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TURKİSH RELIABILITY AND VALIDITY OF THE NUTRITION SCREENING TOOL FOR CHILDHOOD CANCER (SCAN)

MASTER OF SCIENCE THESIS

BİHTER NURTEN ÖNGEL

İSTANBUL, 2022

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Director of Institute of Health Sciences

DECLARATION

I have stated that this thesis is my own work, that I have not had any unethical behavior at any stage from its planning to its writing, that I have obtained all the information in the thesis within academic and ethical rules, that I have cited all the information and comments that were not obtained through the thesis study, and that I have included these sources in the references list, during the thesis study and writing and I declare that I have not acted in violation of copyrights.

16/04/2022

Bihter Nurten Öngel

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LIST of SYMBOLS and ABBREVIATIONS

%	symbol of percentage
ASPEN	American Association for Parenteral and Enteral Nutrition
BMI	Body Mass Index
CDC	The Center for Disease Control and Prevention
DRM	Disease-related malnutrition
ESPEN	European Society for Clinical Nutrition and Metabolism
FAO	Food and Agriculture Organization
FFMI	Free fat mass index
g	unit of mass in gram
kg	unit of mass in kilograms
MUAC	Middle upper arm circumference
n	frequency
SCAN	Nutritional Screening Tool for Childhood Cancer
SGA	Subjective Global Assesment
STRONGKids	Screening Tool on Nutritional Status and Growth Risk
TCSF	Triceps skinfold thickness
WHO	World Health Organization

ABSTRACT

Öngel, BN. (2022). Turkish Reliability and Validity of the Nutrition Screening Tool for Childhood Cancer (SCAN). Yeditepe University, Institute of Health Science, Department of Nutrition and Dietetics, MSc Thesis, İstanbul.

Every country in the world is affected by one or more forms of malnutrition. Fighting malnutrition is one of the biggest global health challenges. In children with cancer, malnutrition can significantly affect outcomes such as decreased treatment tolerance, increased susceptibility to infections, and decreased survival. The SCAN was developed as a quick and simple test to identify childhood cancer patients at risk of malnutrition. In this study, SCAN has been adapted to Turkish language and culture. The language validity of the Turkish version of the scale was ensured by the translation-back translation method. After the scale was translated into Turkish and intercultural adaptation was completed, it was administered to 143 children with cancer. The Screening Tool for Childhood Cancer (SCAN) scale was applied together with the STRONGKids screening scale used in Turkey, and a positive correlation was found between the two scales ($P<0.005$). According to the data obtained from SCAN and STRONGKids tools, the effects of body mass index, diagnosis, duration of diagnosis and surgery history on the development of malnutrition were investigated. A significant correlation was found between SCAN and STRONGKids score classification and nutritional assessment grouping according to anthropometric measurements ($p<0.005$). Cronbach's alpha internal consistency coefficient was used to evaluate the reliability of the Turkish version of the scale. As a result of the statistical analyzes performed, the reliability of the scale is at an 'acceptable' level and it is recommended to re-study with a larger sample.

Keywords: Malnutrition, SCAN, STRONGKids, Children with cancer

ÖZET

Öngel, BN. (2022). 'Çocukluk Çağı Kanserleri için Beslenme Tarama Aracı' Türkçe Geçerlilik ve Güvenilirliği. Yeditepe Üniversitesi, Sağlık Bilimleri Enstitüsü, Beslenme ve Diyetetik ABD, Master Tezi, İstanbul.

Dünyadaki her ülke bir veya daha fazla malnütrisyon biçiminden etkilenmektedir. Malnütrisyonla mücadele, en büyük küresel sağlık sorunlarından biridir. Kanserli çocuklarda yetersiz beslenme, tedavi toleransında azalma, enfeksiyonlara karşı artan duyarlılık ve azalan sağ kalım gibi sonuçları önemli ölçüde etkileyebilmektedir. Çocukluk çağı kanseri için beslenme tarama aracı SCAN yetersiz beslenme riski olan çocukluk çağı kanser hastalarını tanımlamak için hızlı ve basit bir test olarak geliştirilmiştir. Bu çalışmada Screening Tool for Childhood Cancer (SCAN) Türk dili ve kültürüne uyarlanmıştır. Ölçeğin Türkçe versiyonunun dil geçerliliği çeviri-geri çeviri yöntemiyle sağlanmıştır. Ölçek, Türkçeye çevrildikten ve kültürlerarası adaptasyon tamamlandıktan sonra 143 kanserli çocuk hastaya uygulanmıştır. SCAN ölçeği Türkiye'de kullanılan STRONGKids tarama ölçeği ile beraber uygulanmış olup, iki ölçek araında pozitif bir korelasyon bulunmuştur (P=0,000; P<0,005). SCAN ve STRONGKids tarama araçlarından elde edilen verilere göre malnütrisyon gelişiminde beden kütle indeksi, tanı, tanılı olma süresi ve ameliyat geçmişi faktörlerinin etkisini araştırılmış ve SCAN ve STRONGKids skor sınıflandırması ile antropometrik ölçümlere göre beslenme değerlendirme gruplaması arasında anlamlı bir ilişki bulunmuştur ($p<0.05$). Ölçeğin Türkçe versiyonunun güvenirliğinin değerlendirilmesi amacıyla Cronbach alfa iç tutarlık katsayısı kullanılmıştır. Gerçekleştirilen istatistiksel analizler sonucunda ölçeğin güvenililiği 'kabul edilebilir' düzeyde olup, daha büyük bir örneklemle yeniden çalışılması önerilmektedir.

Anahtar kelimeler: Malnütrisyon, SCAN, STRONGKids, Kanserli çocuklar

1. INTRODUCTION and PURPOSE

Malnutrition can be defined as a decrease in the physical and mental functions of the patients as a result of the imbalances in the body composition, together with the decrease in the lean mass as a result of insufficient nutritional intake for various reasons, that is, the worsening of the clinical condition of the patient in general (1). According to American Association for Parenteral and Enteral Nutrition (ASPEN), malnutrition is defined as the simultaneous presence of at least two of six conditions that can be counted as weight loss, insufficient energy intake, loss of subcutaneous fat, loss of muscle mass, a generalized fluid accumulation that can sometimes mask weight loss, and decreased functional stability (2) .

According to the World Health Organization data, in 2014, approximately 462 million adults worldwide were underweight and 1.9 billion adults were overweight or obese. In 2016, an estimated 155 million children under the age of 5 were said to be stunted, and 41 million children were documented as overweight or obese. In 2019, 47 million children under the age of 5 were underweight, of which 14.3 million were underweight, 144 million were stunted, and 38.3 million were overweight or obese. It has been reported that approximately 45% of deaths in children under 5 years of age are associated with malnutrition. This is more common in low- and middle-income countries. At the same time, it has been shown that obesity and overweight increase with malnutrition in these countries (3).

In many countries of the world, one or more types of malnutrition are seen. One of the biggest problems the world is struggling with is malnutrition. Struggling with the problem of malnutrition can affect society in many ways (3).

Cancer, which is a disease that can result in the most deaths in terms of public health, ranks second after cardiovascular diseases in the list of known deaths (1). In this respect, cancer always maintains its place on the agenda as an important public health problem and has a sensitive patient population. Since cancer cachexia is a factor that significantly increases mortality in cancer deaths, it is very important to screen patients for malnutrition during the treatment period.

Malnutrition findings in children with cancer can significantly affect undesirable outcomes such as increased intolerance to treatment, more susceptibility to infections, and reduced survival (5). If malnutrition has occurred during cancer treatment applied to children, early diagnosis is very important for the course of treatment. Among the large number of tests

performed on patients, nutritional assessment can often be overlooked (6). Nutritional screenings to detect malnutrition may offer an alternative to detecting malnutrition in undiagnosed children who are thought to be undernourished or at risk of experiencing undernutrition. The importance of detecting malnutrition that may occur in hospitalized children during treatment has been understood. Many malnutrition screening scales have been developed to ensure this. A nutritional screening tool, which is planned to be applied for childhood cancers and which is claimed to be very practical and fast, has been developed for children with cancer who are at risk of malnutrition. The name of this nutrition scale is 'Screening Tool for Childhood Cancer' (SCAN) (7).

A nutritional screening scale should examine the nutritional status of the administered patient, how stable his/her nutrition is, and what might influence the deterioration of the patient's nutritional status. Especially in the evaluation of children with cancer, the effects of diseases and treatment methods on nutrition should be examined. Except for SCAN, none of the currently used nutritional screening tools meet all the needs of a cancer-specific nutritional screening tool (7).

The Screening Tool on Nutritional Status and Growth Risk (STRONKGKids) developed for children is a screening tool that is specifically used for children in Turkey and has been validated. It was created for all pediatric patients aged 1 month to 18 years and at risk of undernutrition (8). However, validation results show that it gives better results in detecting malnutrition when specially designed screening tools are used for certain patient groups (9). With the introduction of a nutritional screening tool specific to children with cancer in Turkey, more specialized screening for malnutrition and prevention/treatment of malnutrition are among the gains. This study, aimed to perform the Turkish validity and reliability study of the SCAN screening tool and to investigate the effects of body mass index (BMI), diagnosis, duration of diagnosis and surgery history on the development of malnutrition.

2. GENERAL INFORMATION

2.1. Malnutrition

Malnutrition can be defined as a decrease in the physical and mental functions of the patients as a result of the imbalances in the body composition, together with the decrease in the lean mass as a result of insufficient nutritional intake for various reasons, that is, the worsening of the clinical condition of the patient in general. (1).

According to European Society for Clinical Nutrition and Metabolism (ESPEN), there are 2 main ways to define malnutrition in a patient. First of all, the patient should be at risk of malnutrition according to the score obtained from a valid malnutrition screening tool. After this prerequisite was met, 2 no alternatives were determined. The first of these; the BMI is less than 18.5 kg/m2. The second alternative is 5% weight loss in the last 3 months or 10% weight loss independent of time, or if the BMI is less than 20 kg/m2 if less than 70 years old, or if the BMI is 22 kg/m2 if over 70 years old. less than, or a free fat mass index (FFMI) of less than 15.

A similar approach to define malnutrition has been developed by the ASPEN. ASPEN has defined 6 criteria while defining malnutrition and a patient is expected to have at least 2 of these 6 criteria in order to be considered malnourished. These are weight loss, lack of daily energy intake, loss of muscle mass, edema, loss of subcutaneous and reduced functional disorders (2).

2.2. Malnutrition Classification

2.2.1. Gomez Classification

According to the classification made by Gomez in 1956, the measured weight is compared with the average body weight of well-nourished and healthy children at the same age. Gomez's classification of protein energy inadequate nutrition is shown in Table 2.1. (10)

Nutritional Status = measured weight / ideal weight of the same age (50th percentile) x100

Table 2.1 Gomez's Classification of Protein Energy Malnutrition (10)

Category	Weight for Age
Nutritional Status Normal	>% 90
Mild Malnutrition	%75 - 89
Moderate Malnutrition	%60 - 74
Severe Malnutrition	<% 60

2.2.2. Waterlow's Classification

In 1972, Waterlow et al used the ratios of weight for height and height for age. The weight-for-height ratio is found by comparing the child's weight with the weights of healthy children of the same height, and the height-for-age ratio is found by comparing the child's height with the healthy children of the same age (11).

Malnutrition classification made by Waterlow et al. is given in Table 2.2 (11). Waterlow et al. used wasting (weight for age) and stunting (heigth for weight) degrees while classifying malnutrition. The children evaluated their own values according to the values of their peers and classified them in terms of protein-energy malnutrition accordingly (11).

Table 2.2 Waterlow's Classification (11)

Weight For Height	Height For Age >%95	Height For Age <%95
>% 90	Normal	Stunting (Chronic Undernutrition)
<% 90	Wasting (Acute Undernutrition)	Wasting and Stunting (Acute and Chronic Undernutrition)

2.2.3. Classification of the World Health Organization

The World Health Organization first created a classification for moderate and severe malnutrition in children in 1999, and then this classification was rearranged in 2006. Accordingly, malnourished children were classified as stunted and wasted. The child's weight for height and height for age were defined as the z-score. Acute malnutrition, defined as weakness, was graded as moderate to severe. According to the Z-score, those between -2 and -3 were defined as moderately weak, and those below -3 were defined as severely weak. In chronic malnutrition defined as stunting, height for age ratios were used and graded as moderate to severe malnutrition according to the z-score system. Height-for-age z-scores between -2 and -3 are moderately stunted; Those with a z-score of -3 and below were classified as severely stunted (12-13). The malnutrition classification of the World Health Organization is shown in Table 2.3 (13).

Table 2.3 World Health Organization Malnutrition Classification (13)

Stunted	Height-for-age	Moderate	Z score; Between ≤3 and <2
Stunted	Height-for-age	Severe	Z score; <-3
Wasted	Weight-for-height	Moderate	Z score; Between ≤3 and <2
Wasted	Weight-for-height	Severe	Z score; <-3

2.2.4. New Classification of Malnutrition

According to ESPEN, subgroups of malnutrition are divided according to classification based on etiology (14). It is divided into two as malnutrition with inflammation and malnutrition without inflammation. It is shown in Figure 2.1 (14).

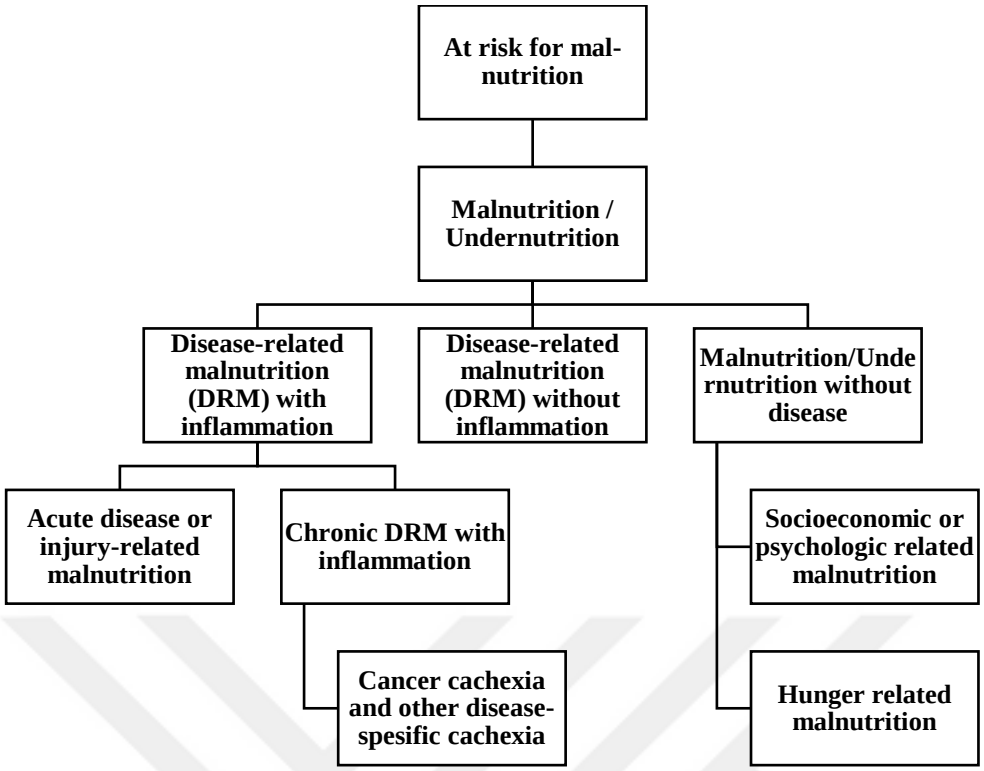

Figure 2.1 Subgroups of Malnutrition are Divided According to Classification Based on Etiology (14)

2.2.4.1. Disease-Related Malnutrition (DRM) with Inflammation

Inflammation is a very important factor among the causes of malnutrition/undernutrition. Malnutrition accompanied by inflammation is a catabolic state characterized by an underlying inflammation (15). Advancing age is another condition that promotes spontaneous inflammation. In addition, inactivity and bed dependency accelerate muscle catabolism in malnutrition accompanied by inflammation (16).

