Author's contributions

The authors equally contributed to preparing this article.

### Conflict of interest

The authors declare no conflict of interest, financial or otherwise.

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