



Taste Alteration in Children with Cancer Before and During Chemotherapy

Kanserli Çocuklarda Kemoterapi Öncesi ve Kemoterapi Sırasında Tat Alma Değişikliği

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Abstract

Aim: This study was conducted to investigate the taste alteration before and during chemotherapy in children with cancer.

Material and Method: It is a descriptive and cross-sectional study. The population of the study consisted of children aged 8-18 years who were followed up and received chemotherapy in the pediatric hematology and oncology clinic of a University Medical Faculty Oncology Hospital. A Child Description Form, the Taste Alteration Scale for Children Receiving Chemotherapy (TAS-CRC) and the Scale of Subjective Total Taste Acuity (SSTTA) were used to collect the data.

Results: It was determined that 13.3% of the children before chemotherapy, 53.3% in the 3rd week of chemotherapy and 66.7% in the 6th week of chemotherapy experienced taste changes. It was determined that there was a statistically significant difference between the mean scores of the TAS-CRC administered before chemotherapy and at the 3rd and 6th week of chemotherapy. In addition, taste acuity was found to be higher in the 3rd and 6th week of chemotherapy compared to before chemotherapy.

Conclusion: It was determined that both taste alteration and taste acuity in children were higher in the 3rd and 6th week of chemotherapy compared to pre-chemotherapy. Since taste alteration and increased taste acuity in children undergoing chemotherapy can adversely affect their nutrition, children should be regularly monitored in terms of height, weight, and Body Mass Index (BMI).

Keywords: Chemotherapy, nursing, taste alteration

Öz

Amaç: Bu çalışma kanserli çocuklarda kemoterapi öncesi ve kemoterapi sırasında tat alma değişikliğini incelemek amacıyla yapılmıştır.

Gereç ve Yöntem: Tanımlayıcı ve kesitsel tipte bir araştırmadır. Araştırmanın evrenini bir Üniversitenin Tıp Fakültesi Onkoloji Hastanesi pediatri hematoloji ve onkoloji kliniğinde izlenen ve kemoterapi alan 8-18 yaş arasındaki çocuklar oluşturmuştur. Verilerin toplanmasında Çocuk Tanıtım Formu, Kemoterapi Alan Çocuklar İçin Tat Alma Değişikliği Ölçeği (KAÇ-TADÖ) ve Subjektif Total Tat Keskinliği Ölçeği (STTKÖ) kullanılmıştır.

Bulgular: Çocukların kemoterapi öncesinde %13.3'nün, kemoterapinin 3. haftasında %53.3'ünün ve kemoterapinin 6. haftasında %66.7'sinin tat alma değişikliği yaşadığı belirlenmiştir. Kemoterapi öncesi, kemoterapinin 3. ve 6. haftasında uygulanan KAÇ-TADÖ puan ortalamaları arasında istatistiksel olarak anlamlı fark olduğu belirlenmiştir. Ayrıca kemoterapi öncesine göre kemoterapinin 3. ve 6. haftasında tat keskinliği kaybının daha fazla olduğu saptanmıştır.

Sonuç: Çocuklarda hem tat alma değişikliğinin hem de tat keskinliğinin kemoterapi öncesine göre kemoterapinin 3. ve 6. haftasında daha fazla olduğu belirlenmiştir. Kemoterapi alan çocuklarda tat alma değişikliği ve tat keskinliği beslenmelerini olumsuz yönde etkileyebileceğinden, çocukların boy, kilo ve Beden Kitle İndeksi (BKİ) açısından düzenli olarak izlenmesi gerekir.

