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Taste alteration, Food Habits and Nutritional Status of Childhood Cancer Survivors

Kanserden Hayatta Kalan Çocukların Tat Alma Değişikliği, Beslenme Alışkanlığı ve Durumu

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Abstract

Aim: This study was carried out to examine the taste alteration, food habits, and nutritional status of childhood cancer survivors.

Material and Method: The research is descriptive and cross-sectional. The study sample was formed by children between the ages of 8 and 18 who ended cancer treatment between March 2021 and 2022, followed by the pediatric hematology and oncology outpatient clinic of a University Medical Faculty Oncology Hospital. Child Introduction Form, Taste Alteration Scale for Children with Cancer Receiving Chemotherapy (TAS-CRC), Mediterranean Diet Quality Index (MDQI), and Subjective Total Taste Acuity Scale (STTA) were used to collect data.

Results: It was determined that 80.4% of children had a Body Mass Index (BMI) score between -2 and +2 (normal), 9.8% were above ≥+2 (obese) and 7.6% were under ≤-2 (malnutrition). Analysis showed that 18.5% of the children had a very low nutrition quality (≤3), while nutrition quality was moderate in 48.9% (4-7) and good in 32.6% (≥8). It was found that there was no statistically significant difference between the weight Z score of the children, the current height Z score and the BMI Z score, and the average score TAS-CRC.

Conclusion: Nearly half of the children experienced taste alteration during cancer treatment, and less than 10% of them currently experience taste alteration. In addition, no association was determined between taste alteration and nutrition quality, in other words, taste alteration had no effect on quality of nutrition.

Keywords: Childhood cancer survivors, food habits, nutritional status, nursing, taste alteration

Öz

Amaç: Bu araştırma kanserden hayatta kalan çocukların tat alma değişikliği, beslenme alışkanlığı ve durumunu incelemek amacıyla yapılmıştır.

Gereç ve Yöntem: Tanımlayıcı ve kesitsel tipte bir araştırmadır. Araştırmanın evrenini bir üniversitesinin tıp fakültesi onkoloji hastanesi pediatri hematoloji ve onkoloji polikliniğinde Mart 2021-2022 tarihleri arasında izlenen, 8-18 yaş arasındaki kanser tedavisi biten çocuklar oluşturmuştur. Verilerin toplanmasında Çocuk Tanıtım Formu, Kemoterapi Alan Çocuklar İçin Tat Alma Değişikliği Ölçeği (KAÇ-TADÖ), Akdeniz Diyet Kalitesi Ölçeği (ADKİ) ve Subjektif Total Tat Keskinliği Ölçeği (STTKÖ) kullanılmıştır.

Bulgular: Çocukların Beden Kitle İndeksi (BKİ) Z skoru %80.4'ünde -2 ile +2 arasında (normal), %9.8'inde ≥+2'nin üstünde (obez) ve %7.6'sında ≤-2'nin altında (yetersiz beslenme) olduğu belirlenmiştir. Çocukların %18.5'inin çok düşük (≤3), %48.9'unun orta (4-7) ve %32.6'sının iyi beslenme kalitesine (≥8) sahip olduğu saptanmıştır. Çocukların KAÇ-TADÖ puan ortalaması ile kilo, boy ve BKİ Z skoru arasında istatiksel olarak anlamlı fark olmadığı saptanmıştır (p>0.05).

Sonuç: Çocukların neredeyse yarısı kanser tedavisi sırasında ve bunların %10'undan azı ise şu anda tat alma duyusunda değişiklik yaşıdığı belirlenmiştir. Ayrıca, tat alma duyusunda değişiklik ile beslenme kalitesi arasında bir ilişki olmadığı, yani tat alma duyusundaki değişikliğin beslenme kalitesi üzerinde bir etkisi olmadığı saptanmıştır.

