

## Original Article

# The Factors Influencing the Taste Alterations in Patients Receiving Chemotherapy

**Celik Aysegul, RN, Ph.D of Internal Medicine Nursing**  
Izmir Provincial Health Directorate/Izmir, Turkey

**Duzgun Gonul, RN, Ph.D of Internal Medicine Nursing**  
Health Sciences University, Tepecik Training and Research Hospital, Palliative Care Department,  
Yenisehir/ Konak. Izmir, Turkey

**Usta Yesilbalkan Oznur, PhD**  
Assist. Prof., Ege University, Nursing Faculty, Department of Internal Medicine Nursing, Izmir, Turkey

**Yildirim Yasemin, PhD**  
Prof., Ege University, Nursing Faculty, Department of Internal Medicine Nursing, Izmir, Turkey

**Correspondence: Celik Aysegul, RN, Ph.D of Internal Medicine Nursing, Izmir Provincial Health Directorate, Izmir, Turkey E-mail: aysegul.g.celik@gmail.com**

### Abstract

**Background:** The taste alterations or dysgeusia are among the common side effects in patients receiving chemotherapy.

**Objective:** The aim of this study was to determine the taste alterations and the influencing factors in patients receiving chemotherapy.

**Methods:** The data of this cross-sectional descriptive study were collected between February 1 and July 30, 2016 in the outpatient chemotherapy unit of a university-affiliated oncology hospital. The sample of the study was formed by 196 patients who were receiving treatment for cancer in the outpatient chemotherapy unit, older than 18 years, had verbal communication and had at least 2 chemotherapy sessions. Data were collected using "Patient Information Form" and "The Chemotherapy-induced Taste Alteration Scale". SPSS 21.0 package program was used in the analysis of the data and the number, percentage distributions of the data and the mean and standard deviation of the numerical variables were calculated. Nonparametric tests were used to compare dependent and independent group variables.

**Results:** Of the patients who agreed to participate in the survey, 57.7% were female, 49.0% were in the 40-59 age group, 78.6% were married, 52.6% were primary/secondary school graduates, 24.0% were diagnosed with breast cancer, 56.1% did not have a comorbid chronic disease, 28.6% received alkylating agent(s) for treatment and 35.2% received 10 and more sessions. The mean scores were found  $2.07 \pm 1.06$  for the subdimension "Decline in basic taste",  $2.57 \pm 1.15$  for the subdimension "Discomfort",  $2.67 \pm 1.37$  for the subdimension "Phantogeusia and parageusia", and  $2.55 \pm 1.14$  for the subdimension "General taste alterations".

**Conclusion:** Patients who received chemotherapy were found to experience moderate taste changes. Gender, age, cancer type, comorbid chronic diseases, number of chemotherapy sessions, and chemotherapy agents were important variables affecting the taste alterations. It is important to evaluate the taste alterations in patients receiving chemotherapy and to formulate interventions to prevent or minimize their effects on the patients.

**Keywords:** Cancer, chemotherapy, taste alterations

### Introduction

Cancer is one of the major health problems in Turkey and in the world; it is the second most common cause of death after cardiovascular diseases (Ugur, 2014). According to the data published in GLOBOCAN 2012 by the

International Agency for Research on Cancer (IARC), there were a total of 14.1 million new cancer cases and 8.2 million cancer-related deaths in the world (Ferlay et al., 2015). The latest data published by the Public Health Agency of Turkey indicate that 105,404 men and

70,897 women were diagnosed with cancer in the year 2012 in Turkey. Based on these data, the incidence of cancer in Turkey was higher than that the worldwide average (Public Health Agency of Turkey, 2015).

