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# Assessment of Healthy Lifestyle Habits Among Cancer Patients Before Diagnosis

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ABSTRACT

**Aim:** Cancer is one of the biggest problems of this era and is progressing with increasing momentum. Understanding the etiology of cancer is as crucial as its treatment. Numerous sources emphasize that modifiable factors constitute the largest proportion of cancer causes. This study aimed to evaluate the lifestyle habits of cancer patients and identify potential new modifiable risk factors for cancer.

**Methods:** A cross-sectional survey study was conducted. A total of 199 individuals aged 18 years and older, with a histologically confirmed cancer diagnosis, regardless of cancer type or stage, participated in the study.

**Results:** The median age of the cancer patients included in the study was 60 years (range: 20-86). A significant majority, 175 (87.9% of respondents), reported not engaging in regular exercise, whereas 24 (12.1% of respondents) reported that they exercised regularly. Furthermore, 139 (69.8%) patients worked in sedentary jobs. It was observed that a large proportion of patients [126 (63%)] had the habit of eating or drinking ≤4 hours before sleep. A statistically significant association was found between marital status and cancer stage, as 30 (82%) of unmarried patients were in the advanced stage of cancer ($p<0.001$). The use of electromagnetic radiation-emitting devices, such as smartphones, Wi-Fi, and televisions, was significantly higher among college or university graduates [n=87 (82%)] compared to other groups ($p<0.001$).

**Conclusion:** Advances in modern medicine have led to significant progress in cancer treatments; however, the disease still maintains its frightening image due to high mortality rates. Therefore, raising awareness of modifiable causes of cancer, such as lifestyle habits, is essential.

**Keywords:** Cancer risk factors, lifestyle habits, primary prevention of cancer

## Introduction

Cancer is one of the most diagnosed and the deadliest diseases. About 10 million deaths and 20 million new cases are reported worldwide each year. Unfortunately, the number of deaths is predicted to increase dramatically and will result in approximately double the current number in 20 years [1]. Therefore, hundreds of studies have been conducted to elucidate its etiology. Often, cancer development is considered multifactorial. It is usually caused by environmental factors and lifestyle choices, and just a small percentage of cases are associated with inherited genetic mutations [2,3]. Almost all risk factors of cancer are lifestyle-related, including smoking, diet, alcohol, sun exposure, obesity, physical inactivity, radiation, stress, etc. [4]. They are also modifiable risk factors. Among them, the strongest known risk factors are smoking and diet [5-8]. Based on these studies and similarities, we thought that primary prevention for cancer was essential, so we wanted to focus on modifiable factors. We hypothesize that cancer is more strongly associated with modifiable risk factors than previously thought, many of which are still unknown and not discussed. It is also, not fully known how to protect

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oneself from known risk factors. The aim of our study was to evaluate the frequency of some lifestyle behaviors that may be related to cancer development and that are often ignored or normalized among cancer patients. Cancer requires more primary prevention than other diseases, because once the diagnosis is made, both the disease and its treatment lead to devastating consequences [9-11].

## Methods

An observational single-center cross-sectional survey study was performed to investigate how lifestyle behaviors may affect cancer development. A total of 199 patients with histologically confirmed cancer were included. Data were obtained through a self-administered questionnaire completed by 199 patients from outpatient and inpatient units. The inclusion criteria were the following: [i] cancer diagnosis at any time in life, [ii] volunteering to participate, [iii] age ≥18 years. The exclusion criteria were the following: [i] too ill to understand the questions. The survey, composed of sixty-seven questions exploring at least ten dimensions, was designed after an extensive literature review. Questions aim to examine sociodemographic factors, environmental exposures, occupational history, exercise pattern, exercise environment, the relationship between exercise and food, timing of food intake, radiation exposures, daily water consumption, smoking and alcohol use, maternal birth age, breastfeeding duration, sleep duration, and quality, siesta frequency, tea and coffee consumption, UV exposure,screen-light exposure, rotation night shift work, mood pattern. Questions include multiple-choice, as well as free-text options. All the behaviors we investigated were related to the patients' lives before they were diagnosed with cancer. To improve the accuracy of the questionnaire, the researcher conducted face-to-face interviews with patients and gave them an opportunity to ask questions if there was anything they could not understand. The study garnered ethical approval, ensuring all participants fully understood its purpose. Personal permission was thoughtfully obtained from each individual, underscoring our commitment to transparency and respect throughout the research process. Ethical approval for the study was obtained from the Non-invasive Clinical Research Ethics Committee of Ankara City Hospital and was conducted in accordance with the Declaration of Helsinki (decision no: E2-22-2782, date: 09.11.2022).