Anahtar Kelimeler: Hemşirelik, kemoterapi, tat alma değişikliği



INTRODUCTION

Chemotherapy and radiotherapy used in the treatment of cancer cause a number of side-effects, such as decreased appetite, gustatory and olfactory changes, nausea, vomiting, mucositis, diarrhea, pain, and fatigue.^[1] Taste alteration is another frequent and overlooked side-effect of chemotherapy.^[2] Studies of pediatric cancer patients have reported that 36-77% experience taste alteration during chemotherapy.^[1,3] This treatment leads to a decrease in flavor perception and appetite,^[3,5] weight loss, alteration in social activities associated with decreased nutrient and energy intake, emotional problems, and alterations in daily life and quality of life.^[4]

The sense of taste is a system that plays a critical role in human nutrition and life.^[3] However, taste disorders are generally difficult to diagnose and treat, since they are usually missed at routine examination.^[4]

The adverse effect of taste alteration is more important in children, because their eating behaviors and food preferences are still developing and are more affected by chemical stimuli.^[5] However, adequate and balanced nutrition during the treatment of cancer is regarded as an inseparable factor in survival rates, treatment tolerance, and quality of life.^[6] Increasing energy requirements for growth and development during infancy and adolescence raise the risk of malnutrition among children with cancer in these age groups.^[2,7] Inadequate nutrition in children with cancer increases disease-related complication and recurrence rates, while lowering survival rates.^[1] In addition, taste perception alterations can also reduce quality of life by adversely impacting on children's physiological, psychological, and social function.^[3,8] Early identification and intervention are therefore important in pediatric cancer patients.^[3]

Studies examining taste alteration in pediatric cancer patients before and during chemotherapy are insufficient.^[1,3,5] The present study is important since it evaluated taste alterations in children with cancer three times, once before chemotherapy and twice during it, and investigated how chemotherapy affects the child's sense of taste. The research also examined the relationship between taste alteration and the treatment received during two periods of chemotherapy. It will also serve as a reference for other research and for oncologists and nurses.

MATERIAL AND METHOD

The study was carried out with the permission of Dicle University Non-invasive Clinical Research Ethics Committee (Date: 02.2021, Decision No: 2020/296). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Objectives

The purpose of this research was to determine taste alterations before and during chemotherapy in pediatric cancer patients.

Study Design

A descriptive, cohort, and cross-sectional study.

Research Hypotheses

H1: Taste alteration in children with cancer is greater at the third and sixth weeks of treatment compared to before chemotherapy.

H2: Loss of taste acuity in children with cancer is greater at the third and sixth weeks of treatment compared to before chemotherapy.

Study Setting and Sampling

The study was carried out at a University Oncology Hospital pediatric hematology and oncology clinics, between February 2021 and September 2022.

The research population consisted of children aged 8-18 under follow-up at the University Oncology Hospital pediatric hematology and oncology clinics and receiving chemotherapy between February 2021 and September 2022. Power analysis software was applied to calculate the size of the research sample. Following the power analysis, the minimum number required for the expectation of an effect size of $f=0.35$ between the taste scale scores at different times to be statistically significant was determined at 15 ($\alpha=.05$; $1-\beta=.80$).

Inclusion Criteria

- Voluntary participation on the part of the child and the family,
- The child being aged 8-18,
- The child being diagnosed with cancer, and
- The child being capable of oral nutrition.

Data Collection Tools

A Child Description Form, the Taste Alteration Scale for Children Receiving Chemotherapy (TAS-CRC), and the Subjective Total Taste Acuity (STTA) scale were applied for data collection.

Child Description Form

This form was developed by the researcher based on a scan of the literature.^[1,9-12] It consisted of two sections, containing three questions concerning the child's sociodemographic characteristics and 20 regarding the disease.

Taste Alteration Scale for Children Receiving Chemotherapy (TAS-CRC)

This scale allows the child to express his sense of taste in a subjective manner. It was developed by Bilsin and Bal Yılmaz for the purpose of evaluating changes in taste perception in children receiving chemotherapy aged 8-18.^[9] It consists of nine items. Items 1, 4, 5, 6, and 7 refer to dysgeusia, item 2 to cacogeusia, item 3 to phantogeusia, item 8 to parosmia, and item 9 to cacosmia. Each item is scored on a 0-4 Likert-type scale (0=None, 1=Mild, 2=Moderate, 3=Severe, 4=Very severe). A total scale score is obtained by summing the

scores for the individual items. The lowest possible score is 0 and the highest possible score 36. Higher scores indicate a greater severity of taste alteration. The scale's reported Cronbach α reliability coefficient is 0.88.^[9] In the present study, the Cronbach α reliability coefficient values were 0.834 on the third week of chemotherapy and 0.818 on the sixth week.