In developed and developing countries, malnutrition occurs in overweight or obese individuals with concomitant diseases and damage or who are fed high-energy and low-quality diets. Disruption of the balance between energy intake, energy consumption and quality of food intake constitutes the underlying general mechanism. Excess fat mass/deposit fat cells are associated with an inflammatory response, particularly in abdominal obesity, which contributes to malnutrition (17). Subgroups of malnutrition accompanied by inflammation;

- Malnutrition accompanied by a moderate inflammatory response

- Malnutrition with strong inflammation due to acute disease or injury

2.2.4.1.A. Chronic DRM with Inflammation; Synonym: cachexia

Cachexia is often referred to as the last stage of malnutrition. However, according to ESPEN, chronic DRM accompanied by inflammation and cachexia can be used interchangeably. Cachexia is generally referred to as a metabolic syndrome characterized by muscle wasting regardless of the fat loss associated with the underlying disease. The most prominent feature in cachexia is weight loss (18).

Cachexia is characterized by decreased muscle mass and function, decreased BMI, and weight loss with an underlying disease. Cachexia as seen in cancer; It has been named in three ways: pre-cachexia, refractory cachexia, and finally cachexia only. Two ways to diagnose cancer cachexia have been proposed by Fearon et al. The first of these is a 5% reduction in the patient's weight. The other is that if there is 2% weight loss, decreased BMI or decreased fat mass is seen with it (14).

2.2.4.1.B. Acute Disease- or Injury-Related Malnutrition

Especially patients treated in intensive care units often have a high degree of stress metabolism. These patients are usually hospitalized in this ward with major surgical operations or exacerbation of acute diseases. Most patients with this condition are at risk of undernutrition (14, 19).

2.2.4.2. DRM without Inflammation, Synonym: Non-cachectic DRM.

There are cases of malnutrition accompanying the disease, even without inflammation. These are conditions that cause deficiencies in the patient's nutrition and cause malnutrition due to the nature of the disease itself. Examples include dysphagia that may result from upper digestive system diseases, and difficulty in swallowing due to neurological problems. Absorption disorders in gastrointestinal diseases can be given as an example. What is important here is that the primary cause of malnutrition is not the underlying inflammation. [Strong Consensus, 94% agreement] (14).

2.2.4.3. Malnutrition without Diseases

The main cause of malnutrition in developed countries is usually the result of disease-related conditions. However, this is not the case for underdeveloped or developing countries. Unfortunately, an important reason for malnutrition in these countries is the difficult access to food. The problem of not being able to reach food may occur due to factors such as socioeconomic, psychological or educational inadequacy (14).

2.2.5. Protein Energy Malnutrition

Protein-energy malnutrition occurs as a result of continuing a state of inadequate protein and energy intake in children. Protein energy malnutrition includes kwashiorkor and marasmus (20).

Kwashiorkor is associated with insufficient protein intake in children. However, these children usually get enough calories in terms of carbohydrates. So overall, these children have consistently low protein intake, not energy intake. Edema and ascites are seen in these children due to insufficient protein intake. Although short stature is not expected due to taking sufficient energy, edema and swelling in the abdomen are the most obvious symptoms (20).

Marasmus, on the other hand, occurs as a result of continuous exposure to insufficient energy intake in children. It is associated with a significant reduction in both fat and muscle mass (20).

A child with marasmus with insufficient energy intake may also develop kwashiorkor due to insufficient protein intake. This condition is called Marasmic kwashiorkor. Children with this condition often have abdominal bloating and edema, with hair and skin being less severe than kwashiorkor (20, 21).

2.3. Etiology of Malnutrition

Factors that cause malnutrition can be grouped under two headings. These are primary and secondary causes of malnutrition. Primary malnutrition is the malnutrition that develops as a result of not being able to reach the food due to reasons such as famine, war and socioeconomic conditions. In short, it is about not being able to reach food for any reason. In secondary malnutrition, the problem is not related to access to food, but to not being able to consume that food for any reason. These reasons can be factors such as loss of appetite, difficulty in eating and swallowing, vomiting, diarrhea, cancer, pancreatic insufficiency and malabsorption. Although the digestion, absorption and metabolism of foods are normal, increased losses from the body due to reasons such as fistula, bleeding, vomiting, diarrhea, and chronic kidney disease may cause secondary malnutrition. In addition to these, although there is normally sufficient food intake, malnutrition may develop in people whose nutritional needs increase due to hypermetabolic conditions such as trauma, fever, and burns, and this is included in the secondary malnutrition group (22).

2.4. Prevalence of Malnutrition in the World and in Turkey

2.4.1. Prevalence of Malnutrition in Children in the World

In many countries of the world, one or more types of malnutrition are seen. One of the biggest problems the world is struggling with is malnutrition. Struggling with the problem of malnutrition can affect society in many ways. Poor people, on the other hand, have a higher risk of malnutrition due to both lack of access to quality food and lack of education. The greater the malnutrition problem in a country, the larger the budget allocated to it, the slower the country's economic growt (3).

Women, infants, children and adolescents in particular are at risk for malnutrition. Especially the first 1000 days after birth is crucial for development of a infant and provides the best possible start in life with long-term benefits (3).

According to the World Health Organization data, in 2014, approximately 462 million adults worldwide were underweight and 1.9 billion adults were overweight or obese. In 2016, an estimated 155 million children under the age of 5 were said to be stunted, and 41 million children were documented as overweight or obese. In 2019, 47 million children under the age of 5 were underweight, of which 14.3 million were underweight, 144 million were stunted, and 38.3 million were overweight or obese. It has been reported that approximately 45% of deaths in children under 5 years of age are associated with malnutrition. This is more common in low- and middle-income countries. At the same time, it has been shown that obesity and overweight increase with malnutrition in these countries (3).

In low-income and middle-income countries, maternal and child nutritional ignorance leads to both under- and over-nutrition. Low BMI, which is considered as an indicator of maternal undernutrition, has decreased somewhat in the last two decades. But it is still common in Asia and Africa. The prevalence of maternal obesity has increased steadily since 1980 and exceeds the underweight ratio in all regions. While stunting in children under the age of 5 has decreased slightly in the last 20 years, South Asia and sub-Saharan Africa are still high and were estimated to affect 165 million children living in these regions in 2011. Wasting is thought to affect at least 52 million of children in these regions. Malnutrition is thought to cause 3.1 million child deaths per year, or 45% of all child deaths in 2011, including fetal growth restriction, stunting, wasting and inadequate breastfeeding, and vitamin A and zinc deficiencies (23).

A study was planned with 3095 children in Ethiopia, on the grounds that malnutrition

in children is the leading public health problem in developing countries. It was applied to measure the prevalence of malnutrition in rural Ethiopia and the resulting malnutrition prevalence was 48.5% (24).

2.4.2. Prevalence of Malnutrition in Children in Turkey

According to the Research Report of the Monitoring the Growth of School Age Children (6-10 Age Group) in Turkey (Toçbi) Project, it is stated that 6.5% of children in Turkey are obese, 14.5% are slightly obese, 7.9% are weak and 1.3% of are too weak. The prevalence of stunting and short stature in children was also determined. Accordingly, it was stated that 5% of the children were stunted and 21.5% were wasted (short in stature for age) (25).

According to the Global Nutrition Report, it was stated that hunger in children under the age of 5 was 1.6% in boys and 2.2% in girls in 2013 in Turkey. While stunting was 16.4% in girls in 2005, 8.6% in 2013, 14.1% in boys in 2005, it was reported to be 11% in 2013. It has been reported that these rates are lower than the average of the Asian region (26).

According to the Global Nutrition Report, it was stated in the studies conducted on children and adolescents between the ages of 5-18 in Turkey that while the rate of weakness seen in girls was 20.6% in 2000, it decreased to 18.2% in 2015. On the other hand, the rate of weakness in men, which was 25.6% in 2000, decreased to 20.2% in 2015. While being overweight was 20.1% for girls in 2000, it increased to 28.7% in 2015, while for boys, it was 17.2 in 2000 and increased to 30.4% in 2015 (26).

2.4.3. Prevalence of Malnutrition in Adults in the World

According to the data of the United Nations Food and Agriculture Organization (FAO), the prevalence of malnutrition in the world showed a steady decline between 2005 and 2015, but this situation was reversed in 2015 and the hunger trend increased between 2015 and 2018. In Africa, where hunger is most prevalent with a rate of approximately 20 percent, it has been on an upward trend as of 2015. Although hunger has increased more slowly in Latin America and the Caribbean since 2015, it still remains below 7% in 2018. In the west of the Asian continent, there has been a steady increase since 2010, and today more than 12 percent of the Asian population suffers from hunger. According to 2018 data, it is thought that more than 820 million people in the world are suffering from hunger (27).

In a meta-analysis to assess the prevalence of protein-energy malnutrition risk in different healthcare settings in European older adults, 223 studies were randomly selected from

24 European countries out of 21,465 studies involving adults 65 years of age and older, and a total of 583,972 participants were included in the study. In all countries and in malnutrition screening tools, prevalence rates of high malnutrition risk were reported as 28% in hospitals, 17.5% in residential care homes and 8.5% in the community (28).

In a clinical study conducted with hospitalized cancer patients in France, the prevalence of malnutrition was examined in 1903 cancer patients under the age of 75, and it was concluded that 44.8% of the patients were malnourished (29).

2.4.4. Prevalence of Malnutrition in Adults in Turkey

The prevalence of malnutrition in the elderly varies depending on hospitalization status, place of residence, and the criteria used in the definition of malnutrition. It has been reported that 20-65% of the elderly hospitalized and 25-85% of the elderly staying in institutions are malnourished. In the prevalence studies conducted in our country, it has been reported that malnutrition is observed in the range of 20-65% or there is a risk of malnutrition in the elderly who are hospitalized, newly admitted to the hospital, or staying in nursing homes (30).

According to the Global Nutrition Report, in 2015 datas in studies conducted with adults in Turkey, it is stated that the rate of underweight in women is 1.7%, the rate of overweight is 69.38%, and the rate of obesity is 39.2%, while the rate of underweight is 1.1% in men, the rate of overweight is 64% and the rate of obesity is 24.4% (26).

2.5. The Prevalence of Malnutrition of Oncology Patients in the World and in Turkey

In a study conducted to evaluate the relationship between anthropometric measurements and body fat mass in children with cancer treated in the field of oncology and hematology, as a result of correlation analysis, BMI Z score, body fat percentage, ideal body weight, middle arm circumference, triceps skin folds and middle upper arm fat area was found to be statistically significant (31).

A study was conducted by Nething et al. to evaluate the relationship between BMI for age and height for age, weight for age and age for height in order to determine the nutritional status of children diagnosed with cancer. As a result of the study, 94.9% of the participants were considered to be at risk of malnutrition due to their low weight for height, while 86.9% were considered to be at risk of malnutrition because their BMI was low for age (32).

In a study conducted to evaluate the nutritional status and body fat mass of children with

cancer, 42 children who were treated for cancer were included. Participants were evaluated according to criteria such as age, weight, height, BMI, BMI z-score, ideal body weight percentage, body fat percentage, percentage of weight loss within 1 month, mid-arm circumference measurement, skinfold circumference measurements (triceps, biceps, suprailiac and subscapular skin folds) and mid-upper arm fat area, serum albumin level, treatment and its side effects, 50% or less food consumption for 3 days, growth percentage trend changes and nutritional risk of cancer treatment. At the end of the study, 21 of the children were below ideal body weight and 17 of them had negative BMI. It was stated that 28 participants had high-risk malnutrition, while 14 participants had low-risk malnutrition (33).

45 children were included in a study to evaluate the effects of nutritional status, oral nutritional supplementation on anthropometric and biochemical parameters, and complications in malnutrition in children diagnosed with cancer. Malnutrition was found in 49% of the patients. There was no significant difference between malnutrition-related gender, diagnosis of the disease, stage of the disease, and the place of residence of the patient. After the first nutritional evaluation, a total of 26 patients (18 hypercaloric and 8 isocaloric products) received oral nutritional support, and the number of patients with malnutrition decreased from 14 to 11 in the second 3 months after the diagnosis, and it was found to be statistically significant. Infection complications were observed more frequently in patients who were malnourished in the first 3 months. Regression analysis also showed that in malnourished patients, episodes of infection were more frequent at the time of diagnosis and at 3 months. A total of 12 of 45 patients died. Survival at diagnosis or at 3 months was not significantly different between malnourished children and well-nourished children. However, it was reported that the survival of children with malnutrition at 6 months was significantly lower than those of well-nourished children (34).

In a study conducted by Aarniyala et al., 139 children with cancer were included in order to evaluate the changes in BMI depending on age and gender in children with cancer and the malnutrition status in children treated for different cancer types. 9% of the participants were defined as underweight, 71% as normal, 16% as overweight and 4% as obese. Malnutrition occurred in 28% of patients during cancer treatment (35).

It has been concluded that the acute malnutrition rate is 65% in pediatric patients diagnosed with acute lymphoblastic leukemia and non Hodgkin lymphoma in India (36).

In a study conducted by Dişçi et al. in 2018, it was found that the rate of acute malnutrition was 39.5% in a study they conducted with 170 pediatric oncology patients, and

that malnutrition was most common in the 3rd and 6th months after chemotherapy treatment (37).

Zhang et al. conducted a systemic review and meta-analysis to examine the efficacy of diet therapy in patients who are malnourished or at risk of malnutrition. According to the quality of life results in three of the six studies included in this meta-analysis, diet programs given by dietitians show that they are beneficial in improving the quality of life of cancer patients with malnutrition. When the mortality rate is considered, it has been reported that there is no change in the mortality rate with diet practices in cancer patients with malnutrition. Dietary advice given by dietitians in two of the six studies included may increase energy intake in cancer patients undergoing treatment. In a total of four studies, it was stated that dietary counseling given by dietitians did not have a significant effect on body weight in cancer patients at risk of malnutrition or malnutrition (38).

Zhang et al. conducted a meta-analysis to determine the effect of malnutrition on overall survival in the elderly with cancer. This meta-analysis included 4692 older adult participants with cancer. As a result, it was stated that the risk of death in adults with cancer and undernourishment is higher than in well-nourished adults (39).

A study to evaluate the prevalence of malnutrition in people with different types of cancer and the effect of nutritional supplements on cancer patients included 1903 cancer patients. Malnutrition was defined as BMI <18.5 in patients aged <75 years or <21 in patients aged 75 years and/or more than 10% weight loss since disease onset. In the study, the prevalence of malnutrition, which was evaluated with the nutritional risk index and body weight loss, was found to be 39% and the prevalence was changed by different types of cancer such as 66.7% pancreas and 13.9% prostate. Participants stated that oral food intake decreased due to loss of appetite, loss of taste, nausea, difficulty in swallowing, poor or malnutrition, constipation, mouth pain, abdominal pain, vomiting, diarrhea and loss of smell. Overall, 57.6% of malnourished patients and 28.4% of malnourished patients received nutritional support (40).

4783 cancer patients were included in a study conducted to evaluate the prevalence of malnutrition and the effect of nutrition on cancer symptoms in elderly individuals diagnosed with cancer. The prevalence of malnutrition was reported as 45.3%, and the prevalence of malnutrition was found to be significantly higher in patients aged ≥65 years compared to other age groups. The most common findings were loss of appetite, nausea, dry mouth and vomiting (41).

In a study conducted in Brazil with 3061 cancer patients from 44 institutions,

hospitalized patients were evaluated using the Mini Assesment Short Form (MNA-SF) that is malnutrition screening tool, and at the end, 33.4% of the patients had malnutrition and 39.3% of them had risk of malnutrition and 27.3% of them had normal nutritional status (42).

