T.C.

YEDITEPE UNIVERSITY

INSTITUTE OF HEALTH SCIENCES

DEPARTMENT OF NUTRITION AND DIETETICS

INVESTIGATION AND COMPARISON OF HEDONIC HUNGER STATUS OF TYPE 1 DIABETES AND NON-DIABETIC ADULT INDIVIDUALS

MASTER OF NUTRITION AND DIETETICS THESIS

DİLAN ÇEVİK

İstanbul-2023

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İstanbul-2023

THESIS APPROVAL FORM

Institute : Yeditepe University Institute of Health Sciences

Programme : Nutrition and Dietetics

Title of the Thesis : Investigation and Comparison of Hedonic Hunger Status of Type 1 Diabetes and Non-Diabetic Adult Individuals

Owner of the Thesis : Dilan ÇEVİK

Examination Date : 30.01.2023

This study have approved as a Master/Doctorate Thesis in regard to content and quality by the Jury.

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APPROVAL

This thesis has been deemed by the jury in accordance with the relevant articles of Yeditepe University Graduate Education and Examinations Regulation and has been approved by Administrative Board of Institute with decision dated ..... and numbered .....

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DECLARATION

I hereby declare that this thesis is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which has been accepted for the award of any other degree except where due acknowledgment has been made in the text.

DİLAN DİLEK ÇEVİK

ACKNOWLEDGEMENTS

With all the effort made and attention paid this thesis work has been such a devotion to me and my dedicated supervisor Assoc. Dr. Hülya Demir. She has been sincerely giving and always there whenever I needed her. For the most part it is a great honor to be her master student and I am willing to take our scientific relationship forward.

I am thankful to my dear father Veli Dilek, my mother Ergül Dilek and my husband Fırat Çevik. They are in every moment of my life, supported and loved me throughout my work, helped me overcome all difficulties and trusted me forever.

My endless thanks.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF SYMBOLS AND ABBREVIATIONS

AAb	Autoantibodies
ADA	American Diabetes Association
AgRP	Agouti-Related Peptide
ARC	Arcuate Nucleus
BDNF	Brain-Derived Neurotrophic Factor
BMI	Body Mass Index
C/I	Carbohydrate/Insulin Ratio
CART	Cocaine-Amphetamine-Regulated Transcript
CB1	Cannabinoid Receptor Type 1
CB2	Cannabinoid Receptor Type 2
CSEI	Coopersmith Self-Esteem Inventory
CVB	Coxsackie Virus
DKA	Diabetic Ketoacidosis
DM	Diabetes Mellitus
DMH	Dorsomedial Hypothalamus
ER	Endoplasmic Reticulum
FCQ	Food Craving Questionnaire
GAD	Glutamic Acid Decarboxylase
GDM	Gestational Diabetes Mellitus
GI	Glycemic Index
GLP-1	Glucagon-Like Peptide 1

HbA1c	GlycoHemoglobin
HLA	Human Leukocyte Antigen
IA2	Insulinoma Antigen 2
IAA	Insulin Autoantibodies
ICA	Islet Cell Antibodies
IDF	International Diabetes Federation
IGT	Impaired Glucose Tolerance
ISF	Insulin Sensitivity Factor
ISPAD	International Society for Pediatric and Adolescent Diabetes
LHA	Lateral Hypothalamic Area
NPY	Nutrition-Promoting Neuropeptide Y
OGTT	Oral Glucose Tolerance Test
PEMS	Palatable Eating Motives Scale
PFS	Power of Food Scale
POMC	Peptide Neurotransmitter Pro-Opiomelanocortin
PVN	Paraventricular Nucleus
PYY	Peptide YY
TURDEP	Turkey Diabetes Epidemiology
VAS	Visual Analog Scale
VMH	Ventromedial Hypothalamus
VTA	Ventral Tegmental Area
WHO	World Health Organization
ZnT8	Zinc Transporter Antibodies

ABSTRACT

Çevik, D. (2023). Investigation and Comparison of Hedonic Hunger Status of Type 1 Diabetes and Non-Diabetic Adult Individuals. Yeditepe University, Institute of Health Sciences, Department of Nutrition and Dietetics, Master Thesis, Istanbul.

