

## Evaluation of Exposure to Carcinogenic Agents in Tehran Citizens

Mitra Zolfaghari<sup>1</sup>, Fatemeh Bahramnezhad<sup>2</sup>, Zohreh Parsa-Yekta<sup>3</sup>,  
Anooshirvan Kazemnejad<sup>4</sup>, Zahra Monjamed<sup>3</sup>

### ABSTRACT

**Background:** Today, one of the major health problems worldwide is cancer. Several factors are involved in cancer incidence; however, the role of environmental factors is more prominent. Modifying these factors and changing them into proper behavior can have a fundamental role in preventing cancer. Accordingly, this study was conducted to evaluate the exposure to carcinogenic agents in Tehran citizens.

**Methods:** This descriptive cross-sectional study was conducted on a sample size of 2500 Tehran citizens who were selected by cluster random sampling. Data collection instrument was a questionnaire with five parts including demographic information, and questions regarding alcohol and tobacco use, exposure to radiation, chemicals, and reaction to stressors. Data were collected at one time and in person. Data analysis was performed by SPSS software (v. 11.5) and descriptive statistics.

**Results:** Results showed that 10.4% of the sample consumed alcohol, 16% smoked cigarette and hookah, 22% of the subjects were always exposed to sunlight, 88.4% had no contact with chemicals at work place and 94.4% were not taking hormone during menopause and the majority of subjects (45.8%) got angry sometimes.

**Conclusion:** Most of Tehran Citizens are exposed to carcinogenic agents, especially radiation, cigarette smoke, chemicals and with less intensity with stressors. Due to the fact that alcohol is prohibited in Islam, no clear information is available about its consumption. It is helpful to educate people about the carcinogenic agents.

**Keywords:** Cancer, Carcinogenic Agents, Exposure, Tehran Citizens.

1. Department of Critical Care Nursing, School of Nursing and Midwifery, Tehran University of Medical Science, Tehran, Iran.

2. School of Nursing and Midwifery, Tehran University of Medical Science, Tehran, Iran.

3. Department of Medical and Surgical Nursing, School of Nursing and Midwifery, Tehran University of Medical Science, Tehran, Iran.

4. Dept. of Biostatistics, Tarbiat Modares University, Tehran, Iran.

**\*Corresponding Author:**

Fatemeh Bahram-Nejad,  
School of Nursing and Midwifery,  
Tehran University of Medical Science, Tehran, Iran.

Tell: +989133974856 E mail: Fatemeh\_Bahramnezhad@yahoo.com

## Introduction

Cancer is one of the major health problems in human community such that more than 40% of Europeans suffer from cancer during life. Cancer incidence has increased considerably in recent years. In Europe, the number of people with cancer reached from 2.9 million in 2004 to 3.2 million in 2006.<sup>1</sup> In the past decade, 23% of all deaths in the United States have been associated with different kinds of cancer.<sup>2</sup> This disease is the second leading cause of mortality worldwide,<sup>3</sup> and each year 10 million new cases of cancer are recognized worldwide and if a solution to prevent this health problem will not be found in next 17 years, the figure will reach 20 million people per year.<sup>4</sup> Every year, more than six million deaths occur worldwide as a result of cancer.<sup>5</sup> This disease not only affects the person's physical condition, but also overshadows his mental state and his economic and social conditions.<sup>6</sup> In Iran, 30,000 people die of cancer annually.<sup>7</sup> What is certain is that cancer is the result of several factors<sup>8</sup> and the interaction between genes and environmental factors is evident in its incidence.<sup>9</sup> Of all cancers, 5% to 10% occur due to genetic problems<sup>10</sup> and 90% to 95% of cancers are caused by environmental factors and people's lifestyle. Cigarette smoking and alcohol consumption, obesity, infectious agents, sunlight, stress, environmental pollutants and some foods are the most important factors in causing cancer.<sup>11</sup> Evidence shows that of 559,650 deaths due to cancer in 2007, a third was associated with nutrition, physical activities and overweight and obesity, while all of them are preventable.<sup>12</sup> Alcohol is responsible for 3% of all cancer cases worldwide.<sup>13</sup> Also, the risk of all types of cancer including the most common cancer in women (breast cancer) has a direct relationship with alcohol consumption and 7.1% of all cancers caused by alcohol consumption.<sup>14</sup> Although the immune system plays an important role in destroying cancer cells, a further weakened immune system and more growth of cancer cells will occur following stress.<sup>15</sup>