Although several methods exist for cancer treatment today, all of these methods are associated with side effects. Chemotherapy is the most effective and most common form of treatment for all types of cancer (Aslam et al., 2014). Although chemotherapy was initially thought to destroy cancer cells only, it is now known to harm normal cells and to have several side effects such as malaise/fatigue, nausea, vomiting, hair loss, pain, taste alterations, mucositis, susceptibility to infection and bleeding, anemia, constipation, and diarrhea. The chemotherapy related side effects negatively influence the patients' self-care behavior, daily life activities, and quality of life (Aslam et al., 2014; Usta Yesilbalkan et al., 2005; Akcay D and Gozum S, 2012). The taste alterations or dysgeusia are among the common side effects in patients receiving chemotherapy and experienced by 30 to 75% of all cancer patients receiving chemotherapy (Kano and Kanda, 2013; Speck et al., 2013). Taste alterations often begin in the initial phase of chemotherapy and may last weeks or even months after the active treatment. However, taste alterations may sometimes start before the initiation of the treatment, which suggests that some cancers (such as head and neck cancers) are themselves responsible for taste alterations (Zabernigg et al., 2010).

The chemotherapy related taste alterations develop in connection with the modifications in taste buds and saliva secretion and with the neurotoxic effect of chemotherapy (Sozeri and Kutluturkan, 2015). The patient's taste perception is influenced quantitatively (increased or decreased perception) or qualitatively (altered perception). Thus, foods and beverages might be perceived to have unpleasant or different taste (metallic, bitter); sometimes, the act of eating may become repulsive (Gamper et al., 2012). Taste alterations affect the individuals physiologically, psychologically, and socially (Sozeri and Kutluturkan, 2015). It affects patients' daily life and emotional well being by causing problems such as avoidance of specific foods, malnutrition, and weight loss. Since the act of eating plays an important role in social activities, these patients' interest in and pleasure from social interactions also decrease (Kano and

Kanda, 2013). Some studies have also reported that taste alterations had a negative effect on the quality of life. Zabernigg et al. (Zabernigg et al., 2010) indicated that taste alterations were associated with the patients' quality of life; especially the appetite loss and fatigue sub-dimensions of the quality of life were negatively affected. Gamper et al. (Gamper et al., 2012) also demonstrated the negative effect of taste alterations on the quality of life. In a study in Turkey, Sozeri and Kutluturkan (Sozeri and Kutluturkan, 2015) have shown that the patients with taste alterations were affected in various ways, which, in turn, decreases their quality of life. The studies evaluating the factors that affect taste alterations in patients receiving chemotherapy are limited. Determining the chemotherapy related taste alterations in cancer patients and the influencing factors are important for minimizing their effects on patients and for planning the interventions to decrease the severity of taste alterations or to eliminate them. The aim of this study was to determine the taste alterations and the influencing factors in patients receiving chemotherapy.

**Materials and Methods:** This is a descriptive cross-sectional study; the population of the study consisted of patients who were treated in the outpatient chemotherapy unit of a university-affiliated oncology hospital between February 1 and July 30, 2016. The study sample consisted of 196 patients. The inclusion criteria were as follows: receiving treatment for cancer in the outpatient chemotherapy unit, being older than 18 years, the ability for verbal communication, having received chemotherapy at least 2 courses, and giving consent for participating the study. Of the patients contacted for study, 38 were excluded from the study for not meeting the criteria.

#### **Data collection tools**

*Patient Information Form:* this form includes 22 questions and was developed by the researchers based on the literature review for the taste alterations and influencing factors as well as the socio-demographic features such as age, sex, and education (Gamper et al., 2012; Sozeri and Kutluturkan, 2015).

*The Chemotherapy-induced Taste Alteration Scale (CiTAS):* CiTAS is a 5-point Likert-type scale developed by Kano and Kanda (Kano and Kanda; 2013) and consists of 18 items and 4 factors:

1. *Decline in basic taste* (items 1-6) assesses the individual's perception of bitterness, sweetness, saltiness, sourness, and umami (richness of taste).

2. *Discomfort* (items 13-18) assesses the relationship between the taste alterations and nausea/vomiting, alterations in the sense of smell, difficulty in eating hot/oily foods and meat, and loss of appetite.

3. *Phantogeusia and parageusia* (items 10-12) assesses the experience of continuous abnormal (bitter) taste in the mouth.

4. *General taste alterations* (items 1, 7-9) assesses the experiences of ageusia (loss of taste functions), cacogeusia (unpleasant taste unrelated to food or beverage), and hypogeusia (decreased ability to taste).