In a study conducted by MD Anderson Cancer Center in the USA to investigate the prevalence of malnutrition among elderly cancer patients undergoing geriatric evaluation, 468 cancer patients were included and it was reported that 41.9% of the patients had malnutrition (43).

2.6. Determining the Nutritional Status of Pediatric Oncology Patients

Clinical assessment is essential in determining nutritional status in children. Clinical assessment includes taking nutritional history and anthropometric measurements and physical examination. It is recommended to use biochemical parameters when necessary (44).

Assessment of nutritional status is a comprehensive evaluation made by a registered dietitian nutritionist (RDN) using medical, health, social, nutrition and food consumption, history of drug, supplement and herbal support use, physical examination, anthropometric measurements and laboratory findings (45).

2.6.1. Nutritional History

The purpose of a food and nutrition history is to describe nutrient intake and imbalances, the causes of potential food and nutritional problems, and all dietary factors that are important in establishing nutritional diagnosis and intervention (46).

Some methods have been developed to determine an individual's food intake. The two most practically used methods are the 24-hour food consumption method, remembering and recording, and determining the frequency of food intake (46-47).

2.6.2. 24-Hour Food Consumption Method

The individual is asked about all the foods and beverages that he or she has consumed in the last 24 hours or more. The questionnaire can be written by the individual himself or recorded in the form prepared by a dietitian or nutritionist who has been trained in food and nutrition. The amount of energy and nutrients provided by each nutrient is calculated using the Nutrient Composition Charts. The sum of all days is divided by the number of days and the average daily amount of food types and nutrients is found (47).

2.6.3. Determination of Food Consumption Frequency

The food consumption frequency and the consumption of food or food groups are determined as the frequency of the day, week or month, and in quantity when requested. Food consumption frequency, when used together with 24-hour food consumption, confirms the information obtained and gives information about the food consumption pattern. The food consumption frequency form can be prepared in different ways depending on the purpose (47).

The food consumption frequency form has 2 advantages. These are a simple way to understand that not all of the nutrient categories are consumed and to cross-check routine daily intake (46).

2.6.4. Anthropometric Measurements

Assessment of nutritional status with anthropometric measurements is a non-invasive, easy, inexpensive and fast method used in the evaluation of short and long-term nutritional status. However, there is no single anthropometric measurement sufficient for a complete assessment of nutritional status. For this reason, many anthropometric measurements are used together in the evaluation of nutritional status. The most commonly used anthropometric measurements are weight, height, head circumference, skinfold thickness, and arm circumference. All anthropometric measurements for the evaluation of nutritional status should be compared with normals for age and gender (48).

Compared with healthy children, oncological patients have normal height for age and body weight for height, but have lower middle upper arm circumference (MUAC) and triceps skinfold thickness. MUAC is below the 5% percentile in 20% of patients. Compared with healthy children, 23% of children with cancer have higher triceps skinfold thickness, less than 2 standard deviations (49).

2.6.5. Body Weight Measurement and Weight Calculations According to Age

For most hospitalized or outpatients, body weight was the most commonly used measure in clinical practice (1). Weight is the sum of total body fat, muscle, water and bones (50).

Short-term changes in body weight reflect fluid balance and are the most important criterion for fluid balance. Long-term changes in body weight may reflect net changes in tissue mass, but do not provide insight into compositional changes (1). A precision balance with sensitivity up to 0.1 kg should be used during measurement (47).

In order to determine the degree of malnutrition, the Gomez classification, which is

calculated by calculating the percentage of the patient's weight according to the standard weight for his age, can be used (51).

Weight for height is more meaningful than weight for age in terms of evaluating the child's recent nutritional status. If the weight for height is below the 5th percentile, it indicates undernutrition, between the 5-95th percentile indicates normal nutrition, and above the 95th percentile indicates overnutrition (50).

2.6.6. Height Measurement and Calculation of Height by Age

Height measurement helps to evaluate the nutritional status as well as to distinguish between short-term and long-term nutritional disorders. The height of children under 2 years of age is measured lying down. Head-foot board is used for measurement. The patient's head is placed so that it touches the fixed headboard. With the knees extended and the ankles flexed to 90 degrees, the footboard is brought into contact with the sole of the foot and the length at the level of the footboard is read. In children over the age of two, height measurement is made standing up. However, if children over the age of 2 cannot stand, height measurement can be done lying down. However, measurements taken while lying down should be reduced by approximately 2 cm before marking them on percentile curves. Because, due to the effect of gravity, there is a difference of approximately 2 cm between standing and lying height measurements (48, 52).

The World Health Organization (WHO) has developed growth curves for children aged 0-5 and adolescents aged 5-19. Accordingly, it is recommended to use the WHO-2006 and 2007 Growth Standards, developed for the 0-5 age group, in the evaluation of body weight according to height for age (lying and standing), body weight for age, and height (lying and standing) for children. These growth curves include body weight, height, BMI, upper middle arm circumference, head circumference, triceps and subscapular skinfold thickness values (53). For children and adolescents aged 5-19 years, body weight, height for age and BMI values for age are given (53).

Neyzi et al. conducted a study to establish up-to-date reference standards for Turkish children and compare them with growth standards for US children The Center for Disease Control and Prevention (CDC) 2000 Growth Charts and previous local data. Height and weight measurements of 1100 boys and 1020 girls were taken. As a result, heights for boys and girls in all age groups were close to the updated 2000 US growth reference. This study was conducted with the children of families with high economic income. (54).

2.6.7. Body Mass Index

Body mass index (BMI) is a practical method used to determine the state of thinness and obesity. BMI is used for all age groups. The 0-5 age group is evaluated according to the WHO-2006 standard. The 5-19 age group is evaluated according to the WHO-2007 reference values (53).

BMI: It is considered as the index that best reflects the body composition. It is calculated with the formula [Body weight(kg)/height²(m)]. A value below the 5th percentile for age is considered underweight, those between the 85th and 95th percentile are considered overweight, and those above the 95th percentile are considered obese (55).

2.6.8. Head Circumference

Head circumference is measured from the largest frontal-occipital protrusion. Head circumference is a useful measurement until around age 3, when head growth slows down. The measurement should be made to at least 0.5 cm (46).

2.6.9. Upper Middle Arm Circumference

Middle upper arm circumference (MUAC) can be measured from the midpoint of the acromion and olecranon protrusion using a tape measure. It is a measurement that can replace weight measurement in cases where weight measurement is impossible. A low measurement value correlates well with mortality, morbidity, and response to nutritional support (A). Unlike other measures, the MUAC can be used as a stand-alone anthropometric assessment tool, since normal values vary little in the first years, making the MUAC a valuable tool in the evaluation of pediatric patients. The measurements can be compared with the standards developed by the World Health Organization (46, 56).

2.6.10. Triceps Skinfold Thickness

Triceps skinfold thickness (TCSF) measures the subcutaneous adipose tissue and is an indicator of the total amount of fat in the body. The measurement is made from the triceps and subscapular regions with the help of an instrument called a "skinfold caliper". The skinfold thickness is measured from the same point as the arm circumference measurement, in the middle of the arm above the triceps muscle. Measurements from these regions reflect long-term nutritional status rather than recent nutritional status. When the nutritional status deteriorates, the skin fold thickness will decrease as subcutaneous adipose tissue will decrease. In cases of overnutrition and obesity, the skinfold thickness increases as subcutaneous adipose tissue will

increase. The nutritional status of the patient is evaluated by comparing the skinfold thickness with the values in the tables showing the standards according to age and gender (57).

Measuring triceps skinfold thickness with a caliper is a very demanding procedure and there is an error rate of up to 20% among practitioners (1).

2.6.11. Laboratory Evaluation

Biochemical and hematological tests, which are indicators of nutritional status, are performed on blood (plasma, serum), red and white blood cells, urine and tissues such as liver, bone and hair. Blood proteins (albumin, transferrin, thyroxine-binding prealbumin, retinol-binding protein, fibronectin, somatomedin C), blood fats (total cholesterol, HDL-cholesterol, LDL-cholesterol, VLDL-cholesterol, triglyceride), hemoglobin and hematocrit levels, vitamin and mineral levels in blood and urine are assessments used to determine nutritional status. Biochemical and hematological tests are objective methods for determining nutritional status (47).

Many biochemical tests can be used to evaluate nutritional status. However, none of these tests alone is sufficient to evaluate nutritional status. In general, these tests are used as a complement to the history, physical examination and anthropometric measurements in the evaluation of nutritional status. Laboratory examinations can be performed to support the diagnosis of malnutrition, to show subclinical nutritional deficiencies, and to obtain baseline values for monitoring response to malnutrition therapy. For this purpose, serum proteins such as albumin, transferrin, prealbumin and retinol binding protein are most commonly used (58).

However, when evaluating nutritional status, it should be kept in mind that serum levels of these proteins may be affected not only by nutritional status but also by other factors such as liver and kidney diseases and infections (57).

2.7. Malnutrition Screening Tools Used in Pediatric Patients

Adequate nutrition in children is possible with the intake and use of calories, protein, vitamins, minerals and trace elements, which are necessary for maintaining life and ensuring adequate growth. Malnutrition is associated with increased mortality and morbidity in children. Malnutrition, which is still an important public health problem in children living in underdeveloped and developing countries, is seen at high rates in children with chronic diseases and who are hospitalized for a long time. The prevalence of malnutrition among hospitalized children ranges from 7.5% to 17% in Europe (59- 60).

Early diagnosis of malnutrition is very important in order to prevent the harm caused by malnutrition to the patient. It may occur due to the patient's illness, or it may occur due to hospital origin. Both malnutritions need to be treated as soon as possible. Usually, children at risk of severe malnutrition can be identified immediately, but it is very important to identify children who are moderately or mildly malnourished. Anthropometric methods are generally used to detect this (61).

In a study examining patients from different countries, it was reported that the prevalence of malnutrition detected at the time of admission to the hospital varied between 6.1% and 40.9% (62-64). It has been reported in other studies that this rate increases to a value between 44-64%, especially in the presence of an underlying disease history in children (65-67).

International health organizations recommend that all adults and children be screened for nutritional risk at every stage of their health care (68). For this purpose, nutritional evaluation scales have been developed to make it easier for health professionals who are not nutritionists to perform nutrition screening (69). The validation of these screening tools has been validated in a variety of clinical settings and in different patient groups. But these tools are mostly designed for adults. Adult questionnaires are not suitable for pediatric patients as their assessment may also include various anthropometric measurements or growth curves (62). To improve nutritional care in hospitals for pediatric patients, the European Society of Pediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) Nutrition Committee recommended the establishment and supervision of nutritional support teams to identify patients at risk of nutrition, ensure adequate nutritional management (70).

To address the risk of malnutrition in hospitalized children, pediatric malnutrition screening tools have been developed in recent years (62).

The Nutrition Risk Score (NRS), developed by Reilly et al., is a screening tool approved for use by nurses to assess the risk of malnutrition in hospitalized patients in both adults and pediatric patients. There are 4 specified parameters and patients score according to these parameters. Scores obtained are summed and patients are divided into risk groups in terms of malnutrition (71).

In 2000, Sermet et al developed a prospective nutritional screening tool. It is designed to identify children who are at risk of losing 2% or more of their weight. It is simple and easy to use, but requires 48 hours of follow-up after hospital admission and is not based on anthropometric measurements. It is interpreted according to the food intake being less than 50%

of normal, the presence of pain and the medical condition of the patient. It is calculated by giving 1 point to less than 50% food intake, 1 point for pain, 2 points for 2nd degree pathological condition and 2 points for 3rd degree pathological conditions. The presence of moderate nutritional risk is considered to be 2 points, while the high-risk malnutrition score is considered to be 3 and above (72).

Another malnutrition screening tool created by Secker et al. in 2017 is the Subjective Global Nutrition Assessment (SGNA). The SGNA was designed to question children's nutritionally focused physical examinations, current height, weight, parental height, dietary intake, presence, frequency and duration of gastrointestinal symptoms, and the patient's current functional capacity. The SGNA divides children into 3 groups: well-nourished, moderately malnourished, and severely malnourished. It has been reported that children classified as malnourished have a higher rate of infectious complications and longer postoperative stay than well-nourished children. One of the limitations of the use of SGNA in clinical practice is the time required to complete it and the education level of practitioners (73).

Another nutritional tool developed by McCarthy et al in 2012 is the Screening Tool for the Assessment of Malnutrition in Pediatrics (STAMP). According to this questionnaire, weight loss, discrepancy between weight and height, recently changed appetite and nutritional risk that may result from clinical diagnosis are questioned (74).

Another screening tool called Pediatric Yorkhill Malnutrition Score (PYMS) was developed by Germasidimis et al. in 2010. Accordingly, the PYMS is designed to detect children with energy/protein deficiency. The PYMS consists of 5 steps, and the last step provides the total nutritional risk score. The PYMS examines patients' BMI, weight loss history, changes in food intake, severity of underlying disease and its effect on nutritional status (75).

Another screening tool developed and tested by Hulst et al. in 2010 is the STRONGKids. In this study, this nutrition screening tool will be taken as ‘STRONGKids’. This scan tool is made up of four elements. The STRONGKids questions subjective clinical assessment, high-risk diseases, nutrient intake and loss, weight loss or inadequate weight gain. It has been claimed that this screening tool is quite simple to implement, but its weakness is that it contains subjective evaluations. The ideal nutritional screening tool is expected to be applicable by all healthcare professionals. According to the STRONGKids screening tool, patients were divided into 3 groups as low malnutrition risk, moderate malnutrition risk and high malnutrition risk (76).

Another nutritional screening tool developed by White et al. in 2016 is the Pediatric

Nutritional Screening Tool (PNST). The PNST consists of four different nutritional screening questions. Data collection on medical condition or anthropometric measurements is not required (77).

SCAN, a screening tool designed to be used under specific conditions, was developed in 2016 by Murphy et al. The SCAN is a simple, rapid and valid screening tool that can be used to determine the risk of malnutrition in children with cancer. Use of the tool allows early detection and treatment of malnutrition, improving potential clinical outcomes for children with cancer. The SCAN screening tool, which consists of 6 questions, questions the severity of the cancer, the intensity of the treatment, the patient's symptoms related to the gastrointestinal tract, food intake, weight loss, and malnutrition symptoms. Each question is worth 1-2 points and argues that patients with 3 points or more are at risk of malnutrition (7).

2.7.1. The Nutritional Screening Tool for Childhood Cancer (SCAN)

In children with cancer, malnutrition can significantly affect outcomes such as decreased treatment tolerance, increased susceptibility to infections, and decreased survival (4-5). However, malnutrition is largely undetected and unmonitored in most pediatric oncology hospitals. Early diagnosis is essential to prevent malnutrition and its complications during cancer treatment. Among the large number of tests performed on patients, nutritional assessment can often be overlooked (6).

Nutritional screening can offer an alternative to nutritional assessment to identify children with cancer who are already malnourished or at risk of malnutrition. The importance of early identification of nutritional risk and appropriate nutritional management has been recognized during hospitalization in hospitalized children, and numerous screening tools have been developed for this population. These screening tools have been developed for a variety of targets, applications and processes, but none of these tools meet the specific needs of children with cancer (7, 61).

According to ESPEN, a nutritional screening tool should assess the patient's current nutritional status, the stability of nutritional status, and the impact of the disease on the risk of malnutrition (78). Specifically, in children with cancer, an intermediary needs to consider the type of cancer and the treatment stages that may occur during treatment, inpatient or outpatient, and nutritional clinical symptoms. Not all nutritional screening tools currently used are designed to be specific to a disease. The SCAN screening tool asks questions that need to be asked in more detail in children with cancer and evaluates them accordingly (7).