Robert & Black believe that UV and behavioral risk factors are responsible for 90% of skin cancers. In almost all types of skin cancers, the role of UV can be clearly seen.<sup>16</sup> For the maintenance and promotion of health, modification and improvement in living conditions and modification of environmental factors are necessary, in

that most of the data obtained suggest a close relationship between health and people's lifestyle.<sup>17</sup> Since environmental factors play an important role in cancer incidence and exposure to these factors is preventable, cancers can be largely prevented through identifying these factors and preventing exposure to them. Nurses can play an important role in disease prevention because of their training role. They also have more responsibility toward health behaviors and modification of these behaviors. In fact, training to identify cancer risk factors and how to deal with them, identifying the exposure of people to carcinogens and modifying them is nurses', particularly community health nurses' responsibility.<sup>18</sup> Today, cancer is not addressed as a disease but is considered as a health problem and since environmental factors have more important roles in cancer, people need to know these factors and at the time of exposing they should know the ways of preventing them. The current study was conducted to assess exposure of Tehran citizens to environmental risk factors and carcinogenic agents.

## Materials and Methods

This descriptive cross-sectional study was conducted on a sample of 2500 Tehran citizens who were selected by random cluster sampling. Thus, by using the map of Tehran, 84 clusters were determined so that 17 clusters in each part: north (from north-west to north-east), west (from north-west to south-west), south (from south-west to south-east), east (north-east to south-east) and 16 clusters in the center were identified. Each cluster comprised 10 households and each household had an average of three members, so each cluster contained 30 citizens.

The cluster heads were selected by a statistical consultant on a map, then the questioners attended the relevant address and the nine houses next to it made up that cluster. If, for any reason, the questioners could not receive responses from the first house, they went to the next house. If a family member was absent, the questioner had to return the next day and collect his/her related information. In order to reduce the probability of people's absence, data were collected in the afternoon hours when all family members were present at home, unless a person was traveling. It should be mentioned that the questioners attempted to collect samples' information after they

introduced themselves and showed their valid photo ID, prepared for the survey purpose, and explained the goals of the research and obtained their informed consent. The questionnaires were filled anonymously. Subjects could refuse to deliver the questionnaire even after completing it and not to participate in the study. The study population included all native Iranian adults who were Tehran citizens and had research inclusion criteria (age more than 18 years, not suffering from cancer during the study, residents of Tehran and willing to participate in the study). Data collection method was interview and instrument for collecting data was a questionnaire with five sections including demographic information (15 questions), smoking and alcohol use (12 questions), exposure to sun's rays, X-ray, microwave and radioactive materials (10 questions), exposure to chemicals in the workplace and its protective measures and the use of hormones (47 questions), response to stressors (13 questions). The questionnaire's items were designed in two forms: Likert (five-point scale with 5 for the correct behavior and 1 for the wrong behavior and zero for the answer of never and irrelevant, and a reverse score was given for the negative questions), and Yes–No (score 1 for Yes and 0 for No). The questionnaire validity was determined by content validity. At first, the instrument was prepared by reading scientific literature including similar studies and then was given to ten faculty members, a blood expert, an oncology specialist and a food chemistry expert and for their views and they were applied and the final questionnaire was developed. To determine the instrument's scientific reliability, Cronbach's alpha method was used and alpha coefficient of 0.85 was obtained. Data collection was performed in spring and summer (6 months). After data collection, data were entered into SPSS software version 11.5 and were analyzed by Chi-square statistical test. It should be noted that this paper is the conclusion of a part of a research project titled "Study of Tehran citizens' lifestyle toward cancer prevention".