Subjective Total Taste Acuity (STTA) Scale

This scoring tool is employed to evaluate taste acuity.^[13] The Late Effects Normal Tissue Task Force (LENT) adapted from the Subjective, Objective, Management, Analytic (SOMA) scoring system was established in 1995 by a specialist working group (the European Organization for Cancer Research and Treatment and Radiation Therapy Oncology Group) to grade radiotherapy-related side effects.^[14] It contains five statements permitting the evaluation of taste acuity (0: Pre-treatment taste acuity, Grade 1: Mild loss of taste acuity, but not troublesome in daily life, Grade 2: Moderate loss of taste acuity, sometimes causing inconvenience in daily life, Grade 3: Severe loss of taste acuity generally troublesome in daily life, and Grade 4: Complete or almost complete loss of taste acuity). These items indicate a decrease in taste acuity from 0 to 4. Each item on the scale is evaluated in yes/no form.^[13] The Turkish-language and content validity were investigated by Sülger Bici and Bilsin Kocamaz. The items' Content Validity Ratio (CVI) was 0.80-1.00, and the Content Validity Ratio (CVR) was 0.96. Since $CVI \geq CVR$, the content validity of the scale was regarded as statistically significant.^[15]

Data Collection

The study was carried out at a University Oncology Hospital pediatric hematology and oncology clinics, between February 2021 and September 2022. The child description form, TAS-CRC, and STTA were applied to children diagnosed with cancer and who had not yet started chemotherapy by the author at face-to-face interviews. The same author subsequently administered the section of the child description form related to the patient's disease, the TAS-CRC and the STTA on the third and sixth weeks of chemotherapy. The children were weighed and measured in the clinic. Height, weight, and body mass index (BMI) Z scores were calculated using the appropriate tool on the Diabetes Association web site.^[16] A pre-questionnaire was applied to 10 children as a pilot study, after which the requisite amendments were made, and it thus assumed its final form.

Data Analysis

Data analyses were performed on SPSS version 20.0 (Statistical Packages for the Social Sciences) software. Non-parametric tests were applied since the data were not normally distributed according to the Shapiro Wilk normality test. The normality test, mean, number and percentage distributions, Cronbach alpha coefficient, and the Friedman and Wilcoxon tests were used in the data analysis.

RESULTS

The children's mean age was 10.73 ± 2.60 years, 60.0% were boys, and 46.6% were attending elementary school.

ALL was determined in 46.7% of the children, and 88.2% received chemotherapy via the intravenous route. In terms of types of chemotherapy, 100.0% used antitumor antibiotics, 66.7% antimetabolites, 60.0% vinca alkaloids, 53.3% alkylating agents, 13.3% hormones, and 7.7% enzymes.

Examination of pre-chemotherapy nutrition and gastrointestinal symptoms showed that children's weight Z scores were between -2 and +2 in 86.7% of cases and $\geq +2$ in 13.3%. Height Z scores were between -2 and +2 in 93.3% of the children and ≤ -2 in 6.7%, while BMI Z scores were between -2 and +2 in 93.3% and $\geq +2$ in 6.7%. Weight loss was present in 26.7% of the children, dry mouth in 20%, swallowing difficulty in 33.3%, no sensitivity to any hot or cold foods or beverages was found in any patients, lack of appetite in 40.0%, abdominal pain in 20.0%, and taste alteration in 13.3%. All the children performed oral hygiene care, with 46.7% using mycostatin, 100.0% sodium bicarbonate, and 100.0% chlorhexidine. In addition, 46.7% of the children adopted measures to overcome taste alteration, with 33.3% consuming favorite foods, 33.3% not eating, and 20.0% adding spices to food (**Table 1**).