This study was planned to examine and compare the relationship between hedonic hunger status and the Food Craving Questionnaire, Visual Analog Scale, Coopersmith Self-Esteem Inventory, and Palatable Eating Motives Scale in adults who were diagnosed with type 1 diabetes and those who were not diagnosed with diabetes. 225 (74.5%) female and 77 (25.5%) male volunteers between the ages of 18-64 who applied to the Turkish Diabetes Foundation in Istanbul between October 2021 and January 2022, were diagnosed with type 1 diabetes and were not diagnosed with diabetes included. Participants consisted of 72 adults with type 1 diabetes and 102 without diabetes with a mean age of 18-28 years, 48 adults with type 1 diabetes and 25 with a mean age of 29-39, and 26 adults with type 1 diabetes and 25 non-diabetic adults, with a mean age of 40-64 years. In order to determine the personal characteristics and nutritional habits of individuals, a questionnaire consisting of 28 questions in total, Power of Food Scale (PFS), Food Craving Questionnaire (FCQ), Visual Analog Scale (VAS), Coopersmith Self-Esteem Inventory (CSEI) and Palatable Eating Motives Scale (PEMS) were used to collect data. A PFS total score of 2.5 and above, a FCQ total score approaching 234 points increase hedonic hunger, VAS total score approaching 10 points interest in foods such as chocolate, chips, french fries, fast food and pastries, CSEI total score approaching 100 points increasing self-esteem respect, and PEMS total score approaching 5 points indicates the frequency of consumption of delicious foods for non-metabolic reasons. The mean total scores of PFS, FCQ, VAS, CSEI, and PEMS of type 1 diabetics were found to be 2.790.83, 164.7847.72, 5.181.47, 38.833.14, and 1.970.57, respectively. In those without diabetes, the mean total scores of PFS, FCQ, VAS, CSEI, and PEMS were found to be 2.810.89, 165.7445.24, 5.571.54, 38.803.54, and 2.140.70, respectively. There was no significant difference between the scores of individuals who were diagnosed with type 1 diabetes and those who were not diagnosed with diabetes. Individual differences such as gender and age and factors such as the types of foods for which excessive nutrient demand, the presence of excessive food cravings, self-esteem, and motivation to consume these foods affect the hedonic hunger status of individuals.

Determining the factors that cause hedonic hunger will contribute to more accurate guidance in the nutrition programs to be planned for individuals, improving the nutritional habits of individuals, keeping blood sugars at optimal levels in diabetics, and increasing the success of preventing and delaying diabetes-related complications.

Keywords: Hunger, Appetite Regulation, Hedonic Nutrition, Diabetes

ÖZET

Çevik, D. (2023). Tip 1 Diyabetli ve Diyabetli Olmayan Erişkin Bireylerin Hedonik Açlık Durumunun İncelenmesi ve Karşılaştırılması. Yeditepe Üniversitesi, Sağlık Bilimleri Enstitüsü, Beslenme ve Diyetetik Anabilim Dalı, Yüksek Lisans Tezi, İstanbul.