## Results

The results showed that 74.4% of the sample were in age group of 18-45 years with a mean age of 36.01 for men, and a mean age of 34.11 for women, 52.9% of the subjects were female and 58.9% were married, 43.9% were

employed and 27.2% worked in the city center. The results showed that 10.4% of Tehran citizens consumed alcohol. Absolute and relative frequency distribution of findings with carcinogenic agents such as cigarette, pipe and hookah are listed separately in **Table 1**. Among the citizens who have been in contact with chemicals in their workplace, 69.4% have been in contact with one to five materials and 7.9% have been in contact with 11-15 chemicals (**Table 2**). On the exposure of study population to other chemicals, 87.4% did not use oral contraceptive pill (OCP), 94.4% did not use hormone replacement therapy during menopause and 97.7% did not use bodybuilding hormones. In **Table 3**, self-report of Tehran citizens with stressors is shown (**Table 3**). Frequency of Tehran citizens' exposure to radiation is listed in **Table 4**.

## Discussion and Conclusion

Findings of the current research showed that 10.4% of the study subjects consumed alcohol. Of course, considering that alcohol is forbidden in Islam and Iran's law, it is likely that the answer to this question has not been honest and the actual consumption is more than this. Alcohol is among the most important environmental factors for cancer. Brown in a study conducted in 2005 titled "Epidemiology of the relationship between cancer and alcohol consumption" stated that alcohol is involved in 25% to 80% of all cancers of oral cavity, pharynx, and larynx, and the effects of excessive alcohol consumption on pancreas cancer is quite evident.<sup>19</sup> Further studies have also indicated the role of alcohol in gastrointestinal, colorectal, liver, pancreatic, and breast cancer incidence.<sup>20, 21</sup> In addition to the direct role of alcohol in cancer incidence, its use leads to stressful emotions, anger and anxiety and indirectly plays a weakening immune system and causing cancer.<sup>22</sup> Findings of the research showed that 16% of the subjects smoked cigarette and 15.8% smoked hookah from 'always' to 'in the most time', while studies have shown that lung cancer is increasing day by day and the main reason (80%) is exposure to cigarette smoke (primary and secondary). According to the report of Thun et al. in 1965, 44% of people over 18 years in the United States were cigarette smokers and this proportion reached 55% in 2006 and this has led to increased risk of lung cancer. Each year more than 1.4 million people die of lung

**Table 1: Absolute and relative frequency distribution of study population's exposure to carcinogenic materials such as cigarette, hookah, and pipe**

Carcinogen			Number	Percentage		
Cigarette	Number of cigarettes per day	1-10	174	43.6		
		20-11	123	30.8		
		21-30	81	20.3		
		31-40	21	5.3		
	Type of cigarettes smoked	Filtered	377	94.5		
		Unfiltered	22	5.5		
	Duration of use (years)	1-10	191	47.9		
		11-20	66	16.5		
		21-30	76	19		
		31-40	5	11.3		
		41-50	14	3.5		
		51-60	7	1.8		
Hookah	Duration of use (years)	1-5	268	66.2		
		6-10	93	23		
		11-20	32	7.9		
		21-40	12	3		
	The frequency of use	Always	21	5.2		
		Most of the time	42	10.4		
		Sometimes	159	39.3		
	Rarely		183	45.2		
		Pipe	Duration of use (years)	1-5	53	71.6
				6-10	14	18.9
11-15	7			9.5		
	The frequency of use in 24 hours	1-2	68	91.9		
		3-4	5	6.8		
		5	1	1.4		