Examination of nutritional and gastrointestinal symptoms on the third week of chemotherapy showed that weight Z scores were between -2 and +2 in 93.3% of children and $\geq +2$ in 6.7%, while height Z scores were between -2 and +2 in 93.3% and ≤ -2 in 6.7%, and BMI Z scores were between -2 and +2 in 86.7% and ≤ -2 in 13.3%. Analysis showed that 86.7% of children experienced weight loss, 53.3% difficulty in swallowing and dry mouth, 33.3% sensitivity to hot food or beverages, 20.0% sensitivity to cold food or beverages, 73.3% lack of appetite, 46.7% abdominal pain, and 53.3% taste alteration (**Table 1**).

Examination of nutritional and gastrointestinal symptoms on sixth week of chemotherapy revealed that weight Z scores were between -2 and +2 in 86.7% of children and ≤ -2 in 6.7%. Height Z scores were between -2 and +2 in 86.7% and ≤ -2 in 6.7%, and BMI Z scores were between -2 and +2 in 86.7% and ≤ -2 in 13.3%. Weight loss was experienced by 66.7% of children, dry mouth by 33.3%, difficulty in swallowing by 26.7%, sensitivity to hot food or beverages by 26.7%, sensitivity to cold food or beverages by 13.3%, lack of appetite by 60.0%, abdominal pain by 40.0%, and taste alteration by 66.7% (**Table 1**).

Examination of the distribution of foods that children regarded as pleasant or unpleasant after the development of taste alteration showed that 20.0% of the children liked home-made foods and 6.7% fruit, pizza/toasted sandwiches, pasta, and potatoes, while 33.3% disliked hospital food, 20.0% fruit and desserts, 13.3% eggs, and 6.7% spicy foods (**Table 1**).

Table 1: Distribution of nutritional and gastrointestinal symptoms

Nutrition and Gastrointestinal Symptoms	Pre-Chemotherapy	3 rd Week of Chemotherapy	6 th Week of Chemotherapy
	n (%)	n (%)	n (%)
Weight Z score			
Between -2 and +2	13 (86.7)	14 (93.3)	13 (86.7)
≤-2	0 (0)	0 (0)	1 (6.7)
≥+2	2 (13.3)	1 (6.7)	1 (6.7)
Height Z score			
Between -2 and +2	14 (93.3)	14 (93.3)	13 (86.7)
≤-2	1 (6.7)	1 (6.7)	1 (6.7)
≥+2	0 (0)	0 (0)	1 (6.7)
BMI Z score			
Between -2 and +2 (normal)	14 (93.3)	13 (86.7)	13 (86.7)
≤-2 (insufficient nutrition)	0 (0)	2 (13.3)	2 (13.3)
≥+2 (obese)	1 (6.7)	0 (0)	0 (0)
Weight loss			
Yes	4 (26.7)	13 (86.7)	10 (66.7)
No	11 (73.3)	2 (13.3)	5 (33.3)
Dry mouth			
Yes	3 (20.0)	8 (53.3)	5 (33.3)
No	12 (80.0)	7 (46.7)	10 (66.7)
Swallowing difficulty			
Yes	5 (33.3)	8 (53.3)	4 (26.7)
No	10 (66.7)	7 (46.7)	11 (73.3)
Sensitivity to hot food or beverages			
Yes	0 (0)	5 (33.3)	4 (26.7)
No	15 (100.0)	10 (66.7)	11 (73.3)
Sensitivity to cold food or beverages			
Yes	0 (0)	3 (20.0)	2 (13.3)
No	15 (100.0)	12 (80.0)	13 (86.7)
Lack of appetite			
Yes	6 (40.0)	11 (73.3)	9 (60.0)
No	9 (60.0)	4 (26.7)	6 (40.0)
Abdominal pain			
Yes	3 (20.0)	7 (46.7)	6 (40.0)
No	12 (80.0)	8 (53.3)	9 (60.0)
Taste alteration			
Yes	2 (13.3)	8 (53.3)	10 (66.7)
No	13 (86.7)	7 (46.7)	5 (33.3)
Oral health care			
Yes	15 (100.0)		
No	0 (0)		
Product used in oral health care*			
Mycostatin	7 (46.7)		
Sodium bicarbonate	15 (100.0)		
Chlorhexidine	15 (100.0)		
Steps taken to overcome taste alteration			
Yes	7 (46.7)		
No	8 (53.3)		
Measures adopted to overcome taste alteration			
Eating favorite foods	5 (33.3)		
Not eating	5 (33.3)		
Adding spices to food	3 (33.3)		