Bu çalışma, tip 1 diyabetli ve diyabetli olmayan yetişkin bireylerde hedonik açlık durumları ile Aşırı Besin İsteği Ölçeği, Görsel Analog Skalası, Coopersmith Benlik Saygısı Envanteri ve Lezzetli Besinleri Tüketme Motivasyonu Ölçeği arasındaki ilişkinin incelenmesi ve karşılaştırılması amacıyla planlanmıştır. Çalışmaya Ekim 2021-Ocak 2022 tarihleri arasında İstanbul'da Türkiye Diyabet Vakfı'na başvuran, tip 1 diyabet tanısı almış olan ve diyabet tanısı almamış olan, 18-64 yaş arası gönüllü 225 (%74.5) kadın, 77 (%25.5) erkek birey dahil edilmiştir. Katılımcılar yaş ortalaması 18-28 olan 72 tip 1 diyabetli ve 102 diyabetli olmayan, yaş ortalaması 29-39 olan 48 tip 1 diyabetli ve 25 diyabetli olmayan, yaş ortalamaları 40-64 olan 26 tip 1 diyabetli ve 25 diyabetli olmayan erişkin bireyden oluşmaktadır. Bireylerin kişisel özelliklerini ve beslenme alışkanlıklarını belirlemek için toplamda 28 sorudan oluşan bir anket formu ile Besin Gücü Ölçeği (PFS), Aşırı Besin İsteği Ölçeği (FCQ), Görsel Analog Skalası (VAS), Coopersmith Benlik Saygısı Envanteri (CSEI) ve Lezzetli Besinleri Tüketme Motivasyonu Ölçeği (PEMS) kullanılarak veriler toplanmıştır. PFS toplam puanının 2.5 ve üzeri olması, FCQ toplam puanının ise 234 puana yaklaşması hedonik açlığın arttığını, VAS toplam puanının 10 puana yaklaşması çikolata, cips, patates kızartması, fast food ve hamur işleri gibi yiyeceklere olan ilgiyi, CSEI toplam puanının 100 puana yaklaşması artan benlik saygısını ve PEMS toplam puanının 5 puana yaklaşması lezzetli gıdaların metabolik olmayan nedenlerle tüketim sıklığını göstermektedir. Tip 1 diyabetlilerin, PFS, FCQ, VAS, CSEI ve PEMS ortalama toplam puanları sırasıyla 2.790.83, 164.7847.72, 5.181.47, 38.833.14 ve 1.970.57 olarak bulunmuştur. Diyabetli olmayanlarda ise, PFS, FCQ, VAS, CSEI ve PEMS ortalama toplam puanları sırasıyla 2.810.89, 165.7445.24, 5.571.54, 38.803.54 ve 2.140.70 olarak bulunmuştur. Tip 1 diyabetli olan ve diyabetli olmayan bireylerin puanları bakımından aralarında anlamlı bir farklılık saptanmamıştır. Cinsiyet, yaş gibi bireysel farklılıklar ile aşırı besin isteği duyulan besin çeşitleri, aşırı besin isteğinin varlığı, benlik saygısı, bu besinleri tüketme motivasyonu gibi faktörler bireylerin hedonik açlık durumlarını etkilemektedir. Hedonik

açlığa yol açan faktörlerin belirlenmesi bireylere özgü planlanacak beslenme programlarında daha doğru yönlendirmeler yapılmasına, bireylerin beslenme alışkanlıklarının iyileştirilmesine, diyabetlilerde kan şekerlerinin optimal seviyelerde tutulmasına, diyabete bağlı komplikasyonların önlenmesi ve geciktirilmesine yönelik başarının artırılmasına katkı sağlayacaktır.

Anahtar Kelimeler: Açlık, İştah Düzenleme, Hedonik Beslenme, Diyabet

1. INTRODUCTION AND PURPOSE

Nutrition, which has an important place in human life, is one of the most basic needs and has been the main target in the struggle for survival, which emerged with hunger and energy needs in the history of human beings (1). With food being the main source of energy for the body, for many individuals, eating has become much more than meeting metabolic needs (2). Eating behavior in humans is an extremely complex process that can change with factors such as internal homeostatic processes, environmental and social factors (3). Eating food with hunger and terminating eating when satiation is felt are regulated by homeostatic systems that provide energy balance (4).

Hunger; it is a complex situation that includes more than one motivational process that evokes feeding and food-seeking behaviors (5). The hunger process can be examined in two ways. The first of these is homeostatic hunger. In the case of homeostatic hunger, food intake occurs independently of the taste of food, with the aim of eliminating the energy deficit as a result of acute negative energy balance (6,7). The second type of hunger is hedonic hunger. In the absence of metabolic need, hedonic hunger is associated with an imaginative desire to eat foods that are not available, resulting in an appetite and expectation to enjoy food (6).

The hedonic urge to eat leads individuals to consume even though the body does not need it. Food types generally consumed under these conditions are high-energy products that are processed and flavored with high fat, sugar or salt content (2,8). An example of this is when a person consumes his favorite dessert despite being full after a meal. The liking reflects the pleasure obtained from eating a food as experience and expectation. Wanting is the internal urge to eat. In daily life, liking is an important component of wanting and is an important factor in food selection. The high hedonic response create an important risk factor in the regulation of blood sugar in diabetics (1).

Diabetes Mellitus (DM); developed due to insufficiency in insulin secretion and/or insulin action; it is a chronic disease characterized by fasting or postprandial hyperglycemia leading to carbohydrate, protein and fat metabolism disorders. Since there is absolute insulin deficiency in type 1 diabetes, it is necessary to replace the deficiency (with insulin injection or continuous insulin infusion systems), close blood

sugar monitoring, regulation of nutrition (with diabetic diet or carbohydrate counting), and structuring of the exercise program (9). It is reported that the number of children and adolescents diagnosed with type 1 diabetes worldwide is 1.1 million and this number is increasing every year (10, 11). It is reported that Turkey will be among the top 10 countries with the highest population of children and adolescents with type 1 diabetes, according to 2035 estimates (10).