cancer and 85% of lung cancer deaths occur in people who are exposed to cigarette smoke. In addition, stress and anxiety lead people to cigarette smoking, all of which are important factors in cancer incidence.<sup>23</sup> Yun et al., in a study titled "Cigarette and cancer incidence risk in men", showed the relationship between cigarette smoking and cancer risk in urinary system, oral cavity, pharynx and pancreas and stated that cancer incidence in different systems of the body<sup>24</sup> and oral cavity is greater following cigarette smoking.<sup>25</sup> The results of the current study showed that 22% of subjects have always been exposed to the sun's rays, while researchers believe that more than 10% of all cancers are caused by radiation.<sup>10</sup> Williams pointed to carcinogenic role of radioactive rays and stated that radioactive rays play an important role in thyroid cancer incidence.<sup>26</sup> But results of Moreno et al. study are contrary to results of other studies, and they believe that sunlight causes the prevention of several major cancers, and it is not essentially risky.<sup>27</sup> Milham in a study conducted in 2009 showed that the leading cause of testicular cancer incidence, leukemia, multiple myeloma, colon, rectum, stomach, brain, and thyroid cancer in firemen is long exposure to radiation.<sup>28</sup> The results showed that the highest percentage of study subjects were exposed to 1-5 chemicals at workplace (69.4%) and the lowest percentage (7.9%) contacted with 10-15 chemicals. However, chemical agents have an evident role in causing cancer.<sup>1</sup> Researchers also believe that cancer is associated with exposure to chemical agents; for example, the results of Heck et al. study showed that lung cancer has a relationship with exposure to arsenic and those exposed to more than 0.05 µg/g arsenic are more susceptible to lung cancer.<sup>29</sup> and Vocht et al. believe that exposure to aromatic amines in rubber factories is one of the causes of increase in cancer and argue that they cause prostate and bladder cancer in men and breast cancer in women even in low levels.<sup>30</sup> Results of Bolt and Golka study titled "The debate on carcinogenicity of permanent use of hair dyes" showed that 1.7% of bladder cancers in women aged 30-55 years are due to the permanent use of hair dyes.<sup>31</sup> On the carcinogenic chemicals, Byun et al. concluded that long-term use of certain pesticides increases the risk of cervical cancer.<sup>32</sup> Rushtona stated that benzene, arsenic, oils, solar radiation, silica, and variety of colors play a fundamental and important role in cancer incidence.<sup>34</sup> Al-

**Table 2: Absolute and relative frequency distribution of the study population's exposure to chemicals at home**

Chemicals	Answer		Always		Most of the time		Sometimes		Rarely		Never		Total
	Frequency	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
NaOCl		131	5.2	350	14	864	34.6	686	27.4	469	18.8	2500	100
Insecticide		76	3	256	10.2	817	32.7	802	32.1	549	22	2500	100
Fertilizer		21	0.8	59	2.4	283	11.3	693	27.7	1444	57.8	2500	100
Spraying plants		11	0.4	35	1.4	222	8.9	604	24.2	1628	65.1	2500	100
Hydrogen chloride		29	1.2	100	4	425	17	740	29.6	1206	48.2	2500	100
Chemical air fresheners		170	6.8	275	11	563	22.5	569	22.8	923	36.9	2500	100
Chemical hair color		122	4.9	247	9.9	541	21.6	341	13.6	1249	50	2500	100
Hair spray		73	2.9	124	5	323	12.9	466	18.6	1514	60.6	2500	100
Antiperspirant spray		429	17.2	415	16.6	398	15.9	318	12.7	940	37.6	2500	100