*More than one option was selected.

Mean TAS-CRC scores were 1.86±2.72 before chemotherapy, 4.40±5.77 on the third week, and 5.26±6.28 on the sixth week. Mean pre-chemotherapy TAS-CRC scores differed significantly from those on the third and sixth weeks (P<.05) (Table 2).

Table 2: Mean TAS-CRC scores before and on the third and sixth weeks of chemotherapy

Mean TAS-CRC score	Min-Max	M ± SD
Pre-chemotherapy TAS-CRC	0-10	1.86±2.72
Third week of chemotherapy	0-22	4.40±5.77
Sixth week of chemotherapy	0-22	5.26±6.28

Note. TAS-CRC= Taste Alteration Scale for Children Receiving Chemotherapy, M=Mean, SD= Standard deviation.

While no significant differences were determined between mean pre-chemotherapy and third week TAS-CRC scores, or between third and sixth week of chemotherapy scores (P>.05 for both), mean pre-chemotherapy and sixth week of chemotherapy TAS-CRC scores differed significantly (P<.05) (Table 3).

Table 3: A Comparison of mean and median TAS-CRC scores before and on the third and sixth weeks of chemotherapy

Mean TAS-CRC score	M ± SD	Median (Q1-Q3)	P
TAS-CRC before chemotherapy	1.86±2.72	1 (0-3)	
TAS-CRC on the third week of chemotherapy	4.40±5.77	2 (1-7)	.046*
TAS-CRC on the sixth week of chemotherapy	5.26±6.28	3 (2-6)	

Friedman test; Q1:1st quartile; Q3:3rd quartile, *p<.05, Note. TAS-CRC= Taste Alteration Scale for Children Receiving Chemotherapy, M=Mean, SD= Standard deviation.

Table 4 show that mean TAS-CRC scores on the third and sixth weeks of chemotherapy were higher than the pre-chemotherapy values, and statistically significant differences were determined between the three TAS-CRC scores (P<.05).

Table 4: A Comparison of mean TAS-CRC scores before and on the third and sixth weeks of chemotherapy

Pre-Chemotherapy TAS-CRC M ± SD	TAS-CRC on the Third Week of Chemotherapy M ± SD	Z-p
1.86±2.72	4.40±5.77	Z=-1.827 p=.068
Pre-Chemotherapy TAS-CRC M ± SD	TAS-CRC on the Sixth Week of Chemotherapy M ± SD	Z-p
1.86±2.72	5.26±6.28	Z=-2.112 p=.035*
TAS-CRC on the Third Week of Chemotherapy M ± SD	TAS-CRC on the Sixth Week of Chemotherapy M ± SD	Z-p
4.40±5.77	5.26±6.28	Z=-1.303 p=.192

*p<.05, Note. TAS-CRC= Taste Alteration Scale for Children Receiving Chemotherapy, M=Mean, SD= Standard deviation

In terms of pre-chemotherapy STTA grade distributions, loss of taste acuity was Grade 0 in 66.7% of children, Grade 1 in 6.7%, Grade 2 in 13.3%, and Grade 3 in 13.3%. On the third week of chemotherapy, loss of taste acuity was Grade 0 in 20.0%, Grade 1 in 46.7%, and Grade 2 in 33.3%. On the sixth week of chemotherapy, loss of taste acuity was Grade 0 in 20.0%, Grade 1 in 26.7%, Grade 2 in 40.0%, and Grade 3 in 13.3% (Table 5).