The SCAN was developed as a straightforward and easy-to-apply tool to identify childhood cancer patients at risk for malnutrition. This tool can be easily applied not only by dietitians, but also by other healthcare professionals. In this study, this nutritional screening tool will be referred to as 'SCAN'. This study was conducted by testing the accuracy and validity of SCAN against STRONGKids (7).

The SCAN consists of 6 questions and includes the principles of meeting the nutritional screening tool principles, being oriented to pediatric oncology nutritional needs, being applicable with routine information and not requiring measurement, being quick and simple to apply, and being applicable for both high-income and low-income countries. It is a screening tool that can be applied to all cancer patients between the ages of 5-18 who receive inpatient or outpatient treatment. The value of each question varies between 1-2 points, and if the score obtained as a result of the screening is 3 or higher, it indicates the need for further evaluation (7).

3. MATERIALS AND METHODS

3.1. Research Location, Time and Participants

A total of 143 pediatric patients who were hospitalized in Yeditepe University Koşuyolu Hospital between 18.02.2021 and 02.06.2021 were included in this study. Patients were included in the study within 48 hours of their admission to the pediatric bone marrow transplantation service, surgical service, or neurosurgery service.

Participants who applied to Yeditepe University Koşuyolu Hospital, gave written consent from their legal parents and verbally consented from the children, were between the ages of 5-18, were diagnosed with cancer, and whose height and weight could be measured were included in the study.

Patients whose voluntary consent was not obtained, who were under the age of 5 and over the age of 18, who were not diagnosed with cancer, and whose height and weight could not be measured for any reason, were excluded from the study.

At the beginning of the study, approval was obtained from the Yeditepe University Ethics Committee (Ethics Committee Approval No: 2095 and 10/02/2021) (Appendix 1). In addition, permission was obtained from the Hospital's Chief Physician on 09/07/2020 with the approval numbered 11156775.900/170 to conduct the study at Yeditepe University Koşuyolu Hospital.

3.2. General Plan of the Research

First of all, written permission was obtained from the researcher who developed the SCAN nutritional screening tool. The Turkish language validity of the questionnaire, whose original language was English, was confirmed. For this purpose, a standard application procedure developed by Brislin (1986) was carried out, and the questionnaire questions were first translated into Turkish by the researcher who was fluent in both languages. Secondly, it was translated back into its original language by a jury of independent and bilingual expert academics. The translation procedure from the original language to Turkish and from Turkish to the original language was repeated until there was no inconsistency, error, bias or incompatibility in the questionnaire (79).

Before starting the fieldwork, a pilot study was conducted on the SCAN questionnaire. In November 2020, a pilot study was conducted on 15 dietitians who were registered toy he

master program of the Yeditepe University, Department of Nutrition and Dietetics. In the SCAN questionnaire, which was directed to dietitians, no unintelligible scale questions were encountered, except for the first question. Except for the first question, no changes were made for the other scale questions.

In our pilot study, there was no clear consensus on the definition of 'high-risk cancer' in the first question. In the original study in which the SCAN was developed, there is a description of 'according to hospital protocols'. Two specialist pediatric oncology doctors working at Yeditepe University Koşuyolu Hospital were consulted to learn about hospital protocols. A high risk definition was made according to the Yeditepe University Hospital criteria. In line with the suggestions, the SCAN questionnaire has become final.

3.3. Data Collection Tools

In order to achieve the aims of the research, two nutrition screening tools and one data collection tool were applied to the volunteer parents who participated in the research as data collection tools. These surveys were STRONGKids, SCAN and 'additional data collection form' surveys.

3.3.1. Screening Tool for Risk of Impaired Nutritional Status and Growth (STRONGKids)

STRONGKids is a screening tool created by Huls. Joosten et al to determine the risk of malnutrition in children aged 1 month to 18 years who have been hospitalized for more than 1 day. With the STRONGKids screening tool, patients are evaluated in 4 steps: Subjective clinical assessment (patient stability), high disease risk, food intake and weight loss (8).

The first question of STRONGKids shows the current nutritional status of the patients. This question, which is a subjective assessment, questions whether patients have signs of poor nutritional status. According to STRONGKids, signs of poor nutritional status; refers to the patient's decreased subcutaneous fat and/or muscle mass and/or meaningless blank stare.

STRONGKids' second question questions the stability of patients' condition. According to this scale, patients with weight loss or non-stop weight gain (<1 year) are considered stable, while patients who have lost weight or stopped gaining weight in recent weeks (<1 year) are considered unstable.

The third question of STRONGKids questions the deterioration of patients. 4 criteria were determined for deterioration. The first is diarrhea lasting more than 5 days and/or vomiting

lasting more than 3 days, the second is decreased food intake over the last few days, the third is previous nutritional intervention, and the fourth is insufficient food intake due to pain. According to STRONKGkids, if the patient has any of these, it is considered that the patient will worsen.

The fourth question from STRONGKids questions the acceleration of worsening in patients. The list of underlying diseases is given in the explanation section of this question. According to this question, if the patient has any of the underlying diseases listed in the list and/or a major surgical intervention is expected, it is accepted that the worsening of the patient has accelerated.

Patients receive points from the four questions in this scale, and if the total score is 0, the patients are considered to be at low risk for malnutrition, if the total score is between 1-3 points, the patients are considered to be at medium risk for malnutrition, and if the total score is between 4-5 points, the patients are considered to be at high risk for malnutrition. In the results section of the study, patients were grouped as 'low risk', 'moderate risk' and 'high risk' according to the scores they got from the scale (8).

3.3.2. Screening Tool for Childhood Cancer (SCAN)

Nutrition screening tool called SCAN was created by Alexia J. Murphy in 2016 to determine the malnutrition risk of children with cancer (7). The tool consists of 6 questions. Each question was given one or two points and the risk of malnutrition is determined according to the score obtained at the end of the survey. According to the score indicator of this scale, if the total score obtained from the survey questions is 3 and above, the patient is considered to be at risk of malnutrition. According to the scoring of the scale, those who score below 3 are considered to be at no risk in terms of malnutrition. In the results section of the study, patients were grouped as 'at risk of malnutrition' or 'not at risk of malnutrition' according to the scores they received from the scale.

The first question of the SCAN screening scale questions whether patients have a high-risk cancer. According to hospital protocols, high-risk cancer patients receive intensive chemotherapy, bone marrow transplant patients, and comorbidities (such as infection, recurrence of the disease).

The second question of SCAN questions whether patients are receiving intensive treatment. Criteria for intensive treatment include first chemotherapy block, radiation therapy, bone marrow transplant or upcoming gastrointestinal surgery.

The third question of SCAN questions whether patients have symptoms associated with the gastrointestinal (GI) tract. GI-related symptoms include any gastrointestinal symptoms in the patient from mouth to anus; for example, nausea, vomiting, diarrhoea, constipation, dysphagia, mucositis, typhitis, ileus, or radiation enteritis.

The fourth question of the SCAN questions whether patients have had inadequate nutrient intake during the past week.

The fifth question of SCAN questions whether patients have lost weight in the past month.

The sixth question of SCAN questions whether patients show signs of malnutrition. The criteria for showing signs of malnutrition, according to SCAN, are the patient's visible muscle wasting, edema, bilateral pedal edema, dry, thin, shiny or wrinkled skin, thin, sparse, and easily removed hair, or micronutrient deficiencies. (7).

3.3.3. Additional Data Collection Form

In addition to STRONGKids and SCAN nutritional screening tools, 'Additional Data Collection Form' was also used. Diagnosis, duration of diagnosis, and whether they had undergone surgery related to the disease were questionanned.

3.3.4. Anthropometric Measurements

Seca brand 799+220 height and weight scale was used to measure the height and weight of the patients aged 5–18 years. These vehicles are already available at Yeditepe University Koşuyolu Hospital.

Anthropometric measurements are observational measurements of the body using measuring instruments. According to the CDC, anthropometry can be used to inquire about the nutritional status of people of all ages. It is generally used in children to follow the growth and development of children and to evaluate their current situation (80).

In adulthood, body measurements can help determine the current nutritional status and make an idea about future diseases. Anthropometric measurements are often used to diagnose obesity in adults (81).

According to the American Academy of Pediatrics and Child Health and Disability Prevention (CHDP) Program Health Assessment Guidelines, accurately selected and measured anthropometric measurements can predict medical nutrition problems, social problems, and underlying medical problems in children and adults (82).

Measurements such as height and weight measurements in children and head circumference in infants are frequently used to monitor growth. When the ratio of any two of these measurements to each other is calculated, the new value created is called an index. For example, the ratio of age and height measurements to each other is an index used as 'height for age' (82).

CDC Growth Charts show five gender-specific enhanced anthropometric indices.

Evaluation of age and BMI together creates the '**BMI for age**' index. Accordingly, children are classified as underweight, normal weight, overweight or obese.

The ratios of age and height measurements form the '**height for age**' index. Accordingly, children can be classified as stunting, normal height or tall.

The ratios of age and weight measurements form the **'weight for age'** index. This value gives an idea about the weight status of children. Children can be evaluated as underweight, normal or overweight than other children of their age, and this value helps to show the current nutritional status of children.

Height and weight ratios constitute the '**weight for height**' index and are independent of age.

Wasting represents low weight for height. It is a definition that emerges with the 'weight for height' index. It occurs when children do not get enough energy for various reasons or when some disease conditions last for a long time, that is, when they cannot be fed for a long time (83).

Stunnting is an index obtained by the ratio of age and height measurements. In childhood, height rather than weight is more important for their development. Stunting, meaning being short for their age, can occur as a result of children being malnourished for a long time, battling an illness, having uneducated parents, or recurrent malnutrition. Stunting affects the cognitive development of children as well as their physical development (83).

Underweight is a diagnosis that emerges as a result of the 'weight for age' index evaluation, which is revealed by the ratios of age and weight measurements. A child who is underweight may also experience wasting or stunting, or even both (83).

The CDC growth reference charts use the 5th and the 95th percentiles as the outermost percentile cutoff values indicating abnormal growth.

Table 3.1 shows the percentile rank in CDC growth charts and the percent cutoff corresponding to the nutritional indicator (80).

In the study, the participants consisted of 7 groups as stunting, severly underweight, underweight, wasting, normal, overweight and obese according to their anthropometric measurements. In the study, those who were classified as stunting, severly underweight, underweight and wasting categories were grouped as 'undernourished', those who in the normal category was named 'well nourished' according to their anthropometric measurements and those who were overweight and obese were named 'overnourished'. These 3 groups are be referred to as 'nutritional assessment groups' throughout the study.

Table 3.1 Percentile Rank in CDC Growth Charts and the Percent Cutoff Corresponding to the Nutritional Indicator (80)

Anthropometric Index	**Percentile Cut Off Value**	**Nutritional Status Indicator**
BMI-for-age	> 95 Percentile	Obese
BMI-for-age Weight-for-height	85 < a < 95	Overweight
BMI-for-age	5< a <85	Normal
BMI-for-age Weight-for-height	<5	Underweight
Height-for-age	< 5th Percentile	Stunting
Weight-for-height	< 5th Percentile	Wasting

3.3.5. Statistical Analyzes

Microsoft Excel and SPSS 23 were used to evaluate the data. The Cronbach's Alpha test was used for the reliability test of the research, and the Kaiser-Meyer-Olkin Measure of Sampling Adequacy test was used for the validity test. The conformity of the variables to the normal distribution was examined using the Kolmogorov-Smirnov test. Descriptive analyzes were calculated using mean±standard deviation for normally distributed variables and using median and quartile ranges for non-normally distributed variables. Levene's test was used to determine the homogeneity of variances. Chi-square test was used to compare the variables.

The alpha coefficient method, developed by Cronbach (1951), is an internal consistency estimation method that is suitable to be used when items are scored sequentially (80). The alpha value obtained for all items indicates the overall reliability of that questionnaire. To be reliable,

the generally accepted view is that this value should be 0.7 or greater than 0.7. Expressions for each factor may have a single value determined, or there may be an average value for all items in the scale (81).

George and Mallery (George, D. and P. Mallery, 2003) made the classification as follows. Confidence Coefficient Criterion Values are given in Table 3.2 (81).

Table 3.2 Confidence Coefficient Criterion Values (81)

Cronbach Alpha	**Internal consistency**
$\alpha \geq 0.9$	Excellent
$0.8 \leq \alpha < 0.9$	Good
$0.7 \leq \alpha < 0.8$	Questionable
$0.6 \leq \alpha < 0.7$	Acceptable
$0.5 \leq \alpha < 0.6$	Poor
$\alpha < 0.5$	Unacceptable

Paired comparisons were made using Mann Whitney U test and Wilcoxon W test. Pearson Correlation Test and Spearman's Correlation Test were used to examine the relationships between variables. 95% confidence interval was applied in all tests and statistical significance level was accepted as $p < 0.05$ for comparisons.

4. RESULTS

4.1. Validity and Reliability Analysis

4.1.1. Reliability Analysis of the Research

The internal consistency analysis method called the Cronbach Alpha Coefficient was used to test the reliability of the scales. This 6-item screening scale is at an 'acceptable' level in terms of reliability with a Cronbach's Alpha score of 0.653 ($0.6 \leq \alpha < 0.7$).

4.1.2. Validity Analysis of the Research

Cronbach's Alpha analysis was used to test the internal consistency reliability of each scale of SCAN. It was not included in the analysis because there was no Likert-type question in the scanning tool. Cronbach's Alpha value is shown in Table 5. According to the Cronbach's Alpha value, the reliability for the scales is at an 'acceptable' level ($0.6 \leq \alpha < 0.7$).

Each item of the SCAN scale was analyzed separately, and each item was positively correlated with the other. The second item of the SCAN scale has the lowest correlation with 0.084. The calculated "Alpha if Item Deleted" value was calculated to determine the effects of the items (Table 4.1).

Table 4.1 SCAN Validity Analysis

	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
(SCAN1) Hastanın yüksek riskli bir kanseri var mı?	0.236	0.664
(SCAN2) Hasta şu anda yoğun bir tedavi görüyor mu?	0.084	0.669
(SCAN3) Hastanın GI kanalıyla ilişkili herhangi bir semptomu var mı?	0.478	0.585
(SCAN4) Hastanın geçen hafta boyunca besin alması yetersiz miydi?	0.543	0.561
(SCAN5) Hastada son 1 ay içinde hiç kilo kaybı var mı?	0.580	0.547
(SCAN6) Hasta yetersiz beslenme belirtileri gösteriyor mu?	0.454	0.606

4.2. Characteristics of the Participants

The characteristics of the participants are given in Table 4.3.

It was determined that 38.5% (n=55) of the participants were girls and 61.5% (n=88) were boys.

While 48.3% of the participants are aged 10 and below, 51.7% are aged 10 and over. The mean age of the participants was 10.20 ± 0.594 years for girls, 10.36 ± 0.454 years for boys and 10.30 ± 4.299 for all participants.

In the study, 1.4% (n=2) of the participants were stunted, 8.4% (n=12) severly underweight, 2.1%', (n=3) underweight, 2.8% (n) =4) were wasted, 32.9% (n=47) were at normal weight, 52.4% (n=75) were overweight or obese (Table 4.2).

Table 4.2 Classification of Participants According to Height for Age, Weight for Age and Weight for Height

Category	**Frequency (n)**	**Percent (%)**
Stunted	2	1.4
Severly Underweight	12	8.4
Underweight	3	2.1
Wasted	4	2.8
Normal	47	32.9
Overweight / Obese	75	52.4
Total	**143**	**100.0**

In the study, 14.7% (n=21) of the participants were undernourished as malnourished, 32.9% (n=47) were well nourished, and 52.4% (n=75) were overnourished (Table 8).

Participants are grouped in Table 4.3 according to BMI. 4.2% (n=6) of the participants were underweight, 39.2% (n=56) were at ideal weight, 23.8% (n=34) were overweight, and 32.9% (n=47) were found to be included in the obese group.