**Table 3: Absolute and relative frequency distribution of Tehran citizens self-report on stressors**

Response	Always		Most of the time		Sometimes		Rarely		Never		Total		Total
	Frequency	Number	Percentage	Number	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	
Angry	169	6.8	505	20.2	1145	45.8	539	21.6	142	5.7	2500	100	
Fierce and furious	102	4.1	324	13	897	35.9	780	31.2	397	15.9	2500	100	
Depressed	98	3.9	274	11	687	27.5	743	29.7	698	27.9	2500	100	
Disappointed	116	4.6	263	10.5	573	23.1	670	26.8	873	34.9	2500	100	
Impatient	149	6	368	14.7	903	36.1	721	28.8	359	14.4	2500	100	
Anxious	152	6.5	364	14.6	773	30.9	718	28.7	483	19.3	2500	100	
Scared	95	3.8	176	7	512	20.5	723	28.9	994	39.8	2500	100	
Aggressive	103	4.1	246	9.8	728	29.1	730	29.2	693	27.7	2500	100	
Isolated and reserved	76	3	186	7.4	519	20.8	621	24.8	1098	43.9	2500	100	
Tired	239	9.6	420	16.8	853	34.1	600	24	5388	15.5	2500	100	
????	207	8.3	353	14.1	605	24.2	533	21.3	802	32.1	2500	100	
Obsessive-compulsive	110	4.4	214	8.6	449	18	533	21.3	1194	47.8	2500	100	
Pessimistic	98	3.9	182	7.3	469	18.8	562	22.5	1189	47.6	2500	100	

though 69 main carcinogenic agents have been identified at workplace and home, these chemical agents are easily identifiable and preventable.<sup>34</sup>

Results of the research showed that 94.4% of the subjects did not use hormone during menopause. A study by Cuzick on the risk of using HRT showed that using

**Table 4: Absolute and relative frequency distribution of under study Tehran citizens' exposure to radiation**

Answer	Daily		2-3 times a week		2-3 times a month		Once a month		Never		Irrelevant	Total	
	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage		Number	Percentage
Sunlight	549	22	421	16.8	241	9.6	278	11.1	1011	40.4	0	2500	100
Sunscreen lotion	505	20.2	197	7.9	135	5.4	179	7.2	1484	59.4	0	2500	100
Using cover	358	14.3	150	6.0	111	4.4	169	6.8	1712	68.5	0	2500	100
Occupational exposure to direct heat	3	0.1	0	0	1	0	4	0.2	2492	99.7	0	2500	100
Using microwave	266	31.4	67	7.9	54	6.5	55	6.5	405	47.8	1653	2500	100
Occupational exposure to radiation	0	0	1	0.05	1	0.05	0	0	2498	99.9	0	2500	100
Occupational exposure to radioactive	0	0	1	0.05	1	0.05	0	0	2498	99.9	0	2500	100

HRT increases the risk of breast cancer.<sup>35</sup> Clapp et al. also showed the role of hormone therapy in cancer incidence.<sup>36</sup> According to research subjects' self-reporting, anger was the greatest stressor in them (45.8%). Irigaray et al. showed that one of the important reasons for the increase of cancers especially after World War II, was industrialization of societies and increased stress, anxiety and then anger.<sup>37</sup> Women who are exposed to constant stress on the living environment or working environment are 3.7 times more likely than others for breast cancer.<sup>38</sup>

The results of this study indicated that most of Tehran citizens are exposed to carcinogenic agents, especially radiation, cigarette smoke (direct and indirect), chemicals agents, and relatively less exposure to stressors. It cannot be properly commented on alcohol consumption, as it is argued that the subjects might not have answered the related question honestly due to religious, cultural and legal factors. But, what can be concluded from this study is that given the essential role of environmental factors in cancer incidence and the amount of exposure of people with them, it should be seriously considered. According to studies, environmental factors play an important role in cancer incidence, but they are easily preventable. It is

necessary that before any action, the attitude and belief on cancer of organizations, especially organizations related to public health including the Ministry of Health, Treatment and Medical Education, Education Organization, Islamic Republic of Iran Broadcasting and general population be studied and according to these views, a plan be designed to deal with this problem. Factories and workshops also need to follow a national standard plan for exposure to risk factors and make their standards according to the plan. Strict supervision of the Ministry of Health, Treatment and Medical Education on observing preventive measures and screening of individuals at risk are among essentials for development of prevention programs. Nurses can play an important role in preventing cancer due to their important educational and screening responsibility. Sensitizing the population on the protection against radiation, cigarette smoke and alcohol consumption through making TV programs, educating students in schools and cultural clubs, providing brochures, banners and educational clips, using the SMS system and websites are among measures that can greatly reduce the role of environmental factors in cancer incidence by proper information and training.

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