### Statistical Analysis

Descriptive statistical methods (number, mean, median, percentage, frequency) were used to evaluate the study data. The Pearson chi-square was used to compare the qualitative variables. The statistical significance level was set at 0.05 in all analyses. Statistical Package for the Social Sciences version 18.0, developed by IBM (Chicago, USA), was used to analyze the data.

### Artificial Intelligence Declaration

No artificial intelligence tools were used in writing the article. All responsibility belongs to the authors of the article.

## Results

199 patients were included in the study. The median age of patients was 60 (minimum 20-maximum 86). One hundred and six (53.3 %) patients were male and 93 (46.7%) were female. Fif-teen (7.5%) were single and 160 (80.4%) were married, and 22 (11%) were divorced or widowed. Other demographic parameters were also specified. Table 1 summarizes the patients' demographic status.

Types of cancer were ranked as, lung cancer 39 (19.6%), genitourinary system cancer 29 (14.6%), breast cancer 23 (11.6%) and colorectal cancer 14 (7%). Ninety-four (47.2%) patients had advanced cancer, and 76 (38.2%) patients had early stage cancer. Ninety-six (49.2%) patients reported a family history of cancer in first, second, or third-degree relatives. The majority of cancer patients participating in the study, 145 (73%), were breastfed for more than 6 months. Table 2 summarizes cancer, patients, and family characteristics.

According to the smoking status, patients were grouped as 98 (49.2%) smokers, 96 (48.2%) non-smokers. 42 (21.1%) patients

**Table 1. Demographic status**

| | Median (min-max) | Number of patients (n) | Percentage (%) |
|---|---|---|---|
| Age, years | | | |
| | 60 (20-86) | | |
| Gender | | | |
| Female | | 93 | 46.7 |
| Male | | 106 | 53.3 |
| Marital status | | | |
| Single | | 15 | 7.5 |
| Married | | 160 | 80.4 |
| Divorced/widowed | | 22 | 11 |
| Education | | | |
| Illiterate | | 18 | 9 |
| Less than college | | 142 | 71.4 |
| College/university | | 35 | 17.6 |
| Number of children | | | |
| | 3 (0-11) | | |
| Never have | | 15 | 7.5 |
| 3 children or less | | 123 | 61.8 |
| 4 or more | | 41 | 20.5 |
| Job | | | |
| Civil servant | | 29 | 14.6 |
| Worker | | 38 | 19.1 |
| Others | | 48 | 24.1 |
| Salary (per month ) (5500 TL = minimum wage) | | | |
| Less than 5500 TL | | 56 | 28.1 |
| 5500 TL | | 79 | 39.1 |
| More than 5500 TL | | 50 | 25T |

TL: Turkish lira, min-max: Minimum-maximum

quit smoking after being diagnosed and 157 (78.9%) continued to smoke. According to exercise status, 24 (12.1 %) patients engaged in regular exercise, while 175 (87.9%) of patients did not exercise. In this study population, 85 (42%) of the patients consumed water in plastic containers, while 113 (57%) consumed water from glass bottles or by purification. One hundred and thirty-nine (69.8%) cancer patients participating in the study work in sedentary conditions, whereas 51 (25.6%) of them work in non-sedentary conditions.

It was observed that 40 (20.6%) of cancer patients slept less than 6 hours a day and their sleep was frequently interrupted. Most of the patients [126 (63%)] eat something within ≤4 hours before going to sleep; some of them [68 (34%)] do not eat. Most of patients [146 (73%)] used smartphones or watched television as a last activity before sleep. In this study population, 137 (67%) patients have more than 2 hours of daily screen exposure time, including blue light. Mood status in cancer patients over the last few years before cancer diagnosis was categorized as follows: 83 (41.7%) of patients were generally stressed, 54 (27.1%) patients were generally happy, 19 (9.5%) of patients were generally upset, and 38 (19.1%) of patients had a non-dominant mood. Table 3 summarizes lifestyle behaviors.