Table 4.3 Characteristics of the participants

Category		**Frequency (n)**	**Percent (%)**
Gender	Girls	55	38.5
	Boys	88	61.5
	Total	**143**	**100.0**
Age	<10 years	69	48.3
	>=10 years	74	51.7
	Total	**143**	**100.0**
BMI	Underweight	6	4.2
	Ideal weight	56	39.2
	Overweight	34	23.8
	Obese	47	32.9
	Total	**143**	**100.0**
Weight Classification	Undernourished	21	14.7
	Well nourished	47	32.9
	Overnourished	75	52.4
	Total	**143**	**100.0**

The diagnosis period of 27.3% (n=39) of the participants was 6 months or less, the diagnosis period of 10.5% (n=15) was between 6 and 12 months, 11.9% of the participants (n=17 individuals) were diagnosed duration was between 12 and 24 months, and 50.3% (n=72) had a diagnosis period of 24 months or longer (Table 4.4).

It was determined that 65.7% (n=94) of the participants had a surgical operation related to their disease while 34.3% (n=49) of the participants had not a surgical operation related to their disease (Table 4.4).

Table 4.4 Disease-Related Characteristics of Participants

Category		Frequency (n)	Percent (%)
Diagnosed time (month)	<6	39	27.3
	>=6, <12	15	10.5
	>=12, <24	17	11.9
	>=24	72	50.3
	Total	**143**	**100.0**
The situation of surgical operation related to the disease	Yes	94	65.7
	No	49	34.3
	Total	**143**	**100.0**

Table 4.5 shows the distribution of the participants according to their diagnoses. 49.7% (n=71) of the participants were diagnosed with acute lymphoblastic leukemia, 27.3% (n=39) of the participants had brain cancer, 6.3% (n=9) of the participants had hodkgin lymphoma, 4.2% (n=6) of the participants had were diagnosed with kidney cancer,2.8 % (n=4) of the participants had chronic myeloid leykemia, 2.8 % (n=4) of the participants had head and facial bones cancer, 0.7% (n=1) of the participants had langerhans cell histiocytosis, 0.7% (n=1) of the participants had histiocytic and mast cell tumors, 0.7% (n=1) of the participants had acute myeloid leukemia, 0.7% (n=1) of the participants had throid cancer, 0.7% (n=1) of the participants had retroperioneal cancer, 0.7% (n=1) of the participants had ovarian cancer, 0.7% (n=1) of the participants had liver cancer, 0.7% (n=1) of the participants had testicular cancer, 0.7% (n=1) of the participants had thorax connetive and doft tissue cancer, 0.7% (n=1) of the participants had adrenal gland cancer.

Table 4.5 The Distribution of the Participants According to Their Diagnoses

Category	Frequency (n)	Percent (%)
Acute Lymphoblastic Leukemia	71	49.7
Brain Cancer	39	27.3
Langerhans Cell Histiocytosis	1	0.7
Chronic Myeloid Leukemia	4	2.8
Histiocytic and Mast Cell Tumors	1	0.7
Acute Myeloid Leukemia	1	0.7
Thyroid Cancer	1	0.7
Hodkgin Lymphoma	9	6.3
Kidney Cancer	6	4.2
Head and Facial Bones Cancer	4	2.8
Retroperitoneal Cancer	1	0.7
Ovarian Cancer	1	0.7
Liver Cancer	1	0.7
Testicular Cancer	1	0.7
Thorax Connective and Soft Tissue Cancer	1	0.7
Adrenal Gland Cancer	1	0.7
Total	**143**	**100.0**

Table 4.6 shows the results of the STRONGKids questionnaire administered to the participants. Among the participants, a ‘low risk’ patient group in terms of malnutrition was not detected. It was determined that 83.2% (n=119) of the participants were in the moderate risk group, while 16.8% (n=24) were in the high risk group.

The results of the SCAN scale applied to the participants are shown in Table 4.6. According to the SCAN classification, 58.7% (n=84) of the participants were at risk of malnutrition and 41.3% (n=59) were not at risk of malnutrition.

Table 4.6 STRONGKids and SCAN Scores

		Frequency (n)	Percent (%)
Classification of STRONGKids	Low Risk	0	0.0
	Moderate Risk	119	83.2
	High Risk	24	16.8
	Total	**143**	**100.0**
Classification of SCAN	Not at risk of malnutrition	84	58.7
	At risk of malnutrition	59	41.3
	Total	**143**	**100.0**

4.3. STRONGKids Screening Test Evaluation and Analysis

In this section, the answers to each question in STRONGKids will be evaluated. All analyzes were performed on 2 groups, as there was no one scoring <1 according to the STRONGKids score classification.

As shown in Table 4.7, it was determined that 92.3% (n=132) of the patients did not have a poor nutritional status, and 7.7% (n=11) had a poor nutritional status. It was determined that the health status of 15.4% (n=22) of the patients was stable, and the health status of 84.6% (n=121) was unstable. It was determined that 39.2% of the patients had worsening in terms of malnutrition, and 60.8% of them did not worsen in terms of malnutrition. According to STRONGKids, 100% of the patients (n=143) had an underlying illness with a risk of malnutrition or expected major surgical intervention. All of our participants answered yes in this section, as 'cancer' is in the list of underlying diseases.

Table 4.7 Distribution of STRONGKids Questionnaire Responses

		Frequency (n)	Percent %
Poor Nutritional Status	Yes	132	92.3
	No	11	7.7
	Total	**143**	**100.0**
Health Status	Stable	121	84.6
	Not stable	22	15.4
	Total	**143**	**100.0**
Worsening in Terms of Malnutrition	Yes	87	60.8
	No	56	39.2
	Total	**143**	**100.0**
Underlying Illness with a Risk of Malnutrition or Expected Major Surgical Intervention	Yes	143	100.0
	No	0	0.0
	Total	**143**	**100.0**

The details of the patient's worsening condition are given in figure 4.1. According to STRONGKids, 87 participants had a worsening condition. When the causes of deterioration were examined, 9.2% of the patients had diarrhea for more than 5 days and/or vomiting for more than 3 days, 63.2% had reduced food intake for a few days, 27.6% had pre-existing nutritional intervention, %0.1 of them had insufficient food intake due to pain.

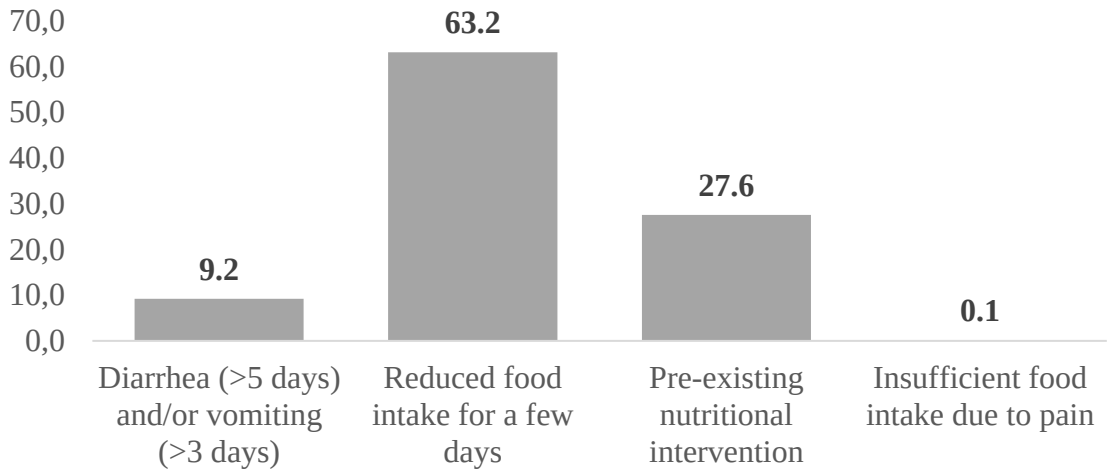

Figure 4.1 Details of Participants' Worsening Status

Table 4.8 shows the distribution of malnutrition risk classification according to the scores obtained from the STRONGKids screening tool. Accordingly, 83.2% of the patients were in the moderate risk malnutrition, while 16.8% were in the high-risk malnutrition classification.

Table 4.8 Distribution of Malnutrition Risk and Need for Intervention by STRONGKids

	Frequency (n)	**Percent (%)**
Low risk	0	0.00
Moderate Risk	119	83.2
High Risk	24	16.8
Total	**143**	**100.0**

In Table 4.9, the distribution of STRONGKids classification by gender was analyzed using the Chi-square test. No significant difference was found between the genders (P>0.05). While 83.6% (n=46) of the girls participating in the study were in the moderate risk group, 16.4% (n=9) were in the high risk group. While 83% (n=73) of the boys participating in the study were in the moderate risk group, 17% (n=15) were in the high risk group.

Table 4.9 STRONGKids Classification by Gender

	Girls		Boys		
	Frequency (n)	**Percent (%)**	**Frequency (n)**	**Percent (%)**	**p**
Low risk	0	0.00	0	0.00	
Moderate Risk	46	83.6	73	83.0	0.915
High Risk	9	16.4	15	17.0	
Total	**55**	**100.0**	**88**	**100.0**	

The distribution of STRONGKids classification according to age was evaluated with the Mann-Whitney U test (Table 4.10). No statistically significant difference was found between the two groups as a result of the Mann-Whitney U Test for STRONGKids score comparison according to age (P>0.05). According to STRONGKids, 82.6% (n=57) of children under the age of 10 were found to be moderate risk, and 17.4% (n=12) were found to be high risk. It was determined that 83.8% (n=62) of children over the age of 10 were moderate risk and 16.2% (n=12) high risk.

Table 4.10: STRONGKids Classification by Age

		Frequency (n)	**Percent (%)**	**p**
<10	Moderate Risk	57	82.6	
	High Risk	12	17.4	
	Total	69	100.0	0.279
>=10	Moderate Risk	62	83.8	
	High Risk	12	16.2	
	Total	74	100.0	

The distribution of the STRONGKids classification according to the duration of diagnosis was evaluated with the Pearson Chi-square test (Table 4.11). No significant difference was found between the time of diagnosis and the STRONGKids score (P>0.05).

Table 4.11 STRONGKids Classification by Time of Diagnosis

Time of Diagnosis	STRONGKids Score	Frequency (n)	Percent (%)	p
<6	Moderate Risk	33	84.6	0.703
	High Risk	6	15.4	
	Total	39	100.0	
>=6, <12	Moderate Risk	11	73.3	
	High Risk	4	26.7	
	Total	15	100.0	
>=12, <24	Moderate Risk	15	88.2	
	High Risk	2	11.8	
	Total	17	100.0	
>=24	Moderate Risk	60	83.3	
	High Risk	12	16.7	
	Total	72	100.0	

STRONGKids scores according to the surgical history of the participants are given in Table 4.12. The relationship between the presence of the participants' surgical history and the STRONGKids scores was evaluated with the Mann-Whitney test, but no statistically significant difference was found ($p<0.005$).

Table 4.12 Distribution of STRONGKids Scores by Participants' Surgical History

		Frequency (n)	Mean	Std. Deviation	p
Patients Have a History of Surgery	STRONGKids Score	94	2.85	.829	0.408
Patients Have Not Surgical History	STRONGKids Score	49	2.76	.855	

The distribution of STRONGKids classification according to nutritional assessment grouping by anthropometric measurements shown (Table 4.13). Pearson chi-square test was used to determine the statistical difference of STRONGKids classification according to nutritional assessment group. A significant correlation was found between STRONGKids score classification and nutritional assessment grouping by anthropometric measurements ($p<0.05$).

Kruskal Wallis-H test was used to determine whether the nutritional assessment grouping by anthropometric measurements showed a significant difference according to the STRONGKids scores variable (Table 4.13). As a result of the test, a statistically significant difference was found between the nutritional assessment groups and the mean STRONGKids scores.

The distribution of STRONGKids classification according to nutritional assessment groups by anthropometric measurements is shown (Table 4.13). 52.4% (n=11) of under nourished participants were at moderate risk, 47.6% (n=10) of at high-risk, 78.7% (n=37) of well-nourished participants wereat moderate risk and 21.3% (n=10) at high risk, 94.7% (n=71) of over nourished participants at moderate risk and 5.3% (n=4) at high risk.

Table 4.13 STRONGKids Classification Distribution According to Nutritional Assessment Grouping by Anthropometric Measurements

Nutritional Assesment Group	**STRONGKids Score**	**Frequency (n)**	**Percent (%)**	**p**
Undernourished	Moderate Risk	11	52.4	
	High Risk	10	47.6	
	Total	21	100.0	
Well nourished	Moderate Risk	37	78.7	
	High Risk	10	21.3	<0.001
	Total	47	100.0	
Overnourished	Moderate Risk	71	94.7	
	High Risk	4	5.3	
	Total	75	100.0	

Mann-Whitney U Test was performed to show the statistical difference of the relationship between STRONGKids classification according to nutritional assessment grouping by anthropometric measurements.

Post-hoc analysis show that there is a statistically significant difference between undernourished and well-nourished groups (p=0.012, <0.05). There was also a statistically significant difference between the undernourished and overnourished groups (p<0.001). There was a statistically significant difference between the well-nourished group and the over-nourished group (p=0.003, <0.05).

4.4. SCAN Scanning Scale Evaluation Charts

This section includes the evaluation of each of the six questions of the SCAN screening scale. Figure 4.2 shows that 56.6% of the participants had high risk cancer, and 43.4% did not have high risk cancer.

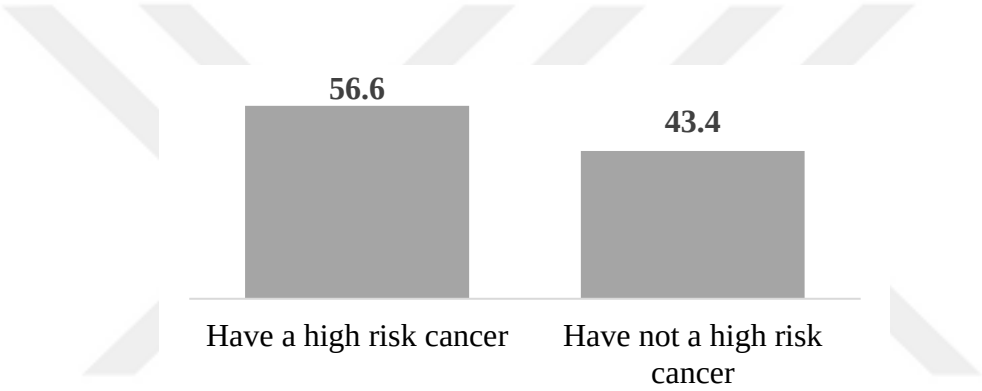

Figure 4.2 High Risk Cancer Status of Participants

In the study, it was determined that 43.3% of the participants were undergoing intensive treatment and 56.72% of were not undergoing intensive treatment (Figure 4.3).