The aim of this study is to reveal whether there is a difference between the hedonic hunger status of adults who were diagnosed with type 1 diabetes and those who were not diagnosed with diabetes and to reveal the effect of the factors affecting the hedonic hunger drive by using different scales. In this study, using the Power of Food Scale (PFS); evaluating the feelings and thoughts of individuals about food and nutrition without physiological need in environments where delicious foods are widely available, using the Food Craving Questionnaire (FCQ) scale; examining the effects of behavioral, psychological and cognitive conditions on food intake, using the Visual Analog Scale (VAS); to identify which types of food they are most interested in, using the Coopersmith Self-Esteem Inventory (CSEI); determining the effects of psychological factors, which may affect individuals' hedonic hunger status, on food intake, and using the Palatable Eating Motives Scale (PEMS); determining the reasons for consuming delicious foods and non-alcoholic sugary drinks in hedonic hunger, it is aimed to reveal the relationship between many factors affecting hedonic hunger. In this study, individual differences such as age, gender, body mass index (BMI) that cause differences in sensitivity to environmental food cues associated with hedonic hunger; it has been revealed that psychological factors such as excessive food cravings, physical activity, consuming snacks, dieting and self-esteem that individuals have experienced affect the motivations for food intake and hedonic hunger. This study is important because it is the first study on hedonic hunger and the factors affecting hedonic hunger in adults with type 1 diabetes, and more studies are needed on this subject.

2. LITERATURE REVIEW

2.1. Definition and History of Diabetes Mellitus (DM)

DM is a systemic disease that can cause chronic and acute complications due to increased blood glucose levels as a result of insulin deficiency, insulin resistance, or both. If high blood glucose level (hyperglycemia) can not be controlled in individuals with diabetes, microvascular complications such as retinopathy, nephropathy, peripheral and autonomic neuropathy, which are chronic complications of diabetes, develop over time (12).

Diabetes has been known since ancient times. Diabetes is mentioned in Egyptian papyrus, ancient Indian and Chinese medical literature, and the works of ancient Greek and Arab physicians. In the Ebers papyrus in 1500 BC, patients with excessive thirst, profuse urination complaints and treated with plant extracts are mentioned. In the 2nd century AD, Aretaeus of Cappadocia introduced the first definition of diabetes, and in the 17th century, Thomas Willis added the term mellitus to the disease to describe the sweet taste of urine (13). The important work of the nineteenth century French physiologist Claude Bernard on the glycogenic effect of the liver paved the way for further advances in the physiology of the disease. In the same period, Oskar Minkowski and Joseph von Mering found that diabetes developed after the removal of the pancreas. Then, a new era started in the treatment of diabetes with the extraction of the pancreas, the production of insulin and its use in the treatment of DM (13, 14). In nineteen twenty-thirds, the world's first commercially available insulin product, Iletin, was introduced. In the following years, insulin purification methods were developed and new insulin formulations were developed, such as Protamine-zinc insulin, a long-acting insulin in the 1930s, and the Hagedorn and Lente series in the 1940s-1950s. In nineteen fifty-five, Fred Sanger described the structure of insulin (13). Our understanding of diabetes has evolved tremendously, from the first documentation of the disease by the ancient Egyptians to the discovery of insulin in the twentieth century and the development of current cell replacement therapies (14).

2.2. Epidemiology of Diabetes Mellitus

According to the World Health Organization (WHO) data; The global prevalence of DM, which was 4.7% in 1980, reached 8.5% in 2014 (15). In 2017, approximately 32.7 million adults in the European Union were found to have diabetes. It is also estimated that 12.8 million people have undiagnosed diabetes. The number of men diagnosed with diabetes has increased rapidly since 2000, with the number of diabetics doubling from 8 million in 2000 to 17.1 million in 2017. The number of women with diabetes also increased by more than 50%, from 10.3 million in 2000 to 15.6 million in 2017 (16). There are 422 million diabetics in the world. 1.2 million deaths are associated with diabetes each year. It is estimated that diabetes will be the seventh most common cause of death by 2030. Diabetes-related deaths are more common in low- and middle-income countries, including Turkey. Over the past 30 years, the prevalence of type 2 diabetes has increased significantly in countries of all income levels. Stopping the rise of diabetes and obesity by 2025 is an agreed global goal. For this reason, the Diabetes Program is being carried out and the mission of the Diabetes Program is to prevent type 2 diabetes, minimize complications and maximize the quality of life for all individuals with diabetes (15).