Anahtar Kelimeler: Beslenme alışkanlığı, beslenme durumu, hemşirelik, kanserden hayatta kalan çocuk, tat alma değişikliği

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INTRODUCTION

Cancer is a disease characterized by abnormal, uncontrollable cell growth and proliferation.[1] It is a significant cause of death among children worldwide. According to the World Health Organization (WHO), some 300.000 children aged 0-19 are diagnosed with cancer every year.[2] Leukemia is the most common form of cancer in the pediatric age group.[1]

Visible improvement has been achieved in survival rates from childhood cancers in recent years.[3] More than 80% of children in high-income countries are treated with new and advanced therapies.[2,4]

Not only is the treatment of cancer a lengthy and difficult process, it also leads to psychological and physiological problems.[5] Symptoms such as pain, lack of appetite, mucositis, nausea, vomiting, taste alteration, and xerostomia-related insufficient nutritional intake may be seen in association with cancer treatment.[6] Taste alteration is one of the most frequent and underestimated symptoms among cancer patients.[3] Studies have reported that taste perception alterations are the most important cause of altered food preferences and nutritional problems in children with cancer.[7] Taste alteration can also play an important role in the development of disease-related weight loss and causes several problems including a distaste for various foods, decreased food intake, and undernourished in severe cases.[3] Insufficient nutrition leads to impairment of quality of life and a greater risk of infection and increased mortality.[5] Identifying risk factors leading to altered taste perception in children with cancer and routine evaluation of taste alteration are therefore highly important.[5] Very little is known about the nutritional habits of children who survive childhood cancers.[4] However, the effects of food preferences and nutritional habits acquired during the treatment of cancer persist in children even after treatment.[5] Some studies have observed insufficient calcium and folate intake in young people who survive childhood cancers.[5,8] In addition, children's parents have reported changes in their children's nutritional habits compared to before the diagnosis of cancer, with insufficient fruit and vegetable consumption.[8] Some children who survive pediatric cancer are also at risk of becoming overweight or obese due to nutritional changes occurring during or after treatment,[9] while others are at risk of lack of appetite and being underweight.[5] Children who survive pediatric cancers are at risk of various chronic long-term health problems in adulthood, such as obesity associated with poor nutritional habits, cardiovascular diseases, metabolic syndrome, and osteoporosis.[4-6,8]

Children who have completed their treatment require long-term care to reduce the potential toxic effects associated with cancer treatment.[2] It is important for children's nutritional status to be evaluated in terms of their achieving normal growth and development.[10] Although several studies have investigated nutritional habits in cancer-surviving children[1,4,5,11-15] there has been insufficient research into taste alteration. No previous study has evaluated taste alteration and nutritional status and habits together. It was also intended to reveal the long-term effects of chemotherapy on taste perception and nutritional status and habits in cancer-surviving children, and thus to represent a source of information for subsequent studies on the subject. We therefore think that the research will be important.[15]

MATERIAL AND METHOD

Aim

To examine taste alteration and nutritional habits and status in cancer-surviving children.

Type of Research

The research was performed as a descriptive and cross-sectional study.

Study Setting and Sampling

The study was performed in a University Oncology Hospital pediatric hematology and oncology clinic, between March 2021 and March 2022. Two hundred children aged 8-18 years followed-up in the Gaziantep University Faculty of Medicine Oncology Hospital pediatric hematology and oncology outpatient clinic between March 2021 and March 2022. Sample size determined as 82 children using power analysis; 92 children who agreed to participate in the study were included in the sample.

The mean age of the children was 12.78±3.14 years, 50% were girls, and 38% attended middle school. Weight Z scores were between -2 and +2 in 88% of children, height Z scores between -2 and +2 in 70.7%, and BMI Z scores between -2 and +2 in 80.4% (**Table 1**).