**Table 2. Cancer patients and family characteristics**

| | Number of patients (n) | Percentage (%) |
|---|---|---|
| Cancer type | | |
| Lung | 39 | 19.6 |
| Breast | 23 | 11.6 |
| Gus | 29 | 14.6 |
| Colorectal | 14 | 7 |
| Other | 39 | 19.6 |
| Stages | | |
| Early stage | 76 | 38.2 |
| Advanced stage | 94 | 47.2 |
| Family cancer history | | |
| No | 103 | 51.8 |
| Yes | 96 | 48.2 |
| Maternal age at birth | | |
| ≤40 years | 183 | 92 |
| >40 years | 7 | 3.5 |
| Breastfeeding duration | | |
| None | 9 | 4.5 |
| Less than 6 months | 29 | 14.6 |
| More than 6 months | 145 | 72.9 |
| Which child is she/he in the family | | |
| First child | 51 | 25.6 |
| Second or third child | 87 | 43.7 |
| Fourth or more | 57 | 28.6 |

There was statistical significance between marital status and disease stage. 30 (82%) of unmarried patients were in the advanced stage of the disease (p<0.001). It was observed that

**Table 3. Lifestyle behaviors**

| | Number of patients (n) | Percentage (%) |
|---|---|---|
| Smoking use | | |
| Yes | 98 | 49.2 |
| Never | 96 | 48.2 |
| Cessation of smoking after diagnosed (How many years not smoked) | | |
| For 5 years | 11 | 5.5 |
| 5-10 years | 10 | 5 |
| More than 10 years | 21 | 10.6 |
| Total | 42 | 21.1 |
| Continues to smoke | 157 | 78.9 |
| Exercise | | |
| Regular | 24 | 12.1 |
| No | 175 | 87.9 |
| Obtaining method of water | | |
| Purifier/fountain/glass | 113 | 56.8 |
| Plastic | 85 | 42.7 |
| Working condition | | |
| Sedentary | 139 | 69.8 |
| Non-sedentary | 51 | 25.6 |
| Sleep duration | | |
| Lower than 6 hours | 41 | 20.6 |
| 6-8 hours | 116 | 58.3 |
| More than 8 hours | 39 | 19.6 |
| Sleep quality | | |
| Interrupted | 133 | 66.8 |
| Never interrupted | 62 | 31.2 |
| Eating before sleeping | | |
| Within 4 hours | 126 | 63.3 |
| After 4 hours | 68 | 34.2 |
| Habit before sleep | | |
| Reading book | 6 | 3 |
| Mobile phone & tv & computer | 146 | 73.4 |
| None | 40 | 20.1 |
| Daily screen exposure time | | |
| Less than 2 hours | 52 | 26.1 |
| More than 2 hours | 137 | 68.8 |
| Mood over the last few years | | |
| Generally happy | 54 | 27.1 |
| Generally stressfully-upset | 102 | 51.3 |
| No dominant mood | 38 | 19.1 |

the usage of radiation-emitting devices such as smartphones, wifi, and television in the university/college graduate group [n=87(82%)] was significantly higher than that in the less educated population (p<0.001)

In our study population, we found that 64 (70.3%) of patients in the advanced stage had sedentary working conditions. (p=0.148). Additionally, 79 (56.8%) of individuals with a sedentary lifestyle were college/university graduates, but this analysis did not reach statistical significance (p=0.35). Among the cancer patients participating in the study, a difference in daily sleep hours was observed between those with a screen time of ≤2 hours and those with >2 hours. Patients with shorter screen exposure (n=109, 64%) were able to sleep ≥6 hours per day (p<0.001). In addition, it was observed that the majority of cancer patients with sedentary working conditions [26 (65%)] could sleep less than 6 hours, and this difference was significant (p=0.005). It was observed that the rate of those who did not demonstrate sun protection behavior was significantly lower in the low-income group 48 (87%) than in the higher-income group of cancer patients (p=0.018).