According to the results of the Turkey Diabetes Epidemiology (TURDEP-I) study conducted in our country between 1997-1998, the prevalence of type 2 DM was 7.2% and the frequency of impaired glucose tolerance (IGT) was 6.7%, while in the TURDEP-II study repeated in 2013, 20 cases across the country were found. Over the age of 26,499 people were examined and it was determined that the frequency of type 2 DM increased significantly in the past years and reached 13.7%. In addition, according to the TURDEP-II study data, 45.5% of individuals with diabetes are not aware of their disease (17, 18). With the Diabetes Program (2015-2020) carried out by the Ministry of Health, strategies for the prevention and control of DM have been determined based on the rapid increase (12).

2.3. Diabetes Mellitus Classification

WHO, in 1965, in the first classification system for diabetes, based on age; 0-14 years old (infancy or childhood), 15-24 years old (young), 25-64 years old (adult), 65 years and older onset (elderly). WHO; in 1985, updated the classification criteria of diabetes and classified it as insulin-dependent (type 1) and non-insulin-dependent (type 2) diabetes. In the following years, WHO added the classifications of gestational diabetes mellitus (GDM) and other types of diabetes by making revisions (19).

Diabetes in the International Society for Pediatric and Adolescent Diabetes (ISPAD) and WHO guidelines; It is classified under 4 main etiological titles as type 1, type 2, other specific types and gestational diabetes (9, 19).

Table 2.1. Etiologic Classification of Diabetes Mellitus (20)

I. Type 1 diabetes (β-cell destruction, usually leading to absolute insulin deficiency)
A. Immune mediated
B. Idiopathic

II. Type 2 diabetes (may range from predominantly insulin resistance with relative insulin deficiency to a predominantly secretory defect with insulin resistance)

III. Gestational diabetes mellitus
Diabetes that occurs during pregnancy and usually resolves with delivery

IV. Other specific types

A. Genetic defects of β-cell function (monogenic forms of diabetes)
1. MODY 3 (Chromosome 12, HNF-1a)
2. MODY 1 (Chromosome 20, HNF-4a)
3. MODY 2 (Chromosome 7, glucokinase)
4. Other very rare forms of MODY (e.g., MODY 4: Chromosome 13, insulin promoter factor-1; MODY 6: Chromosome 2, NeuroD1; MODY 7: Chromosome 9, carboxyl ester lipase)
5. Transient neonatal diabetes (most commonly ZAC/HYAMI imprinting defect on 6q24)
6. Permanent neonatal diabetes (most commonly KCNJ11 gene encoding Kir6.2 subunit of b-cell KATP channel)
7. Mitochondrial DNA
8. Others

B. Genetic defects in insulin action
1. Type A insulin resistance
2. Leprechaunism
3. Rabson-Mendenhall syndrome
4. Lipoatrophic diabetes
5. Others

C. Diseases of the exocrine pancreas
1. Pancreatitis
2. Trauma/pancreatectomy
3. Neoplasia
4. Cystic fibrosis
5. Hemochromatosis
6. Fibrocalculous pancreatopathy
7. Others

D. Endocrinopathies
1. Acromegaly
2. Cushing's syndrome
3. Glucagonoma
4. Pheochromocytoma
5. Hyperthyroidism
6. Somatostatinoma
7. Aldosteronoma
8. Others

E. Drug or chemical induced
1. Vacor
2. Pentamidine
3. Nicotinic acid
4. Glucocorticoids
5. Thyroid hormone
6. Diazoxide
7. b-Adrenergic agonists
8. Thiazides
9. Dilantin
10. g-Interferon
11. Others