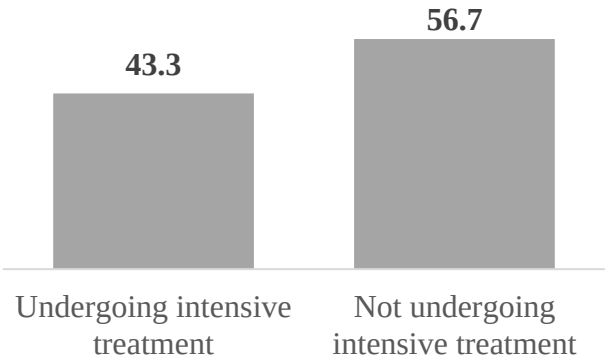

Figure 4.3 Participant's Distribution of Being Undergoing Intensive Treatment

In the study, it was determined that 18.2% of the participants had gastrointestinal (GI) related symptoms and 81.8% did not have gastrointestinal-related symptoms (Figure 4.4)

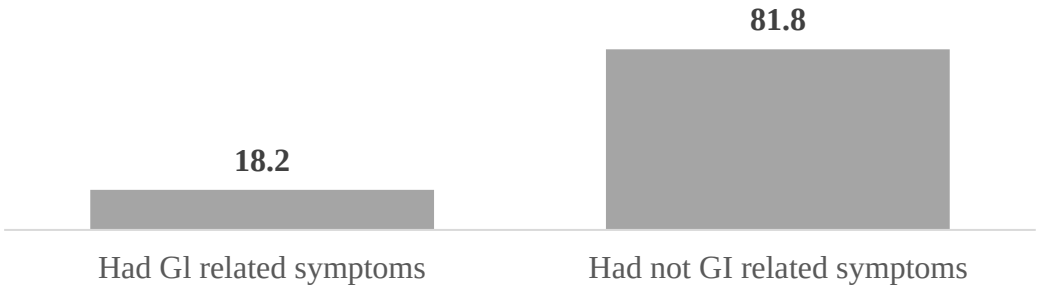

Figure 4.4 Distribution of Symptom Associated with the Participant's GI Tract

It was determined that 47.6% of the participants had poor oral intake during the last week, and 52.4% of them did not have poor oral intake during the last week (Figure 4.5).

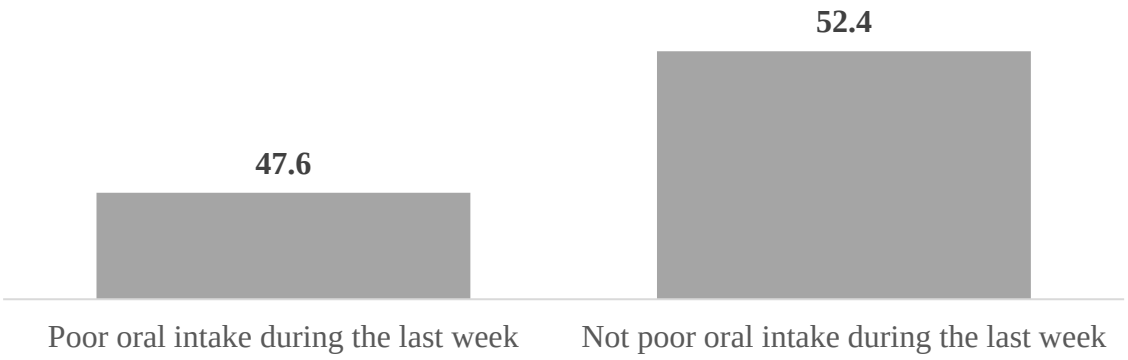

Figure 4.5 Distribution of Participants' Poor Oral Intake During

It was determined that 14.7% of the participants lost weight in the last month, and 85.3% did not lose weight in the last month (Figure 4.6).

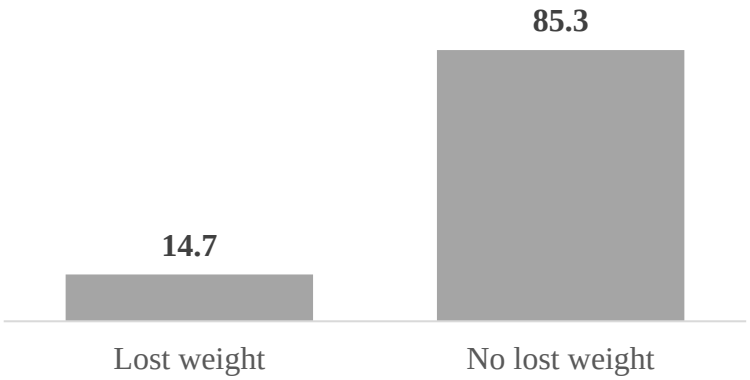

Figure 4.6 Distribution of Participants' Weight Loss in the Last Month

It was determined that 8.4% of the participants showed signs of malnutrition, while 91.6% did not show signs of malnutrition (Figure 4.7).

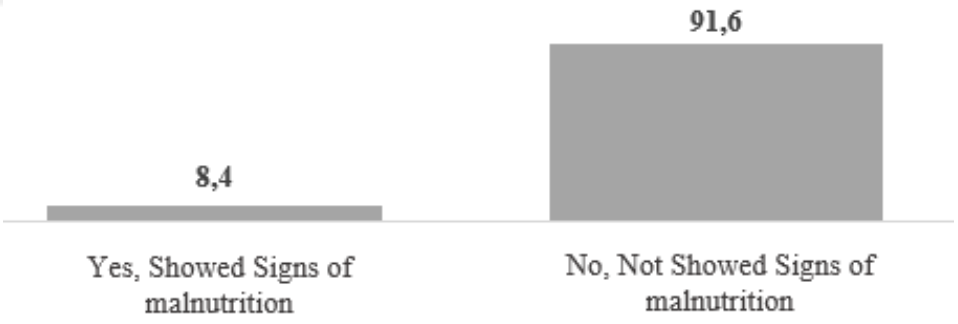

Figure 4.7 Distribution of Participants' Signs of Under Nutrition

Table 4.14 shows the malnutrition risk distribution of the participants according to SCAN. It was determined that 58.7% of the patients participating in the study were not at risk for malnutrition, and 41.3% were at risk for malnutrition.

Table 4.14 Malnutrition Risk Distribution of Participants by SCAN

	Frequency (n)	Percent (%)
Not at risk of malnutrition	84	58.7
At risk of malnutrition	59	41.3
Total	**143**	**100.0**

Table 4.15 shows the SCAN classification of patients by gender. It was determined that 63.6% of the girls participating in the study were not at risk of malnutrition, and 36.4% were at risk of malnutrition. It was determined that 55.78% of the boys participating in the study were not at risk of malnutrition, and 44.3% were at risk of malnutrition. Pearson chi-square test was used to determine the statistical difference of SCAN classification according to gender. No statistically significant difference was found as a result of the analysis ($p<0.005$).

Table 4.15 Malnutrition Risk Distribution by SCAN According to Gender

	Girls		Boys		
	Frequency (n)	Percent (%)	Frequency (n)	Percent (%)	P
Not at risk of malnutrition	35	6.6	49	55.7	0.347
At risk of malnutrition	20	36.4	39	44.3	
Total	**55**	**100.0**	**88**	**100.0**	

Table 4.16 shows the distribution of SCAN classification by age. Pearson chi-square test was used to determine the statistical difference of SCAN classification according to age. No significant difference was found between age and SCAN score classification ($P>0.05$). It was determined that 56.5% (n=39) of the participants under the age of 10 were not at risk of malnutrition according to SCAN, and 43.5% (n=30) were at risk of malnutrition. It was determined that 60.8% (n=45) of the participants over the age of 10 were not at risk of malnutrition according to SCAN, and 39.2% (n=29) were at risk of malnutrition.

Table 4.16 Malnutrition Risk Distribution by SCAN According to Age

Age	SCAN Score	Frequency (n)	Percent (%)	p
<10	Not at risk of malnutrition	39	56.5	0.603
	At risk of malnutrition	30	43.5	
	Total	69	100.0	
>=10	Not at risk of malnutrition	45	60.8	
	At risk of malnutrition	29	39.2	
	Total	74	100.0	

Table 4.17 shows the distribution of SCAN classification according to the time of diagnosis. It was determined that 53.8% of the participants who were diagnosed with cancer for less than 6 months were not at risk for malnutrition, and 46.2% were at risk for malnutrition. It was determined that 33.3% of the patients diagnosed with cancer between 6 months and 12 months were not at risk for malnutrition, and 66.7% were at risk for malnutrition. It was determined that 64.7% of the patients diagnosed with cancer between 12 months and 24 months were not at risk for malnutrition, and 35.3% were at risk for malnutrition. It was determined that 65.3% of the patients diagnosed with cancer for more than 24 months were not at risk for malnutrition, and 34.7% were at risk for malnutrition. Pearson chi-square test was used to determine the statistical difference of SCAN classification according to time of diagnosis. No significant difference was found between the time of diagnosis and SCAN score classification ($P>0.05$).

Table 4.17 Malnutrition Risk Distribution by SCAN According to Time of Diagnosis

Time of Diagnosis	SCAN Score	Frequency (n)	Percent (%)	P
<6	Not at risk of malnutrition	21	53.8	
	At risk of malnutrition	18	46.2	
	Total	39	100.0	
>=6, <12	Not at risk of malnutrition	5	33.3	
	At risk of malnutrition	10	66.7	
	Total	15	100.0	0.117
>=12, <24	Not at risk of malnutrition	11	64.7	
	At risk of malnutrition	6	35.3	
	Total	17	100.0	
>=24	Not at risk of malnutrition	47	65.3	
	At risk of malnutrition	25	34.7	
	Total	72	100.0	

SCAN scores according to the surgical history of the participants are given in Table 4.18. The relationship between the presence of the participants' surgical history and the SCAN scores was evaluated with the Independed Sample t-test, but no statistically significant difference was found (P<0.005).

Table 4.18 Distribution of SCAN Scores by Participants' Surgical History

		Frequency (n)	Mean	Std. Deviation	P
Patients Have a History of Surgery	SCAN Score	94	2.77	2.499	0.660
Patients Have Not Surgical History	SCAN Score	49	2.57	2.517	

The distribution of SCAN classification according to nutritional assessment grouping by anthropometric measurements shown (Table 4.19). Pearson chi-square test was used to determine the statistical difference of SCAN classification according to nutritional assessment group. A significant correlation was found between SCAN score classification and nutritional assessment groups regarding the anthropometric measurements ($p<0.05$).

According to anthropometric measurements, 23.8% of the participants in the undernourished group were not at risk for malnutrition and 76.2% were at risk of malnutrition. According to anthropometric measurements, 55.3% of the participants in the well nourished group were not at risk for malnutrition and 44.7% were at risk for malnutrition. According to anthropometric measurements, it was determined that 70.7% of the participants in the overnourished group were not at risk for malnutrition and 29.3% were at risk for malnutrition.

Table 4.19 Malnutrition Risk Distribution by SCAN According to Nutritional Assessment Groups

Nutritional Assesment Group	SCAN Score	Frequency (n)	Percent (%)	p
Undernourished	Not at risk of malnutrition	5	23.8	0.001
	At risk of malnutrition	16	76.2	
	Total	21	100.0	
Well nourished	Not at risk of malnutrition	26	55.3	
	At risk of malnutrition	21	44.7	
	Total	47	100.0	
Overnourished	Not at risk of malnutrition	53	70.7	
	At risk of malnutrition	22	29.3	
	Total	75	100.0	

One-way analysis of variance (ANOVA) was performed to determine whether there was a significant difference according to the nutritional assessment grouping according to anthropometric measurements and the SCAN scale arithmetic means. As a result of the test, a statistically significant difference was found between the nutritional assessment groups and the SCAN arithmetic means ($p<0.001$).

Post-hoc analysis was used to analyze the relationship between significance. While there was a significant difference between undernourished and well nourished participants ($p<0.001$), there was no significant difference between well nourished and overnourished participants ($p= 0.274$; $p>0.005$).

The relationship between nutrition assessment groups is shown in Table 4.20.

Table 4.20 Relationship between Nutritional Assessment Groups

Nutritional Assessment Groups		Mean Difference (I-J)	Std. Error	p
Undernourished	Well nourished	2.462	.598	<0.001
	Overnourished	3.116	.562	<0.001
Well nourished	Undernourished	-2.462	.598	<0.001
	Overnourished	.654	.424	0.274
Overnourished	Undernourished	-3.116*	.562	<0.001
	Well nourished	-.654	.424	0.274

4.5. SCAN Scale Analysis

Since the data in this section showed normal distribution, the analyzes were made with parametric test methods.

4.5.1. Results of Factor Analysis

The entire questionnaire applied with 143 participants using the STRONGKids and SCAN rating scales is valid, and the Alpha coefficient of the reliability analysis is at an 'acceptable' level according to the result of 0.653.

Before applying the Factor Analysis to the questionnaire data, which consists of the answers of the participants to the criteria affecting the STRONGKids and SCAN value, the suitability of the data was investigated. After the Factor Analysis was done, the determination of the number of factors, the rotation and interpretation of the factors were carried out sequentially.

A Kaiser Meyer Olkin (KMO) test result of 0.66 means that the number of samples at the “moderate” level is sufficient in the range of $0.60 \leq KMO < 0.70$. A significance of 0.000 ($p<0.05$) according to Barlett's Test indicates that there is a correlation between the criteria. Therefore, according to the results of KMO and Bartlett's Test, the data were suitable for factor

analysis.

Determining the Number of Factors

The eigenvalues and variances of 6 criteria were analyzed as percentages. The total explained variance ratio of 2 factors with eigenvalues greater than 1 and 1 was determined as 60,423%. Therefore, the number of factors is 2 according to the total explained variance ratio.

Rotation of Factors

In order for the factors to be interpreted more easily, rotation (vertical rotation) was applied with the most commonly used varimax method.

Interpretation of Factors

The 2 factors obtained as a result of the analysis were named according to the general feature specified by the criteria in each factor. The naming of the factors is shown in Table 4.21.

First factor; it has the highest eigenvalue (2.368) and has gathered 2 criteria in total according to factor loads. It has been named 'High-Risk Cancer Treatment'.

Second factor; It has the second largest eigenvalue (1.258) and consists of 4 criteria according to factor loads. It has been named 'Nutrition and Digestive Disorders'.

Table 4.21*:* Naming the factors

Factor	Name of Factors	Number of Items
1	High Risk Cancer Treatment	2
2	Nutrition and Digestive Disorders	4

Eigenvalues and variance explanation rates for the 2 factors obtained are given in Table 4.22. As can be seen from the table, 2 factors can explain 60.423% of the change explained by 6 variables together.

Table 4.22 Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	**% of Variance**	**Cumulative %**	**Total**	**% of Variance**	**Cumulative %**
1	2.368	39.461	39.461	2.368	39.461	39.461
2	1.258	20.962	60.423	1.258	20.962	**60.423**
3	0.876	14.604	75.027			
4	0.675	11.257	86.284			
5	0.466	.761	94.045			
6	0.357	5.955	100			
Extraction Method: Principal Component Analysis.						

Table 4.23 Component Matrix

	Component	
	1	**2**
(SCAN1) Hastanın yüksek riskli bir kanseri var mı?	.339	**.661**
(SCAN2) Hasta şu anda yoğun bir tedavi görüyor mu?	.083	**.840**
(SCAN3) Hastanın GI kanalıyla ilişkili herhangi bir semptomu var mı?	**.728**	-.277
(SCAN4) Hastanın geçen hafta boyunca besin alması yetersiz miydi?	**.725**	.108
(SCAN5) Hastada son 1 ay içinde hiç kilo kaybı var mı?	**.829**	-152
(SCAN6) Hasta yetersiz beslenme belirtileri gösteriyor mu?	**.709**	-.063
Extraction Method: Principal Component Analysis.		
a. 2 components extracted.		

4.6. STRONGKids and SCAN Comparison Analysis

The relationship between the STRONGKids score and the SCAN score was examined by Spearman correlation analysis and it was found that the two scales had a high positive

correlation (p<0.005). Table 4.24 shows the correlation between SCAN and STRONGKids.

Table 4.24 Correlation between STRONGKids and SCAN

			STRONGKids Score	**SCAN Score**
Spearman's rho	**STRONGKids Score**	Correlation Coefficient	1.000	0.799**
		p		**<0.001**
		n	143	143
	SCAN Score	Correlation Coefficient	0.799	1.000
		p	<0.001	
		n	143	143

The table of means by SCAN grouping is given in Table 4.25. Mann-Whitney U test was performed to analyze the means of the SCAN grouping. There was a statistically relationship between SCAN grouping and STRONGKids score classification (p=0.001; p<0.005). There was not a significant relationship between SCAN grouping with age and time of diagnosis.