Table 1: Distribution of the children's sociodemographic characteristics

Sociodemographic Characteristics	X±SD	
Mean age	12.78±3.14	
	n	%
Sex		
Female	46	50.0
Male	46	50.0
Education		
Primary school	32	34.8
Middle school	35	38.0
High school	25	27.2
Weight Z score		
Between -2 and +2 (normal)	81	88.0
≤-2 (undernourished)	3	3.3
≥+2 (obese)	6	6.5
No reply	2	2.2
Height Z score		
Between -2 and +2	65	70.7
≤-2	23	25.0
≥+2	2	2.2
No reply	2	2.2
BMI Z score		
Between -2 and +2 (normal)	74	80.4
≤-2 (undernourished)	7	7.6
≥+2 (obese)	9	9.8
No reply	2	2.2

Research Population and Sample

Inclusion Criteria

- Voluntary participation on the part of the mother and child,
- The child being aged 8-18,
- The child having recovered from cancer, and
- At least one year having elapsed since the end of cancer treatment.

Dependent and Independent Variables of the Study

The dependent variables of the study are taste alteration, eating habits and status. The independent variables are the children's sex, age, education status, weight, height, BMI, cancer type, cancer diagnosis date, age at cancer diagnosis, treatments received during cancer treatment, treatment duration, treatment end date, experiencing taste alteration during cancer treatment, experiencing taste alteration now, foods they like and dislike after cancer treatment.

Data Collection Tools

Child Description Form

This form was developed by the authors based on a scan of the literature.[1-5,11,14,17] It consisted of two sections containing six questions concerning the child's sociodemographic characteristics and nine concerning the disease.

Taste Alteration Scale for Children with Cancer 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[18] for the evaluation of taste alteration in children with cancer aged 8-18 years receiving chemotherapy. It consists of nine items. Five items (1, 4, 5, 6 and 7) express dysgeusia, while the other items refer to cacogeusia (2), phantogeusia (3), parosmia (8), and cacosmia (9). Each item is scored between 0 and 4 on a Likert-type scale (0: None, 1: Mild, 2: Moderate, 3: Severe, 4: Very severe). The total scale score is calculated by adding the scores for each individual item. Possible scores range between 0 and 36. Higher scores indicate a greater severity of taste alteration. The scale's Cronbach alpha reliability coefficient was calculated as 0.88. [18] In the present research the Cronbach alpha reliability coefficient was determined as 0.957.

Mediterranean Diet Quality Index (MDQI)

The MDQI was developed by Serra Majem et al.[19] The validity and reliability of the Turkish version were established by Akar Şahingöz, Özgen and Yalçın.[20] The index consists of 16 questions, 12 (1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 13, and 15) denoting positive connotations to the Mediterranean diet, and (6, 12, 14, and 16) involving negative connotations. The responses were designed as yes/no options. Yes responses are scored +1 in positive items and -1 in negative items. Possible scores range between 0 and 12. Scores ≥8 indicate good adherence to the optimal Mediterranean diet, scores of 4-7 indicate a need to improve adherence to the Mediterranean diet, and scores ≤3 indicate a very low quality diet19. The Cronbach alpha reliability coefficient of the Turkish-language version was calculated as 0.72.[20]

Scale of Subjective Total Taste Acuity (STTA)

The STTA is a scoring system used to evaluate taste acuity. [21] 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.[22] It consists of five items evaluating taste acuity (from 0 to 4) (Grade 0: Taste acuity before treatment, 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.[21]

Validation of the STTA

The Content Validity Ratio (CVR) for the items was 0.80-1.00, and the Content Validity Index (CVI) was calculated as 0.96. Since CVI≥CVR, the content validity of the scale was regarded as statistically significant.

Data Collection

The Child Description Form, TAS-CRC, STTA, and MDQI were applied online to the children aged 8-18 included in the study. The research was explained to the parents and children by telephone. A Google survey form link was sent to the parents and children consenting to take part in the research. The parents of children aged 8-12 and children aged 12-18 themselves were asked to complete the questionnaire. The pre-questionnaire was applied to 10 children and their parents as a pilot study, after which any necessary amendments were made to the pre-questionnaire, and the final version thus assumed its final form.