## Discussion

This study investigated the link between lifestyle behaviors and the risk of developing cancer. Additionally, this study addresses possible risk factors that were insufficiently studied previously, such as sleep duration.

Age is one of the major risk factors for cancer, more than 50 percent of cancer patients are >65 years of age in the world. Unfortunately, due to lifestyle changes, the age of cancer diagnosis has decreased significantly in the last few decades [12]. In our study population, which is consistent with the literature, the median age of patients was 60 years, with a range from 20 to 86; most patients were younger than 65 years of age.

Smoking is a well-established risk factor for several types of cancer, particularly lung cancer [13]. Approximately 80% of individuals diagnosed with lung cancer were current or former smokers [14]. Also, roughly 80% of lung cancer-related fatalities are observed in patients with a history of smoking [15,16]. Thirty-eight of the patients included in our study had lung cancer diagnoses, and a significant portion of them, 26 (69%), had smoked. Additionally, 98 (49.2%) of the cancer patients participating in the study were smokers. Strong evidence supports the idea that smoking increases the risk of not only lung cancer but also colorectal cancer by approximately 15% [17]. In our study, 57% of individuals diagnosed with colorectal cancer reported a history of smoking. The findings in our study support the relationship between smoking and cancer development.

In our study, the proportion of cancer patients using plastic bottles as a source of drinking water was 85 (42.7%), which is quite high. Studies in the literature investigating the potential carcinogenic effects of long-term plastic bottle usage show similarities with our findings [18-22]. This finding is also important and warrants further investigation regarding the relationship between plastic use and cancer development for public health.

According to Wang et al. [23], daily eating patterns are a significant factor in cancer development due to their impact on the endogenous circadian rhythm mechanism. In our study, 126 (63.3%) of cancer patients were found to consume food within four hours before sleep. This finding suggests that eating before sleep may disrupt the circadian rhythm, potentially playing a role in cancer development.

There is a substantial body of evidence indicating a relationship between regular physical activity, exercise timing, and cancer incidence [24,25]. Notably, a 2021 study conducted in Spain demonstrated that engaging in physical activities in the early morning and evening could reduce the risk of prostate and breast cancers [26]. Regular physical activity is a modifiable lifestyle factor that has been consistently associated with a significant reduction in cancer risk [27]. In our study, 174 (87.9%) of participants were found not to engage in regular exercise. This high percentage supports a strong link between physical inactivity and cancer development. Additionally, in our study, no statistically significant relationship was found between exercise time and cancer types (p=0.48).

Although alcohol is not as strongly associated with cancer as smoking, numerous studies have demonstrated that chronic alcohol consumption is a significant risk factor for various types of cancer [28,29]. Research conducted in Atlanta indicates that the combined use of alcohol and tobacco significantly increases the risk of cancer, particularly oropharyngeal, esophageal, laryngeal, and breast cancer, compared to the individual effects of either factor alone [30]. However, in this study, the relationship between combined alcohol-tobacco consumption and cancer types did not reach statistical significance (p=0.7).

The study by Sancar and Van Gelder [31] provided stronger evidence for the relationship between the circadian rhythm mechanism and cancer, allowing a better understanding of this connection. These findings highlight the need for further detailed investigation into the link between sleep patterns and cancer. As per Li et al. [32], the optimal duration of sleep for reducing cancer risk is 7-8 hours. Contrary to the literature, in our study, most cancer patients were found to sleep between 6-8 hours. Also consistent with our study, in a study conducted by Cai et al. [33], which examined the association between sleep duration and breast cancer, no statistically significant correlation was identified between the two variables.

Xiao et al. [34] demonstrated that nighttime exposure to light disrupts the circadian rhythm and may increase the risk of pancreatic cancer. In accordance with this finding, we found that 146 (73.4%) of participants reported using phones or computers before going to sleep. This suggests that blue light emitted from electronic devices may impact the circadian rhythm, potentially contributing to the development and progression of cancer.