Table 4.25 Means by SCAN Grouping

SCAN Classification		n	Minimum	Maximum	Mean	Std. Deviation	p
Not at risk of malnutrition	Time of Diagnosis	84	0,5	156	33.44	35.62	0.140
	Age	84	5	18	10.36	4.301	0.920
	STRONGKids Score	84	2	3	2.32	0.470	**0.001**
At risk of malnutrition	Time of Diagnosis	59	0.5	96	21.72	22.69	0.140
	Age	59	2	18	10.22	4.331	0.920
	STRONGKids Score	59	3	5	3.53	0.728	**0.001**

No statistically significant relationship was found between the mean scores of STRONGKids and SCAN scanning tools (p> 0.05) (Table 4.26). Paired Samples t-test was performed to analyze the relationship between the mean scores of the STRONGKids and SCAN screening tools.

Table 4.26 STRONGKids and SCAN Score Statistics

	Mean	Frequency (n)	Std. Deviation	Std. Error Mean	P
STRONGKids Score	2.82	137	0.851	0.073	**0.435**
SCAN Score	2.69	137	2.537	0.217	

5. DISCUSSION and CONCLUSION

Hospitalized patients are the most risky group in terms of risk of malnutrition. The malnutrition of the patient who is admitted to the hospital for any reason adversely affects the success of the treatment. In order to prevent hospital-acquired malnutrition and complications, decreased nutrition and the risk of developing malnutrition should be determined, especially during admission to the hospital (1). Nutritional screening tests developed for pediatric patients are important to prevent this situation (7, 59-64). In particular, a nutritional screening tool in children with cancer needs to assess the type of cancer, treatment stages, and nutritional-related clinical symptoms that may occur during treatment (7). SCAN is one of the scanning tools aimed at this. In this study, it is aimed to translate the SCAN scanning tool into the Turkish language. Bringing a nutritional screening tool specifically designed for children with cancer to Turkey is important for the prevention and treatment of malnutrition.

The survey results obtained by reaching 143 children with cancer who applied to a private hospital in Istanbul are discussed in this section. This 6-item screening scale is at an 'acceptable' level in terms of reliability with a Cronbach's Alpha score of 0.653 ($0.6 \leq \alpha < 0.7$). When the second item of the SCAN scale was removed, the Cronbach's Alpha value gave a 'reliable' result of 0.7. However, this item was not excluded from the study because it is recommended to increase the number of samples and conduct a re-study in the future. Each item of the SCAN scale was analyzed separately, and each item was positively correlated with the other. Item 2 of the SCAN scale has the lowest correlation with 0.084, and item 5 has the highest correlation with 0.580. In original SCAN study, to measure the validity of SCAN, a receiver-operator characteristic (ROC) curve was used to demonstrate the relationship of the SCAN score with the pediatric SGNA definition of malnutrition. The validation of SCAN against pediatric SGNA showed SCAN had ‘excellent’ accuracy (0.90, 95% CI 0.78–1.00; $p < 0.001$), 100% sensitivity, 39% specificity, 56% positive predictive value and 100% negative predictive value (7).

In the malnutrition screening study conducted in children with cancer using arm anthropometry, malnutrition was detected in 27% of the children (84). In another study, 6.8% of children with cancer were found to be undernourished, and 9.4% were found to be overnutrition (85). In another study, 8-23% of children with cancer were found to be malnourished and 5-20% overweight (86). The inconsistency in the studies may vary according to the sample selection, the severity of the diseases of the patients or the economic and social

conditions of the countries where the studies were conducted. In a meta-analysis conducted by Brinksma et al., as a result of scanning 46 articles from high-income countries, the prevalence of malnutrition was found to be around 0-10% in children with leukemia, between 20-50% in those with neuroblastoma, and around 0-30% in children with solid tumors (87). There are studies showing that the prevalence of malnutrition is higher in underdeveloped or developing countries than in developed countries (88-91). In a study conducted in India, in which 1693 children with cancer were included, the prevalence of malnutrition was reported to vary between 38-81% (89). In a study conducted in Spanish-speaking countries of Central America, the prevalence of malnutrition was found to be 38-57% according to arm anthropometry measurements of 1787 children with cancer (90). In a meta-analysis study to evaluate the prevalence of malnutrition in pediatric cancer patients and the effects of pediatric cancer and its treatment on nutritional status, 46 studies were evaluated. BMI, weight loss, MUAC, and TCSF were used to define malnutrition, while BMI was used for overnutrition. In the study, the prevalence of malnutrition was between 0-60%, while the prevalence of overnutrition ranged from 8-78% (91). In a study conducted in Spain in which the SCAN screening tool was previously applied, 45% of pediatric patients were found to be ‘at risk of malnutrition’ according to SCAN (92). In our study, it was concluded that 58.7% of children were ‘not at risk for malnutrition’ and 41.3% were ‘at risk for malnutrition’ according to the SCAN screening tool. In our study, children with cancer who participated in our study had 0% ‘low risk’, 83.2% ‘moderate risk’ and 16.8% ‘high risk’ for malnutrition according to the STRONGKids screening tool. The inconsistency between the 2 scales in our study is thought to be related to the fact that the STRONGKids screening tool directly included each child with cancer in the 'moderate risk malnutrition' class, regardless of their current nutritional status or anthropometric measurements. In this respect, the STRONGKids screening tool can misjudge patients with cancer and good nutritional status in terms of malnutrition detection.

Studies were conducted to examine whether the prevalence of malnutrition changes according to different diagnostic groups. In a study conducted with 100 children with cancer with different diagnoses, 20-50% malnutrition was observed in children, but no statistically significant difference was found according to diagnoses (l). Another study used weight, height, TCSF, MUAC, arm muscle circumference, BMI, and percent weight loss to assess nutritional status. In this study, in which 1154 children with cancer participated, the patients were divided into two groups as solid and patients with hematological malignancies, and no statistically significant difference was observed between the groups (91). However, some studies have reported that the prevalence of malnutrition varies according to the diagnosis (93). There are

studies showing that children diagnosed with solid tumors have a higher prevalence of malnutrition than those with hematological malignancies. It has been determined that the prevalence of overweight and obesity is higher in patients with brain tumor and other related diagnoses (94). In our study, there was no statistically significant difference between the scores obtained from the SCAN and STRONGKids scanning tools according to the diagnostic groups. This may be related to the non-normal distribution of the diagnostic groups in our sample distribution.

In one of the studies investigating how the time of diagnosis affects the prevalence of malnutrition, it was determined that the prevalence of malnutrition in patients with leukemia was 5-10% at the time of diagnosis, and 0-5% during treatment. In patients with neuroblostoma, the prevalence of malnutrition was found to be 0-50% at the time of diagnosis and 20-50% during treatment (87). In a study conducted in children with cancer, it was reported that malnutrition did not develop in patients 9, 12 and 18 months after diagnosis according to BMI. In the same study, it was reported that there was no statistically significant difference between the duration of diagnosis and the development of malnutrition in the 30-month follow-up of patients newly diagnosed with cancer (94). This is consistent with findings from another study (95). However, this contradicts a systematic review reporting a high prevalence of malnutrition (20%) at the end of cancer treatments (91). In one study, no child with cancer was diagnosed with PEM at 30 and 36 months after diagnosis (94). In another study, the prevalence of malnutrition in children with newly diagnosed cancer at the time of diagnosis was found to be 29.8%, 38.3% after 3 months and 18.5% after 3 years. It was found that the prevalence of malnutrition did not increase as the diagnosis time increased (96). In our study, there was no statistically significant difference between the long or short diagnosis times of different children with different diagnosis times and the scores they got from the screening tools. In our study, a result compatible with the literature was obtained.

In one of the studies investigating the prevalence of malnutrition in patients with a history of surgical operations related to their disease, 26.9% of the patients were found to be severely malnourished and 28.8% to moderately malnourished according to Subjective Global Assesment (SGA) (97). In another study, according to SGA, 14.1% of children who underwent surgery were found to be severely malnourished and 21.7% to moderately malnourished (98). In our study, there was no statistically significant difference between the patients undergoing surgery and the scores they got from the SCAN or STRONGKids scanning tools. The above studies are the studies performed in the first 2 weeks after the operation. This result, which

conflicts with the literature, may be due to the fact that the time passed over the operation was not questioned in our study.

Some studies have shown that detecting malnutrition with BMI alone is insufficient (84, 94, 99). In one of the studies, it was found that patients did not develop malnutrition according to BMI for 18 months after diagnosis, but showed signs of malnutrition according TCSF and MUAC (94). There are studies advocating the necessity of measuring TSFC and MUAC in addition to BMI to detect malnutrition in children with cancer (100). In a study, it was shown that although children with cancer were classified as normal, overweight or obese according to BMI, MUAC and TCSF measurements could be significantly lower than control values (84). The inconsistency between these values is thought to be due to the effect of large tumor masses masking the decreased true body weight (101). In our study, no statistically significant correlation was found between the BMI values of the patients and the scores they got from the SCAN or STRONGKids screening tools. This result is in agreement with the literature.

In most studies, indices of body weight are used to detect childhood malnutrition (102-103). In a meta-analysis conducted in Brazil and including 26 studies, it was determined that 6-25% of 3509 children with cancer were underweight at diagnosis, around 8.9-42.9 percent were stunting, and 4.1-35% were overweight (86) . In a study of patients with hematological and solid tumors, children with cancer were followed for 12 months, and there was a significant increase in BMI and body fat, while no change in lean body mass was observed during the follow-up. As a result, BMI increased as the duration of diagnosis of the patients increased (104). Malnutrition in obese children can be overlooked in malnutrition screenings performed according to the weight index. It is known that corticosteroids used in the treatment of leukemia cause an increase in body weight as a side effect. Therefore, malnutrition rates may have been found to be lower than normal rates due to the side effects of corticosteroid therapy (105). In one study, it was stated that obesity in children with cancer may be caused by low physical activity, corticosteroid treatments, growth hormone deficiency, leptin deregulation and poor eating habits (106). There are other studies showing that body weight is not sufficient to detect malnutrition in pediatric oncology patients. One study showed that tumor masses can reach more than 10% of total body weight in children with malignancy, so body weight alone may be misleading in detecting malnutrition (107). In our study, 29.3% of overweight or obese patients who were overnourished were identified as 'at risk of malnutrition' according to the SCAN screening test. As a result supporting that only my weight measurement is insufficient to detect malnutrition, a result compatible with the literature was obtained.

The GI tract related questions of the SCAN screening test were asked in more detail than the GI tract related questions of the STRONGKids screening scale. STRONGKids only queries for vomiting and diarrhea, while the SCAN scan tool queries for nausea, constipation, dysphagia, mucositis, typhitis, ileus, or radiation enteritis as well as vomiting and diarrhea. In our study, GI tract-related problems were detected in 25 patients according to SCAN, while GI-related problems were detected in only 8 of these 25 children according to the STRONGKids screening test. The SCAN scan tool is considered to be better than STRONGKids at detecting GI tract related questions.

This study should be repeated with a larger sample. In this study, it is aimed to translate the SCAN scanning tool into Turkish, to make a validity and reliability study and to bring it to the Turkish society. However, the sample selection was made only among the patients who applied to a private hospital in Istanbul. The sample selection of the study does not reflect the Turkish society in this respect. Most of the patients participating in the study in the hospital where they work are hospitalized in the pediatric bone marrow transplantation service, and patients with hematological cancer are the majority in the sample selection. The cancer diagnoses of the participants in this study were not homogeneously distributed. Only body weight and height measurements were taken from the anthropometric measurements of the participants, and current studies in the literature have shown that only body weight and BMI may be insufficient to define malnutrition. It is recommended to take MUAC and TCSF measurements from anthropometric measurements in the future study, which is recommended to be done with a larger sample.

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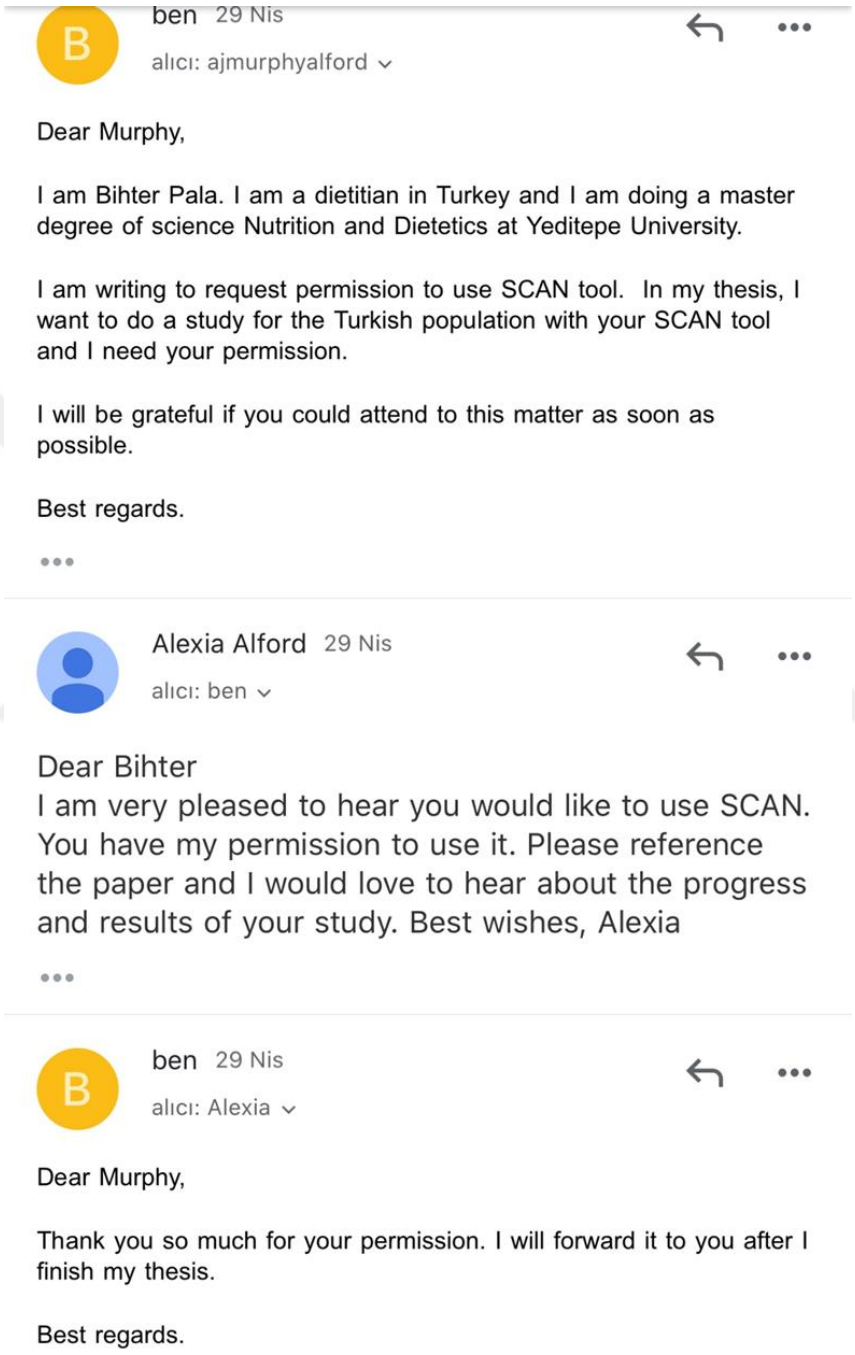
7. APPENDICES

APPENDIX - 1 Written Approval from the SCAN Scale Author



ben 29 Nis

alıcı: ajmurphyalford

Dear Murphy,

I am Bihter Pala. I am a dietitian in Turkey and I am doing a master degree of science Nutrition and Dietetics at Yeditepe University.

I am writing to request permission to use SCAN tool. In my thesis, I want to do a study for the Turkish population with your SCAN tool and I need your permission.