Data Analysis

Data analysis was performed on Statistical Packages for the Social Sciences (SPSS) version 20.0 software. The Kolmogorov Smirnov test showed that the data were not normally distributed and non-parametric tests were therefore employed. CVI, mean, number and percentage distributions, Cronbach Alpha coefficients, Spearman Brown Rank Order Correlation analysis, and the Mann Whitney U, Kruskal Wallis, and chi-square tests were used in the analysis.

RESULTS

The children's mean age at the time of diagnosis of cancer was 6.01±3.57, mean duration of treatment was 33.75±21.13 months, and the mean time elapsed since the end of treatment was 49.34±34.09 months. Seventy-five percent

of the children were diagnosed with ALL, 100% received chemotherapy during cancer treatment, and 54.3% reported taste alteration during cancer treatment and 7.6% at the time of the study (**Table 2**).

Table 2: Distributions of information concerning children's disease

Information About the Disease	X±SD	
Age at diagnosis of cancer	6.01±3.57	
Duration of treatment (months)	33.75±21.13	
Time since end of treatment (months)	49.34±34.09	
Type of cancer	**n**	**%**
ALL	69	75
Lymphoma	18	19.6
Brain tumor	3	3.3
Acute myeloid leukemia	2	2.2
Therapies Employed *		
Chemotherapy	92	100.0
Radiotherapy	33	35.9
Bone marrow transplantation	15	16.3
Surgery	8	8.7
Experience of taste alteration during cancer treatment		
Yes	50	54.3
No	42	45.7
Current taste alteration		
Yes	7	7.6
No	85	92.4

*More than one option was marked.

In terms of foods that children enjoyed eating or found unpleasant after cancer treatment, 100% enjoyed fizzy drinks, 38% red meat, 18.5% fruit, 14.1% white meat, 14.1% snacks, 6.5% pasta, 5.4% vegetables, 5.4% yoghurt, 4.3% soup, 4.3% rice, and 3.3% eggs. In contrast, 14.1% of children found vegetables unpleasant, 6.5% milk and milk products, 6.5% red meat, 6.5% white meat, 5.4% eggs, 3.3% olives, 2.2% snacks, and 1.1% fizzy drinks.

Analysis showed that 18.5% of the children had a very low nutrition quality (≤3), while nutrition quality was moderate in 48.9% (4-7) and good in 32.6% (≥8). The mean total TAS-CRC score was 5.79±7.77 (**Table 3**).

Table 3: MDQI category distributions and mean TAS-CRC score

Scale Categories	n	%
Very low nutrition quality (≤3)	17	18.5
Moderate nutrition quality (4-7)	45	48.9
Good nutrition quality (≥8)	30	32.6
Mean TAS-CRC Score	**Min-Max**	**X±SD**
	0-31	5.79±7.77

Grade 0 loss of taste acuity was determined in 35.9% of the children, Grade 1 in 37.0%, Grade 2 in 30.4%, Grade 3 in 18.5%, and Grade 4 in 8.7%.

No statistically significant association was observed between MDQI categories and the mean TAS-CRC score (p>0.05). No association was found between children's taste alteration and nutrition quality, and taste alteration had no effect on quality of nutrition (**Table 4**).

Table 4: A comparison of MDQI categories and the mean TAS-CR score

MDQI Categories	TAS-CRC X±SD	Statistical Analysis
Very low nutrition quality (≤3)	5.00±9.24	
Moderate nutrition quality (4-7)	5.31±7.45	KW=1.985 p=0.371
Good nutrition quality (≥8)	6.96±7.49	

*p<0.05

No significant association was observed between the mean TAS-CRC score and the STTA grades 0, 1, 2, or 3 (p<0.05), although a significant association was found with Grade 4 (p>0.05). Taste alteration was greater in children with mild, moderate, and severe taste acuity loss (**Table 5**).