Table 5: Distributions of STTA items before and on the third and sixth weeks of chemotherapy

Scale Items	Pre-Chemotherapy		Third Week of Chemotherapy		Sixth Week of Chemotherapy	
	Yes n (%)	No n (%)	Yes n (%)	No n (%)	Yes n (%)	No n (%)
Grade 0: Pre-treatment taste acuity	10 (66.7)	5 (33.3)	3 (20.0)	12 (80.0)	3 (20.0)	12 (80.0)
Grade 1: Mild loss of taste acuity, but not troublesome in daily life	1 (6.7)	14 (93.3)	7 (46.7)	8 (53.3)	4 (26.7)	11 (73.3)
Grade 2: Moderate loss of taste acuity, sometimes causing inconvenience in daily life	2 (13.3)	13 (86.7)	5 (33.3)	10 (66.7)	6 (40.0)	9 (60.0)
Grade 3: Severe loss of taste acuity generally troublesome in daily life	2 (13.3)	13 (86.7)	0 (0)	15 (100.0)	2 (13.3)	13 (86.7)
Grade 4: Complete or almost complete loss of taste acuity	0 (0)	15 (100.0)	0 (0)	15 (100.0)	0 (0)	15 (100.0)

Note. STTA= Subjective Total Taste Acuity

DISCUSSION

Discussion of Findings Concerning Nutrition and Gastrointestinal Symptoms

Insufficient nutrition leads to an increase in mortality and morbidity by raising the incidence of complications, reducing tolerance to treatment, and causing malnutrition, and is therefore an important component of the treatment of patients with cancer.^[10,11] Oral sensory activities play a role in the development of nutritional habits.^[11] Taste perception also plays a role in digestion, absorption, and storage by activating the neuronal pathways. Taste perception function disturbance therefore has an adverse impact on appetite and body weight and can therefore cause symptoms including nausea-vomiting, hypersensitivity, and impairment of intestinal and bladder functions.^[11,12,17] Cancer pathology can cause gustatory and olfactory changes capable of affecting appetite and nutrition.^[14,17]

In the present study, little change was observed in weight Z scores on the third and sixth weeks of chemotherapy compared to pre-chemotherapy values, while height and BMI Z scores decreased slightly. In a study of admission to intensive care of pediatric cancer patients, Feng et al. reported insufficient nutrition in 11.3% of children based on weight Z scores, in 16.3% based on height Z scores, and in 21.3% based on BMI Z scores.^[18] Bilsin and Bal Yilmaz reported that 17.9% of children with cancer were below normal limits in terms of weight percentile values, while 7.4% were above normal limits.^[9] Skolin et al. weighed and measured children on the first day of admission to hospital, weekly for the first six weeks, and three months after initiation of treatment. Based on those measurements, the authors reported weight loss up to three months after commencement of treatment, while height acquisition was significantly delayed.^[19] The results of the present study were consistent with those of the previous literature.

Rapidly proliferating cancer cells play a role in the release of cytokines and chemokines that result in an increase in macrophages and neutrophils. The resulting inflammation causes cachexia and changes in nutritional habits by affecting blood circulation and areas of the brain concerned with taste and smell. The change in taste perception is thus controlled both by taste buds and the taste center in the brain.^[11] Consistent with the previous literature, in the present study, children's gastrointestinal symptoms such as weight loss, dry

mouth, difficulty in swallowing, sensitivity to hot/cold foods, lack of appetite, abdominal pain, and taste alteration increased on the third and sixth weeks of chemotherapy compared to pre-chemotherapy. These findings support our H1 hypothesis. Studies on this subject have reported that 36-77.0% of pediatric oncological patients experience taste perception changes.^[1,3] Similarly to the present research, previous studies have also reported that symptoms of oral mucositis, dry mouth, difficulty in swallowing, lack of appetite, nausea, and vomiting are widely seen in children undergoing chemotherapy.^[10,11,20]