I will be grateful if you could attend to this matter as soon as possible.

Best regards.

Alexia Alford 29 Nis

alıcı: ben

Dear Bihter
I am very pleased to hear you would like to use SCAN. You have my permission to use it. Please reference the paper and I would love to hear about the progress and results of your study. Best wishes, Alexia

ben 29 Nis

alıcı: Alexia

Dear Murphy,

Thank you so much for your permission. I will forward it to you after I finish my thesis.

Best regards.

APPENDIX - 2 Ethics Committee Approval

T.C. YEDİTEPE ÜNİVERSİTESİ

Sayı : 37068608-6100-15- 2093
Konu: Klinik Araştırmalar
Etik Kurul Başvurusu hk.

11/02/2021

İlgili Makama (Bihter Nurten Pala)

Yeditepe Üniversitesi Sağlık Bilimleri Fakültesi Beslenme ve Diyetetik Bölümü Dr. Öğr. Üyesi Binnur Okan Bakır'ın sorumlu araştırmacı olduğu **"Nutrition Screening Tool for Childhood Cancer (SCAN) Tarama Aracının Türkçe Geçerlilik ve Güvenilirliği"** isimli araştırma projesine ait Klinik Araştırmalar Etik Kurulu (KAEK) Başvuru Dosyası **(2095)** kayıtlı Numaralı KAEK Başvuru Dosyası, Yeditepe Üniversitesi Klinik Araştırmalar Etik Kurulu tarafından **10.02.2021** tarihli toplantıda incelenmiştir.

Kurul tarafından yapılan inceleme sonucu, yukarıdaki isim belirtilen çalışmanın yapılmasının etik ve bilimsel açıdan uygun olduğuna karar verilmiştir. **(KAEK Karar No:1381)**

Prof. Dr. Turgay Çelik

Yeditepe Üniversitesi
Klinik Araştırmalar Etik Kurul Başkanı

Appendix – 3 Permission from the Institution

YEDİTEPE ÜNİVERSİTESİ
İHTİSAS HASTANESİ

09.07.2020

Sayı : 11156775.900/170
Konu : Bihter Nurten Pala Tez İzni hk.

YEDİTEPE ÜNİVERSİTESİ KLİNİK ARAŞTIRMALAR ETİK KURUL BAŞKANLIĞI'NA

Yeditepe Üniversitesi Hastanesi'nde "Nutrition Tool for Childhood Cancer (SCAN) Tarama Aracının Güvenilirlik ve Geçerliliği" isimli gözlemsel araştırmanın Diyetisyen Bihter Nurten Pala tarafından akademik amaçlı olarak yapılması planlanmaktadır.

Bu araştırmana için hastanemizden herhangi bir ücret talep edilmemektedir. Çalışmanın hastanemizde yapılabilmesi uygunluğunun tarafınızdan değerlendirilmesi hususunda gereğini arz ederim.

Saygılarımla,

Prof. Dr. Faruk YENCİLEK
Yeditepe Üniversitesi İhtisas Hastanesi
Başhekimi

Ek 1 : Dyt.Bihter Nurten Pala dilekçe

ALO YEDİTEPE 444 7000
YEDİTEPE ÜNİVERSİTESİ İHTİSAS HASTANESİ
Koşuyolu Mah. Koşuyolu Cad. No: 168 34718 Kadıköy/İstanbul
Tel: (0216) 578 50 00 Faks: (0216) 578 50 99

Appendix – 3 Permission from the Institution (continued)

09/07/ 2020

Yeditepe Üniversitesi Koşuyolu Hastanesi Başhekimliğine;

Yeditepe Üniversitesi Koşuyolu Hastanesi' nde akademik amaçlı olarak yapmayı planladığım "Nutrition Tool for Childhood Cancer (SCAN) Tarama Aracının Güvenilirlik ve Geçerliliği" isimli gözlemsel araştırmanın kurumumuzda yapılabilmesi konusunda bu dilekçenin etik kurula yönlendirilmesini arz ederim.

Bihter Nurten Pala

Appendix – 4 Screening Tool for Childhood Cancer (English Version)

Nutrition screening tool for childhood cancer (SCAN)	
Does the patient have a high risk cancer ?	1
Is the patient currently undergoing intensive treatment?	1
Does the patient have any symptoms relating to the GI tract?	2
Has the patient had poor intake over the past week?	2
Has the patient had any weight loss over the past month?	2
Does the patient show signs of under nutrition?	2
Total	
Score indication	
≥3 At risk of malnutrition – Refer to dietician for further assessment	

Fig. 1. Nutrition screening tool for childhood cancer.

Appendix – 5 Screening Tool for Childhood Cancer (Turkish Version)

Screening Tool for Childhood Cancer (SCAN) - Çocukluk Çağı Kanserleri için Beslenme Tarama Aracı (ÇÇKBTA)

Çocukluk Çağı Kanserleri için Beslenme Tarama Aracı (ÇÇKBTA)	
Hastanın yüksek riskli bir kanseri var mı? *(Yüksek riskli tedavi protokollerine sahip hastaları (yoğun kemoterapi alanlar, kemik iliği nakli olanlar gibi) bebekleri ve komorbiditeleri (enfeksiyon, beslenme yetersizliği, hastalığın tekrarlamış olması gibi) olan hastaları içermelidir.)*	1
Hasta şu anda yoğun bir tedavi görüyor mu? *(Yoğun tedavi kriterleri arasında ilk kemoterapi bloğu, radyasyon tedavisi, kemik iliği nakli veya yaklaşan gastrointestinal cerrahi varlığı yer alır.)*	1
Hastanın GI kanalıyla ilişkili herhangi bir semptomu var mı? *(Hastada ağızdan anüse kadar her türlü gastrointestinal semptomu içerir; örneğin mide bulantısı, kusma, ishal, kabızlık, disfaji, mukozit, tifilit, ileus veya radyasyon enteriti var mı?)*	2
Hastanın geçen hafta boyunca besin alımı yetersiz miydi?	2
Hastada son 1 ay içinde hiç kilo kaybı var mı?	2
Hasta yetersiz beslenme belirtileri gösteriyor mu? *(Hastanın; gözle görülür kas kaybı, ödem, bilateral pedal ödemi, kuru, ince, parlak veya buruşuk cilt, ince, seyrek ve kolayca çıkarılan saçlar veya mikro besin eksikliklerinin kanıtı gibi gözlenebilir eksik beslenme belirtileri var mı?)*	2
Toplam	
<u>Puan Göstergesi</u> ≥3 Malnütrisyon riski altında – Daha detaylı değerlendirme için diyetisyene yönlendirin.	

Appendix – 5 Informed Consent Form

T.C. YEDİTEPE ÜNİVERSİTESİ	KLİNİK ARAŞTIRMALAR ETİK KURULU BİLGİLENDİRİLMİŞ GÖNÜLLÜ OLUR FORMU	TARİH: ..... VERSİYON: .....

BİLGİLENDİRİLMİŞ GÖNÜLLÜ ONAM FORMU

BİLGİLENDİRME

Sayın katılımcı;

Katılımınızı talep ettiğimiz bu çalışma kanserli çocuklarda hastalığa bağlı beslenme durumu bozukluğu oluşma riskini belirlemek amacıyla yurtdışında oluşturulan bir ölçeğin Türkiye'de kullanılıp kullanılmayacağına dair araştırmanın yapılacağı Yeditepe Üniversitesi, Beslenme ve Diyetetik Anabilim Dalı'na bağlı olarak yürütülen bir yüksek lisans tez çalışmasıdır. 'Nutrition Screening Tool For Childhood Cancer (SCAN) Tarama Aracının Türkçe Geçerlilik Ve Güvenilirliği' isimli bu araştırmada 6 ay içerisinde, Yeditepe Üniversitesi Hastanesi'nde tedavi gören toplam 70 kanser tanılı çocuk hastaya ulaşılması hedeflenmektedir. Araştırmada katılımcılara; son dönemdeki beslenme durumu ile ilgili bazı soruları içeren bir anket formu uygulanacak ve katılımcıların vücut ağırlığı ve boy uzunluğu ölçümleri yapılacaktır. Ayrıca hiçbir tıbbi girişimde bulunulmayacaktır. Sizlerden kan, doku, idrar örneği alınmayacak olup sadece sözel beyanınız alınacak ve boy ve kilo ölçümü yapılacaktır.

Bu çalışmaya katılmakta özgürsünüz. Başlangıçta kabul edip daha sonra fikir değiştirip, hiçbir gerekçe göstermeden, herhangi bir cezaya ya da yaptırıma maruz kalmaksızın çalışmadan ayrılabilirsiniz.

Araştırmaya katılımınız için sizden herhangi bir ücret istenmeyecek ve katılımınız karşılığında size herhangi bir ücret ödenmeyecektir. Sizden beklenen, bilgilendirilmiş onam formunu imzalamanız, bu araştırmaya katkı sağlamayı kabul etmeniz ve annesi, babası veya yasal varisi olduğunuz çocuğunuza bu araştırma hakkında onun anlayacağı şekilde bilgilendirme yapmanızdır.

Araştırmada sizlerden kimlik bilgileri alınmayacak ve alınacak yaş, boy, ağırlık ölçümleri gibi bilgiler araştırma kapsamı dışında hiçbir kişiyle kesinlikle paylaşılmayacaktır. Elde edilecek olan bilgiler, Etik Kurul, kurum ve diğer sağlık otoritelerinin orijinal tıbbi kayıtlarına doğrudan erişimleri olacaktır. Fakat, bu gönüllü onam formunun imzalanmasıyla bu bilgiler gizli tutulacaktır. Bu araştırmanın sonuçlarının yayımlanması halinde dahi kimlik bilgileriniz kesinlikle kullanılmayacaktır.

İmza:

Appendix – 5 Informed Consent Form (continued)

T.C. YEDİTEPE ÜNİVERSİTESİ	KLİNİK ARAŞTIRMALAR ETİK KURULU BİLGİLENDİRİLMİŞ GÖNÜLLÜ OLUR FORMU	TARİH: ..... VERSİYON: .....

GÖNÜLLÜ ONAM FORMU

Bilgilendirilmiş Gönüllü Olur Formundaki tüm açıklamaları okudum. Bana, yukarıda konusu ve amacı belirtilen araştırma ile ilgili açıklamalar, aşağıda adı belirtilen diyetisyen tarafından sözlü ve yazılı olarak yapıldı. Araştırmaya gönüllü olarak katıldığımı, istediğim zaman gerekçeli veya gerekçesiz olarak araştırmadan ayrılabileceğimi biliyorum. Söz konusu araştırmaya, hiçbir baskı ve zorlama olmaksızın kendi rızamla katılmayı kabul ediyorum.

Gönüllü	Sorumlu Araştırmacı
Ad, Soyad:	Ad, Soyad:
Tarih:	Tarih:
İmza	İmza

Appendix – 6 Screening Tool for Risk of Impaired Nutritional Status and Growth (STRONGKids)

T.C. Sağlık Bakanlığı	STRONG KİDS ÇOCUK NUTRİSYON DEĞERLENDİRME FORMU	TC Sağlık Bakanlığı Bursa İl Sağlık Müdürlüğü Mustafakemalpaşa Devlet Hastanesi

DÖK. KOD	HB.FR.43	YAYIN TARİHİ	13.09.2017	REVİZYON TARİHİ		REVİZYON NO	00	SAYFA	1 / 1

KLİNİK ADI: **TARİH..../..../20...**
ADI SOYADI: **HASTANIN SKORU:**
CİNSİYET:
YAŞI:
Strong-kids (Screening Tool for Risk of İmpaired Nutritional status and Growth)

ESPEN'e Göre Öğeler	Malnütrisyon Riski Taraması (1 ay-18 yaş çocuklarda haftada 1kez)	Puanlama	
Şu anki Durumu Nedir?	Subjektif klinik değerlendirme ile değerlendirildiğinde hastada kötü beslenme bulgusu var mı? (azalmış cilt altı yağı ve/veya kas kütlesi ve/veya anlamsız - boş bakış)	HAYIR	EVET=> 1
Durum stabil mi?	Son hafta-aylarda ağırlık kaybı veya ağırlık kazanımında durma (<1 yaş bebekler) var mı?	HAYIR	EVET=> 1
Durum daha da kötüleşecek mi?	**Aşağıdaki öğelerden biri mevcut mu?** ( )Aşırı ishal (>5gün) ve/veya kusma (>3gün) ( )Son birkaç gün boyunca azalmış gıda alımı ( )Daha önce yapılmış beslenme müdahalesi ( )Ağrı nedeniyle yetersiz besin alımı	HAYIR	EVET=> 1
Hastalık beslenme durumunun kötüleşmesini hızlandıracak mı?	Malnütrisyon oluşturma riski olan altta yatan hastalık (listeye bakınız) ya da beklenen majör cerrahi girişim var mı?	HAYIR	EVET=> 2

Malnütrisyon Riski Olan Altta Yatan Hastalıklar Listesi

( )Bronkopulmoner displazi(max yaş 2 yıl)	( )Anoreksia nevroza	( ) Kanser
( )Beklenen majör cerrahi girişim	( )Kısa bağırsak sendromu	( )Pankreatit
( )Dismatürite/prematürite(düzeltilmiş yaş 6ay)	( )Kronik böbrek hastalığı	( )Yanıklar
( )Kronik kardiyak hastalıklar	( )Metabolik hastalık	( )Travma
( )Kronik karaciğer hastalığı	( )Zihinsel engel / gerilik	( )Kas hastalığı
( )Tanımlanmamış (doktor tarafından sınıflandırılan)	( ) Çölyak hastalığı	( )Kistik fibrozis

Malnütrisyon Riski ve Müdahale Gereksinimi

Skor	Risk	Müdahale ve İzlem
4-5 puan	Yüksek Risk	( )Kesin tanı va bireysel beslenme önerileri için primer doktoru nutrisyon destek ekibinden konsültasyon ister ve takip eder. ( )Haftada iki kez ağırlık kontrolü yapılır ve beslenme önerileri değerlendirilir. ( )Haftalık beslenme risk değerlendirmesi yapılır.
1-3 puan	Orta Risk	( ) Beslenme müdahalesi göz önünde bulundurulur. ( )Haftada iki kez ağırlık kontrolü yap ( )Haftalık beslenme risk değerlendirmesi yapılır.
0 puan	Düşük Risk	( )Beslenme müdahale gereklideğildir ( )Düzenli olarak ağırlık kontrolü yapılır (hastane politikasına göre) ( )Haftalık beslenme risk değerlendirmesi yapılır. **AĞIRLIK KONTROLÜ** İLK KİLOSU : 1. KONTROL : 2.KONTROL :

Appendix 7 - Additional Data Collection Form

Veri Toplama Formu

1-	Hastanın yaşı	
2-	Hastanın kilosu kaçtır?	
3-	Hastanın boyu kaç cm'dir?	
4-	Hastanın vücut kitle indeksi kaçtır?	
5-	Hastanın tanısı?	
6-	Hastanın tanısı ne zaman konmuştur?	
7-	Hastanın hastalığı ile ilişkili cerrahi geçmişi var mıdır?	

Appendix 7 Curriculum Vitae

Personal Information

Name	Bihter Nurten	**Surname**	Öngel

Education

Degree	**Department**	**Institution**	**Graduation Year**
Master	Nutrition and Dietetics	Yeditepe University	2022
Master	Phytotherapy	Yeditepe University	2018
Bachelor	Nutrition and Dietetics	Yeditepe University	2017
High School		Köy Hizmeteri Anadolu Lisesi	2012

Work Experiences

Position	**Institute**	**Duration**
Dietitian	Yeditepe Üniversitesi Koşuyolu Hastanesi	2018 - ongoing
Dietitian	Özel Gebze Merkez Hastanesi	2017-2018

Computer Skills

Program	**Kullanma becerisi**
Microsoft Office	Good
BeBiS	Good