In the evaluation of the results, the scores from the individual sub-dimensions, rather than the total scale score were used. The sub-dimension scores were calculated by averaging the item scores in those sub-dimensions and range between 1 and 5. Higher scores indicate a taste alteration and increased severity of patient's experience (Sozeri and Kutluturkan, 2015). The validity and reliability study of the Turkish version of CiTAS was conducted by Sozeri and Kutluturkan in 2014, and the Cronbach alpha value was 0.86 (Sozeri and Kutluturkan, 2014).

**Ethical considerations:** The approval for the study was obtained from the Ethics Committee at Ege University School of Nursing; written permission was obtained from the institution where the study was conducted. The patients were asked to read and sign a consent form detailing the purpose and procedures of the study. The permission was also obtained from Sozeri and Kutluturkan, who have performed the validity and reliability study of the Turkish version of CiTAS. The data were collected through face-to-face interviews with the patients and from their clinical records. Each interview took 10-15 minutes.

**Data analysis:** The data were analyzed with SPSS 21.0 program (SPSS Inc., Chicago, USA). Number and percentage were used to present the categorical data; mean and standard deviation were used for numerical variables. Normal distribution of the data was checked with Kolmogorov-Smirnov test. Mann-Whitney U test was used for comparison of the two groups with respect to the dependent and independent variables. Kruskal-Wallis H test was used to compare three or more groups. The significance level was set at 0.05.

## Results

Of the patients included in the study, 57.7% were female, 49.0% were in the 40-59 age group, 78.6% were married and 52.6% were primary/secondary school graduates. Of the patients, 24.0% were diagnosed with breast cancer and 56.1% did not have a comorbid chronic disease. Of the patients, 28.6% received alkylating agent(s) for treatment, 32.1% received chemotherapy for 1 to 3 months, 35.2% received 10 and more sessions. Of the patients, 38.3% reported decreased appetite during the treatment period, 54.1% had not lost weight during the treatment period, and 53.6% reported a good overall appetite (Table 1).

The mean scores were found  $2.07 \pm 1.06$  for the sub-dimension "Decline in basic taste",  $2.57 \pm 1.15$  for the sub-dimension "Discomfort",  $2.67 \pm 1.37$  for the sub-dimension "Phantogeusia and parageusia", and  $2.55 \pm 1.14$  for the sub-dimension "General taste alterations".

The mean scores from the CiTAS sub-dimension were stratified based on the descriptive and disease/treatment-related characteristics of the patients. Consequently, the mean subscale scores were found to be related to factors age, gender, disease diagnosis, comorbid chronic diseases, the chemotherapy agent, and the number of chemotherapy sessions ( $p < 0.05$ ) (Table 2).

The patients in the age group 18-39 had a significantly higher mean score on the sub-dimension "Phantogeusia and parageusia" than the other age groups ( $\chi^2=6.52$ ,  $p=0.038$ ). Female patients had a significantly higher mean score on the sub-dimension "General taste alterations" than males ( $Z=-2.053$ ;  $p=0.040$ ). The patients with colon cancer had a significantly higher mean score on the sub-dimension "Phantogeusia and parageusia" than the other diagnostic groups ( $\chi^2=11.13$ ,  $p=0.049$ ). The patients who received antibiotics for chemotherapy had a significantly higher mean score on the sub-dimensions "Discomfort" ( $\chi^2=18.09$ ,  $p=0.012$ ) and "General taste alterations" than those who received other chemotherapy agents. The patients who received 2-3 sessions of chemotherapy had significantly higher mean score on the sub-dimensions "Discomfort" ( $\chi^2=9.73$ ,  $p=0.045$ ) and those received 4-5 sessions had significantly higher mean score on the sub-dimensions "Phantogeusia and parageusia" than the other groups.