Approximately half of the children in this research adopted measures to cope with taste alteration, including, in descending order, consuming foods they liked, not eating, and adding spices to foods. Karaman et al. found that 39.0% of children with cancer employed methods such as adding spices, using flavor enhancers, and increasing fluid intake.^[21] Bilsin and Bal Yilmaz reported that 44.2% of children attempted to cope with taste alteration, using methods such as consuming sweet foods, chewing gum, and using mouthwash.^[9] In addition, Loves et al. observed that children employed methods such as eating favored foods at a rate of 42.0%, while 39.0% added flavor enhancers to foods, 35.0% consumed fluids, 31.0% brushed their teeth, and 25.0% sucked on sugar.^[3] The results of the present study were consistent with the literature. We think that the differences in methods used in taste alteration are due to variations in children's home and hospital conditions.

A Discussion of Findings Concerning Foods Regarded as Pleasant or Unpleasant Following Taste Alteration

Taste alteration can give adversely affect eating behaviors and quality of life and reduce pleasure derived from eating.^[10,11,17] Since children's eating preferences are still developing, they are also more affected by this situation.^[1] In the present study, after taste alteration had commenced, children most frequently liked home-made foods, followed by fruit, pizza-toasted sandwiches, pasta, and potatoes, while they most frequently disliked hospital food, followed by fruit-desserts, eggs/omelets, and spicy foods. In a study of children aged 4-18 with cancer, Loves et al. described home-made foods, salty foods, and meat as the most preferred foods following taste alteration, and flavorless/salt-free foods, fatty foods, and spicy and hot foods as some of the least popular.^[3] Bilsin and Bal Yilmaz described fruit, bitter foods, and yoghurt as

the most popular foods, and hospital food, red meat, and eggs as the least popular.^[9] Karaman et al. described fish and meat products, followed by milk and milk products as the least popular foods after treatment.^[21] Skolin et al. reported that 38.0% of the children in their study avoided sausage sandwiches and chicken.^[19] The results of the present study were partly consistent with the previous literature. We think that the discrepancies in the findings may be attributable to variations in patients' eating cultures.

Discussion of Mean TAS-CRC Scores and Findings Concerning STTA Items Before and on the Third and Sixth Weeks of Chemotherapy

Specific chemotherapy doses can affect the types, onset, and duration of taste alterations.^[17] Very few studies have examined taste perception changes in children on the basis of chemotherapy stages. This study investigated in which period taste alteration and many associated symptoms were experienced most intensely by applying taste alteration and taste acuity scales to children in the same treatment period. Children experienced greater taste alteration on the third and sixth weeks of chemotherapy compared to pre-chemotherapy. These results support our H1 hypothesis. Brinksma et al. investigated taste alterations twice in their study of taste and smell functions in children with cancer, on the first day of chemotherapy and 21 days after the start of chemotherapy. They reported significant differences in sweet, spicy, and total taste scores between the two measurement periods. Children scored higher on the taste test performed 21 days after chemotherapy, their taste sensitivities increased, and they experienced greater taste alterations.^[1] The results of that study are similar to those of the current research.

Loss of taste acuity in the present study was greater at the third and sixth weeks of chemotherapy compared to pre-chemotherapy. These results support our H2 hypothesis. Two previous studies have addressed taste alteration and taste acuity together. Loss of taste acuity increased in line with taste alteration in both.^[15,22] Our findings were compatible with the results of those two studies.

CONCLUSION

The weight Z scores of the children in this study changed little at the third and sixth weeks of chemotherapy compared to baseline, while slight decreases were observed in height and BMI Z scores. Taste alteration and loss of taste acuity were greater at the third and sixth weeks of chemotherapy compared to baseline.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Dicle University Non-invasive Clinical Research Ethics Committee (Date: 02.2021, Decision No: 2020/296).

Informed Consent: All patients signed the free and informed consent form.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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