F. Uncommon forms of immune-mediated diabetes
1. Stiff-man syndrome
2. Anti-insulin receptor antibodies
3. Others

G. Other genetic syndromes sometimes associated with diabetes
1. Down syndrome
2. Klinefelter syndrome
3. Turner syndrome
4. Wolfram syndrome
5. Friedreich ataxia
6. Huntington chorea
7. Laurence-Moon-Biedl syndrome
8. Myotonic dystrophy
9. Porphyria
10. Prader-Willi syndrome
11. Others

H. Infections
1. Congenital rubella
2. Cytomegalovirus
3. Others

2.4. Type 1 Diabetes Mellitus

Type 1 diabetes, which is called insulin-dependent diabetes, occurs as a result of the beta cells of the pancreas being affected by autoimmune or non-autoimmune reasons under the influence of genetic or environmental factors that are common in the childhood age group. Type 1 diabetes, which is characterized by the emergence of insulin deficiency, most commonly presents with symptoms of weight loss, polyuria, polydipsia and polyphagia (21, 22, 23). Type 1 diabetes occurs in 4 clinical stages.

1. Preclinical (Prediabetes) Period: It is the period from the onset of autoimmunity, which is the formation process of type 1 diabetes, to the appearance of clinical symptoms of diabetes. It is the asymptomatic period in which clinical signs and symptoms such as hyperglycemia, weight loss, polyuria, polydipsia, and polyphagia are not observed yet. Since the progression and emergence of this process is affected by environmental factors, it varies from individual to individual. It is stated that approximately 90% of pancreatic beta cells must be damaged for type 1 diabetes symptoms to occur (24-27).
2. Clinical Period: It is the period when beta cell reserve is the lowest, clinical symptoms begin to show signs and the patient needs external insulin. In this period, in addition to the classical symptoms (weight loss, polyuria, polydipsia, polyphagia), enuresis in children, vaginal candidiasis (especially in prepubertal girls), vomiting, dry mouth, weakness, fatigue, rapid weight loss and recurrent skin infections can be seen (23, 26, 28).
3. Partial Remission (Honeymoon) Period: After the diagnosis of type 1 diabetes, islet autoantibodies in the pancreas are positive and the antibodies remain positive for a short time, causing the last remaining insulin secretion to continue to be released. This period is the stage in which external insulin is not needed most of the time, as it progresses with normal or near-normal blood glucose levels, patients think that they are recovering and the disorder is temporarily resolved. The length of this phase varies from person to person (29-32).
4. Advanced Clinical Period: Since c peptide and insulin reserves are depleted in the pancreas at this stage, patients have to take insulin from outside in order to survive. Failure to take insulin even for one day during this period causes

aggravation of the clinical course and rapid emergence of ketoacidosis and other complications (23, 24, 33).

2.4.1. Diagnosis of Type 1 Diabetes Mellitus

Diagnostic criteria for diabetes are based on blood glucose readings and the presence or absence of symptoms. Type 1 diabetes is generally diagnosed based on catabolic symptoms suggestive of insulin deficiency, such as clinical polyuria, polydipsia, ketonemia, nocturia, enuresis, weight loss, and marked hyperglycemia unresponsive to oral agents (9). Biomarkers such as blood sugar, GlycoHemoglobin (HbA1c), C-peptide and autoantibodies (Aab) are used in the diagnosis of type 1 diabetes (34). In addition, progressive β-cell destruction is the hallmark of type 1 diabetes and is effective in diagnosing by looking at the residual C-peptide level (35). Diagnostic criteria developed by the American Diabetes Association (ADA) are used in the diagnosis phase (22, 30, 33).

DM diagnosis;

- DM-specific symptoms + plasma glucose ≥ 200 mg/dl at any time of the day, regardless of fasting or satiety,
- Plasma glucose taken after at least 8 hours of fasting is ≥ 126 mg/dl,
- Plasma glucose ≥200 mg/dl at the 2nd hour of the Oral Glucose Tolerance Test (OGTT),
- Diagnosis is made with a glycosylated HbA1c level of ≥ 6.5% (9, 26, 36).