Skin cancer is the most commonly diagnosed type of cancer in the United States, with millions of cases reported annually [35-38], of which 90% are non-melanoma. This finding emphasized that protecting against UV radiation plays a critical role in reducing the risk of skin cancer [39]. In our study, sun protection behavior was found to be significantly different

between patients in low and high-income groups. (p=0.018). Forty-eight (87%) individuals earning minimum wage or less reported not taking any precautions against sun exposure. Furthermore, these findings emphasize the importance of socioeconomic factors in playing a crucial role in influencing sun protection behaviors.

According to Stuebe [40], breastfeeding reduces the risk of breast and ovarian cancers, as well as several other types of cancer, in mothers. In our study, a significant relationship was found between the duration of breastfeeding and alcohol use in later years. 114 (82%) of patients who did not consume alcohol were found to have breastfed for more than six months (p=0.039). This finding suggests a strong potential relationship between alcohol consumption and breastfeeding, warranting further detailed investigation into this association.

The impact of working life on health is closely related to the environmental conditions. A study conducted in Japan in 2022 investigated the relationship between walking time, type of work, and posture during work and the incidence of colorectal cancer. The results indicated that increased physical activity during working hours, particularly walking, was associated with a reduced risk of colorectal cancer [41]. In our study, 27 (65%) of individuals who slept less than six hours per day were employed in sedentary jobs (p=0.005). This finding suggests that prolonged physical inactivity and irregular sleep habits may increase the risk of cancer.

The study by Wegrzyn et al. [42] indicated that long-term rotating night shift work, particularly among women working shifts during early adulthood, was associated with an increased risk of breast cancer. In our study, we obtained indirect data supporting this finding. There was a statistically significant association observed between night shift work and smoking. Among non-smokers, 77 (93%) had never worked night shifts (p<0.001), suggesting that smoking behavior may be linked to the sleep disturbances caused by night shift work. The literature also supports the notion that work-related factors may increase cancer risk [43].

### Study Limitations

This study presents several limitations that should be taken into account when interpreting the findings. First, the absence of a control group and the cross-sectional nature of the study design limit the ability to establish causal relationships and reduce the etiological interpretability of the results. Second, the relatively small sample size may reduce statistical power, affecting the precision and reliability of the findings. Therefore, the generalizability of the results to broader populations remains limited. Third, reliance on self-reported data introduces the potential for bias, particularly recall and social desirability biases, which may compromise data accuracy. Finally, the study sample was drawn from a single geographic region, which may limit the representativeness of the findings and restrict their applicability to populations in different settings or healthcare systems. Taken together, these limitations highlight the need for cautious interpretation of the results and emphasize the importance of further studies with more rigorous designs and diverse, larger populations.

This study examined the impact of lifestyle behaviors on cancer development, highlighting both well-established and underexplored risk factors. Specifically, physical inactivity, prolonged exposure to blue light from electronic devices, irregular exercise habits, circadian rhythm disruption, and workplace conditions.

## Conclusion

In conclusion, raising awareness about modifiable lifestyle-related risk factors such as physical activity, sun protection, working conditions, smoking, among others, and making these factors actionable for a wider population will play a critical role in reducing cancer incidence. More extensive, long-term, and prospective studies are needed to develop effective prevention strategies.

### Ethics

**Ethics Committee Approval:** Ethical approval for the study was obtained from the Non-invasive Clinical Research Ethics Committee of Ankara City Hospital and was conducted in accordance with the Declaration of Helsinki (decision no: E2-22-2782, date: 09.11.2022).

**Informed Consent:** Personal permission was thoughtfully obtained from each individual, underscoring our commitment to transparency and respect throughout the research process.

### Footnotes

### Authorship Contributions

Surgical and Medical Practices: U.T.M., D.Ş.D., M.D.G., Concept: U.T.M., D.Ş.D., S.E., Design: U.T.M., D.Ş.D., M.D.G., S.E., Data Collection or Processing: U.T.M., D.Ş.D., S.E., Analysis or Interpretation: U.T.M., D.Ş.D., M.D.G., Literature Search: U.T.M., Writing: U.T.M., D.Ş.D., M.D.G.

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