**Table 1. Descriptive and disease/treatment-related characteristics of the patients (n = 196).**

Characteristic	Number	%
<b>Age groups</b>		
18-39 years	24	12.2
40-59 years	96	49.0
Over 60 years	76	38.8
<b>Gender</b>		
Female	113	57.7
Male	83	42.3
<b>Marital status</b>		
Married	154	78.6
Single	23	11.7
Divorced / widowed / separated	19	9.7
<b>Education</b>		
Illiterate	6	3.1
Primary/secondary school graduate	103	52.6
High school graduate	43	21.9
University graduate	44	22.4
<b>Disease diagnosis</b>		
Breast cancer	47	24.0
Lung cancer	18	9.2
Bladder cancer	2	1.0
Gastric cancer	10	10
Colon cancer	43	21.9
Other	76	38.8
<b>Comorbid chronic diseases</b>		
None	110	56.1
Yes	86	43.9
Hypertension	57	
Diabetes mellitus	31	
Thyroid gland diseases	5	
Chronic obstructive pulmonary disease	3	
Other	7	
<b>Chemotherapy agent</b>		
Alkylating agents	56	28.6
Antimetabolites	19	9.7
Herbal alkaloids	36	18.4
Antibiotics	4	2.0
Hormones	3	1.5
Biological agents	36	18.4
Combination of alkylating agent and antimetabolites	19	9.7
Combination of alkylating agent and herbal alkaloids	23	11.7
<b>Duration of chemotherapy</b>		
<1 month	6	3.1
1-3 months	63	32.1

4-6 months	39	19.9
7-9 months	28	14.3
>9 months	60	30.6
<b>Number of chemotherapy sessions</b>		
2-3 sessions	42	21.4
4-5 sessions	46	23.5
6-7 sessions	24	12.2
8-9 sessions	15	7.7
≥10 sessions	69	35.2
<b>Change in appetite during the treatment</b>		
No change	70	35.7
Reduced appetite	75	38.3
Much reduced appetite	40	20.4
Cannot eat anything	11	5.6
<b>Weight loss after the treatment</b>		
No weight loss	106	54.1
1-5 kg	52	26.5
6-10 kg	25	12.8
10-20 kg	5	2.6
>20 kg	8	4.1

**Table 2. The Chemotherapy-induced Taste Alteration Scale scores of patients with respect to their descriptive and disease/treatment-related characteristics (n = 196).**

Variables	Chemotherapy-induced Taste Alteration Scale			
	Decline in basic taste	Discomfort	Phantogeusia and parageusia	General taste alterations
<b>Age groups</b>				
18-39 years	2.29±1.33	3.00±1.32	2.97±1.39	2.98±1.20
40-59 years	2.00±1.00	2.58±1.20	2.84±1.41	2.58±1.19
Over 60 years	2.08±1.06	2.43±1.02	2.36±1.27	2.38±1.03
p	0.748	0.191	0.038*	0.104
$\chi^2$	0.58	3.31	6.52	4.53
<b>Gender</b>				
Female	2.11±1.07	2.69±1.17	2.87±1.51	2.72±1.27
Male	2.01±1.07	2.41±1.12	2.40±1.10	2.33±0.90
p	0.460	0.072	0.058	0.040*
Z	-0.740	-1.802	-1.895	-2.053
<b>Marital status</b>				
Married	2.09±1.07	2.64±1.12	2.66±1.35	2.60±1.13
Single	2.26±1.15	2.33±1.37	2.53±1.48	2.48±1.18
Divorced/widowed/separated	1.64±0.86	2.37±1.18	2.89±1.47	2.28±1.24
p	0.261	0.209	0.671	0.403
$\chi^2$	2.68	3.13	0.79	1.81
<b>Education</b>				
Illiterate	2.66±1.53	3.33±1.05	3.44±1.39	3.25±1.23
Primary/secondary school	2.20±1.11	2.62±1.12	2.63±1.29	2.61±1.10