DISCUSSION

In general terms, some pediatric cancer patients are insufficiently nourished, while others are overnourished.[23] Obese or overweight pediatric patients have lower survival and higher recurrence rates and are more resistant to treatment.[24] In the present study, 80.4% of the children were normally nourished, 9.8% were obese, and 7.6% were undernourished. Comparing our results with those of similar studies of cancer-surviving children, Teixeira et al.[17] reported that 72% of children were of normal weight, 25.5% were overweight, and 2.5% were underweight.[17] Naomi Belle et al.[4] study, 4.9% of children were underweight on the basis of BMI, 61.1% were of normal weight, 22.1% were overweight, and 9.4% were obese.[4] Fleming et al.[13] described 61% of their children as normal weight, 21% as overweight, and 5% as obese.[13] Half or more of the children in those studies were of normal weight. In contrast to those studies, Murphy-Alford et al.[6] described 8% of the children in their study as underweight, 23% as overweight, and 2% as obese.[6] Murphy et al.[6] reported that 53% of children were obese according to their fat percentages and 53% were inadequately nourished on the basis of BMI values.[6] Hansen et al.[24] reported that 48% of children surviving ALL were of normal weight, 12% were overweight, and 40% were obese, while 58.3% of children surviving brain tumors were of normal

Table 5: A comparison of STTA items and the mean TAS-CRC score

	STTA Items									
	Grade 0		Grade 1		Grade 2		Grade 3		Grade 4	
Mean TAS-CRC Score	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
	X±SD	X±SD	X±SD	X±SD	X±SD	X±SD	X±SD	X±SD	X±SD	X±SD
	3.54±6.55	9.81±8.25	9.91±7.81	3.37±6.71	12.10±3.03	3.03±6.26	14.35±7.44	3.85±6.46	7.87±4.15	5.59±8.02
Statistical Analysis	U=465.000 p=0.000*		U=494.000 p=0.000*		U=269.000 p=0.000*		U=159.000 p=0.000*		U=228.000 p=0.119	

*p<0.05

weight, 12.5% were overweight, and 29.2% were obese.[24] Fang Zhang et al.[12] described 59.1% of the children in their study as being of normal weight and 40.9% as overweight or obese.[12] The rates of overweight or obesity were much higher in these studies. We attribute this variation to the type and stage of cancer, the child's age at diagnosis, weight, nutritional habits, appetite, gender, the type and dose of drugs used (especially corticosteroids), infections occurring during treatment, and the child's immune system.

Despite its being an important determinant of survival among children recovering from cancer, very little is known about children's nutritional habits and nutrient intake4. Almost one-fifth of the children in the present research had a very low quality of nutrition, with half having a moderate quality, and a third being well-nourished. Fleming et al.13 found that these exhibited higher rates of food selectivity than peers of the same age. Those authors also reported that 27% of cancer-surviving children had a normal diet quality, 15% a poor diet quality, and 58% a poor quality of nourishment.[13] Another study of cancer-surviving children, by Fang Zhang et al.[12] reported low fruit and vegetable consumption among children, that the true amount consumed was less than half the recommended intake, and that they consumed low levels of fiber and grains and high levels of saturated fat.[12] In Teixeira et al.'s[17] study, carbohydrate constituted 54% of children's diet, protein 20.8%, and lipid consumption 24.6%m while fiber consumption below recommended levels, and children's diet quality was reported to be low.[17] Cohen et al.[5] reported decreased fruit and vegetable consumption among children, with increased snack food consumption and portion sizes.[5] In another study, Cohen et al.[11] reported that 54% of children consumed more food than necessary to meet their recommended energy requirements, and that their folate, calcium, and iron requirements were not met.[11] Another study by Cohen et al.[14] found that 80% of children consumed insufficient fruits and vegetables and that almost none consumed sufficient fiber. It may be concluded that cancer-surviving children generally consume insufficient fiber, fruit, and vegetables and have a low quality of nutrition.[14]