High school	1.91±0.93	2.57±1.20	2.89±1.55	2.59±1.28
University	1.83±0.95	2.38±1.18	2.44±1.33	2.28±1.06
p	0.169	0.214	0.233	0.195
$\chi^2$	5.04	4.48	4.28	4.70
Disease diagnosis				
Breast cancer	1.75±0.96	2.43±1.22	2.24±1.46	2.34±1.34
Lung cancer	2.12±1.09	2.33±1.02	2.29±1.26	2.50±0.97
Bladder cancer	1.50±0.70	1.83±0.23	2.83±0.70	1.75±1.06
Gastric cancer	2.45±1.15	3.83±1.73	3.13±1.29	3.10±0.95
Colon cancer	2.42±1.20	2.49±0.97	2.87±1.30	2.73±1.04
Other	2.01±0.98	2.62±1.08	2.85±1.35	2.55±1.12
p	0.51	0.080	0.049*	0.178
$\chi^2$	11.01	9.84	11.13	7.62
Comorbid chronic diseases				
Yes	2.23±1.10	2.69±1.20	2.72±1.27	2.65±1.08
None	1.94±1.02	2.48±1.11	2.63±1.45	2.48±1.19
p	0.063	0.293	0.425	0.256
Z	-1.858	-1.051	-0.798	-1.858
Chemotherapy agent				
Alkylating agents	2.22±1.07	2.83±1.25	2.78±1.32	2.79±0.94
Antimetabolites	2.14±1.04	2.43±0.93	2.43±1.07	2.27±0.79
Herbal alkaloids	2.01±0.95	2.51±1.14	2.93±1.66	2.69±1.44
Antibiotics	1.70±0.98	4.20±0.25	4.41±0.41	3.87±0.75
Hormones	1.72±0.85	3.38±0.76	3.22±0.69	2.50±0.50
Biological agents	1.86±1.14	2.13±1.05	2.21±1.25	2.19±1.09
Combination of alkylating agent and antimetabolites	2.19±1.13	2.59±1.09	2.87±1.39	2.76±1.06
Combination of alkylating agent and herbal alkaloids	2.05±1.18	2.46±1.13	2.37±1.28	2.17±1.25
p	0.536	0.012*	0.055	0.016*
$\chi^2$	6.03	18.09	13.77	17.15
Duration of chemotherapy				
<1 month	2.16±0.85	3.41±0.43	2.88±1.04	3.12±1.02
1-3 months	2.25±1.16	2.63±1.19	2.86±1.43	2.61±1.25
4-6 months	2.06±1.06	2.61±1.07	2.81±1.34	2.71±1.85
7-9 months	2.02±0.94	2.76±1.41	2.51±1.36	2.53±0.97
>9 months	1.90±1.03	2.32±1.04	2.43±1.44	2.34±1.07
p	0.618	0.089	0.295	0.379
$\chi^2$	2.65	8.07	4.92	4.20
Number of chemotherapy sessions				
2-3 sessions	2.18±1.27	2.94±1.19	3.06±1.40	2.69±1.31
4-5 sessions	2.26±0.98	2.62±1.12	3.10±1.26	2.86±1.16
6-7 sessions	2.09±1.12	2.18±0.96	2.18±1.16	2.26±1.05
8-9 sessions	1.91±0.71	2.76±1.20	3.33±1.59	2.76±1.05
≥10 sessions	1.90±1.02	2.42±1.16	2.17±1.23	2.32±1.02
p	0.281	0.045*	0.000*	0.110
$\chi^2$	5.06	9.73	22.97	7.52

Data were presented as mean ±SD. \*Z: Mann Whitney-U Test \*\* $\chi^2$ : Kruskal-Wallis Test

## Discussion

The chemotherapy related taste alterations are a common problem in cancer patients and affect their daily lives negatively, causing malnutrition, weight loss, and in some cases, morbidity. This descriptive cross-sectional study also demonstrated that the patients experienced taste alterations due to chemotherapy (Kano and Kanda, 2013; Speck et al., 2013; Halyard, 2009; Steinbach et al. 2009). The study also indicated that sociodemographic variables such as age, gender, cancer type, the chemotherapy agent, and the number of chemotherapy sessions were associated with the scores on the CiTAS sub-dimensions “Discomfort”, “Phantogeusia and parageusia”, and “General taste alterations”.

Among taste abnormalities, phantogeusia and parageusia were more commonly experienced in the age group 18-39. Another study that involved 518 subjects also reported a greater taste alteration during chemotherapy in the younger segment of subjects (Bernhardson et al., 2008). Similarly, Zabernigg et al. (Zabernigg et al., 2010) reported that the chemotherapy related taste alterations significantly decreased with increasing age. In this respect, taste function of the elderly individuals has been reported to decrease and their taste thresholds to increase in time. In addition, individuals in this age group perceive the taste alterations later and feel the alterations less intensely.

Women were found to score higher on the CiTAS sub-dimension “General taste alterations”. Other studies have also found that female patients experience chemotherapy related alterations more intensely (Bernhardson et al., 2008; Zabernigg et al., 2010; Rehwaldt et al., 2009). However, Sozeri and Kutluturkan (Sozeri and Kutluturkan, 2015) reported that gender had no effect on chemotherapy related taste alterations. Women have been reported to experience a greater sensitivity for taste and odor although the role of gender in chemotherapy related taste alterations is not fully understood (Ijpm et al., 2017).

The diagnosed cancer type was one of the factors associated with the CiTAS sub-dimension “Phantogeusia and parageusia”; patients with gastric cancer scored higher than others. It has been previously reported that taste alterations were experienced in various ways and to various extents depending on the cancer type. On the contrary to our findings, Sozeri and Kutluturkan (Sozeri and Kutluturkan, 2015) have shown that

the disease diagnosis and stage did not have any effect on the taste alteration in patients receiving chemotherapy. In studies involving patients with various cancer types, 16.6%, 67%, or 100% of the patients were reported to experience taste alterations due to chemotherapy (Beale et al., 2003; Moulin et al., 2000; Maisano et al., 2003). In another study including 197 patients with lung, pancreas, or colorectal cancer, the patients with colorectal cancer were found to have a significantly greater taste alteration compared to the other groups. Although results vary, the studies suggest that the taste alteration in patients receiving chemotherapy is related to the patient’s type of cancer.

The patients who received antibiotic chemotherapy agents were found to score higher on the “Discomfort” and “General taste alterations” sub-dimensions. Chemotherapy agents were reported to cause changes in the taste buds and saliva secretion and to have neurotoxic effects in facial (VII), glossopharyngeal (IX), and vagus (X) cranial nerves (Sozeri and Kutluturkan, 2015). A wide variety of chemotherapy agents such as 6-mercaptopurine, methotrexate, vincristine, cisplatin, doxorubicin, carboplatin, cyclophosphamide, and fluorouracil (5-FU) were found to cause taste alteration in patients (Bernhardson et al., 2008; Zabernigg et al., 2010;

Wickham et al., 1999). There is also evidence that the degree of taste alteration perceived by patients varies based on the cancer type and chemotherapy agent involved (Gamper et al., 2012).

In another study, the patients receiving antibiotic chemotherapy agents (e.g. doxorubicin, bleomycin, vinblastine, dacarbazine) were shown to score higher on the “Phantogeusia and parageusia”, “Discomfort”, and “General taste alterations” sub-dimensions.

The patients who received 2-3 sessions of chemotherapy had a higher score on the “Discomfort” sub-dimension, and those with 4-5 sessions of chemotherapy had a higher score on the “Phantogeusia and parageusia” sub-dimension. The patients were found to experience taste alterations more intensely at the beginning of treatment than in the subsequent periods. In a prospective cohort study investigating the effect of the adjuvant breast cancer chemotherapy process on the taste function, food liking, appetite, and nutrition-

related outcomes by Boltong et al. (Boltong et al., 2014), taste function was shown to significantly decline during the early stages of treatment. Gamper et al. (Gamper et al., 2012) and Zabernigg et al. (Zabernigg et al., 2010) reported that the degree of taste alteration increased as the duration of chemotherapy increased. Variations among the results of the previous studies might be attributed to the variations in the patient groups included in these studies.

### Conclusion and Recommendations

The patients who received chemotherapy were found to experience moderate taste alteration; gender, age, cancer type, comorbid chronic diseases, number of chemotherapy sessions, and chemotherapy agents were found to influence various sub-dimensions of the Chemotherapy-induced Taste Alteration Scale. It is important to evaluate the taste alterations in patients receiving chemotherapy and to formulate interventions to prevent or minimize their effects on the patients.

Nurses have a role and responsibility in educating the patients and their families about the management of taste alterations during chemotherapy. Patients and their families should be given instructions such as

- using plastic tableware,
- favoring the consumption of fresh or frozen fruits and vegetables,
- flavoring foods with onion, garlic, ground pepper, basil, thyme, etc.,
- cleaning mouth regularly,
- serving foods cold or at room temperature (Ijpm et al., 2017; American Cancer Society, 2018).

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