The sense of taste makes it possible to assess the contents of food and assists with food intake.[25] Taste alteration associated with chemotherapy is a condition frequently encountered in oncological patients.[18] However, permanent taste perception disorder is frequently seen in cancer survivors and has an adverse impact on quality of life.[26]

Approximately half of the children in the present study experienced taste alteration during cancer treatment, and 7.6% at the time of the research. Studies of taste alteration in children with cancer have reported that this is experienced by 36-95% of patients.[7] In terms of studies of taste alteration in cancer-surviving children, Cohen et al.[15] reported taste alteration in 27.5% of children, with sweet taste perception disorder in 9.8%, bitter taste disorder in 15.7%, salty taste disorder in 7.8%, and salty or sour taste perception disorder in 11.8%. An examination of the results of this research and other studies that have discussed the subject show that children experience greater taste alteration during cancer treatment than in the post-treatment period. Our findings are also consistent with the previous literature. However, the experience of taste alteration after the end of treatment was lower compared to other studies. We attribute this to differences in the types of cancer and chemotherapy in other studies, and in the methods employed to evaluate taste alteration.

Mild and moderate loss of taste alteration was most frequently observed in the children in this research. Taste alteration was also greater in children with mild, moderate and severe loss of taste acuity. Taste and smell receptor cells are regularly renewed in a few weeks or longer, but cancer treatment causes long-term taste and smell receptor cell damage.[15] We encountered no previous studies investigating taste alteration and taste acuity together. Based on the findings of the present research, we concluded that taste alteration and taste acuity are directly proportional to one another.

No association was determined between taste alteration and quality of nutrition in this research, and taste alteration had no effect on that quality. Similarly, no significant variation or relationship was observed between food groups and taste scores in Cohen et al.'s[15] study of cancer-surviving children, and no association was also found between taste function or preferred foods and quality of life.[15] In contrast to that research, Bomben et al.[27] reported that taste alteration adversely affected nutrition and daily life in cancer-surviving children, and that the presence of unpleasant tastes during eating made food consumption problematic.[27] Van Den Brink et al.'s [7] study of children with cancer reported that eating disorders increased in line with taste function impairment.[7]

Relevance to Clinical Practice

Taste perception disorders have an adverse impact on children. Scales permitting the evaluation of taste alterations and preventive nursing interventions are therefore needed. The aim of nursing care in patients receiving chemotherapy is to prevent or reduce treatment-related symptoms and problems. Nurses play an important role in patients' adaptation to taste alterations. They must support patients in coping with the undesired effects of treatment by means of education, evaluate taste alteration and the severity thereof, and assist with the application of measures directed toward taste alteration.[28] This will prevent potential treatment related symptoms in patients receiving chemotherapy.[18]

Nurses also play an important role in establishing continuity of nutrition in children with cancer.[29] It is important for nurses to weigh and measure children with cancer and to evaluate their daily nutrition. Children's nutritional problems need to be identified, and appropriate measures should be taken to deal with them. Daily evaluation of nutrition helps to identify nutritional problems in the early period, to initiate prompt treatment, to prevent problems that may develop in association with undernourished,[10] to reduce lengths of hospital stay and costs, and to increase the child's treatment adherence and quality of life.[23]

CONCLUSION

To summarize, nearly half of the children in this research experienced taste alteration during cancer treatment, and less than ten percent of them currently experience taste alteration. In addition, no association was determined between taste alteration and nutrition quality, in other words, taste alteration had no effect on quality of nutrition. Greater taste alteration was observed in children with mild, moderate, and severe loss of taste acuity.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Gaziantep University Clinical Researches Ethics Committee (Date: 24.03.2021, Decision No: 2021/95).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

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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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