Diagnosis can be made by evaluation of fasting plasma glucose or HbA1c in a child with suspected or diabetes symptoms. However, in the absence of severe diabetes symptoms, the diagnosis of impaired glucose tolerance or diabetes should be sought by performing OGTT in individuals at high risk for diabetes. If fasting blood glucose alone meets the diagnostic criteria, there is no need to perform an OGTT (9, 32). In OGTT, basal blood sample is taken by measuring capillary blood glucose after at least 8 hours of fasting. Then the patient is allowed to drink 75 g of oral glucose and blood samples are taken again after 30, 60, 90, 120 minutes. Glucose, insulin and, if necessary, c-peptide are evaluated in blood samples (37). If the blood glucose value measured at the 120th minute of the test is above 200 mg/dl, it is sufficient to diagnose diabetes. The

120th minute satiety value is between 140-200 mg/dl, suggesting an increased risk of prediabetes (9, 32).

2.4.2. Epidemiology of Type 1 Diabetes Mellitus

Although type 1 diabetes can be diagnosed at any age, it is the most common chronic disease of childhood (38). The onset of type 1 diabetes increases gradually from birth, peaking at 4-6 years of age and then again at 10-14 years of age (39). Overall, it is estimated that approximately 96,000 children under the age of 15 develop type 1 diabetes each year worldwide (9). It is reported that the annual increase is approximately 3% when geographical differences are taken into account (40). In many countries, type 1 diabetes accounts for more than 90% of childhood and adolescence diabetes and 5-10% of all diabetic individuals throughout life (9). The International Diabetes Federation (IDF) reports that in 2019, 1,110,100 children aged 0-19 years in the world have type 1 diabetes and 128,900 people are newly diagnosed each year (40). Type 1 diabetes incidence is affected by factors such as age, race/ethnicity, and geographic region. It is known that approximately 26% of 500 000 type 1 diabetes children worldwide are in Europe and 22% are in North America and the Caribbean (9). Finland, Sweden and Kuwait are the countries with the highest incidence of type 1 diabetes (40). In Asia, the incidence of type 1 diabetes is very low (9). According to the data of the national type 1 diabetes prevalence and incidence study in children under the age of 18 in our country, the prevalence was 0.75/1000, the total incidence was 10.8/100.000, and the total number of type 1 diabetes cases was 17 175 people (41).

2.4.3. Pathophysiology of Type 1 Diabetes Mellitus

Type 1 diabetes is characterized by chronic immune-mediated pancreatic β-cell destruction leading to partial or, in most cases, absolute insulin deficiency. Most cases result from autoimmune-mediated β-cell destruction, which occurs at a variable rate and becomes clinically symptomatic when approximately 90% of β cells are destroyed. Type 1 diabetes etiology is multifactorial; however, the specific roles of genetic susceptibility, environmental factors, the immune system, and β-cells in the pathogenic processes underlying type 1 diabetes remain unclear. Autoantibodies, which are serological markers of diabetes-associated cell autoimmunity, include islet cell

antibodies (ICA), glutamic acid decarboxylase (GAD), tyrosine phosphatase-like insulinoma antigen 2 (IA2), insulin autoantibodies (IAA), and zinc transporter antibodies (ZnT8). The expression of these antibodies is age dependent. Further expression of IAA and ZnT8 in children under 10 years of age, GAD and IA2 has been reported (9, 42). The presence of antibodies to insulinoma antigen-2 was associated with the highest risk. It is also stated that autoantibodies alone are not sufficient to induce β-cell damage (42).

The susceptibility to type 1 diabetes is determined by multiple genes. The human leukocyte antigen (HLA) genotype accounts for approximately 30-50% of the risk. DR3DQ2 or DR4DQ8 has been found to be expressed in more than 90% of individuals with type 1 diabetes. However, it has been reported that HLA class II haplotypes such as DR2DQ6 provide significant protection against the disease (9, 42).

Type 1 diabetes develops with the initiation of the immune system and proinflammatory responses against β-cell antigens. Chronic immunological reactions that cause β-cell damage occur due to insufficient regulation of immunological reactions influenced by genetic and environmental factors. Autoantigens formed by this deregulation stimulate cells that produce highly affinity autoantibodies against β-cells. T cells increase the release of cytokines and damage to β-cells by causing inflammation of cytokines (TNF-α, IFN-γ, Fas/FASL and perforin/granzyme) in β-cells. The released cytokines stimulate the release of other cytokines that increase β-cell damage by increasing the release of macrophages and other immunological factors. Thus, insulin synthesis and secretion are disrupted and type 1 diabetes develops (43, 44).

Environmental risk factors trigger the autoimmune process that leads to β-cell damage in genetically susceptible individuals. The increase in the number of patients with low genetic risk (HLA) calls into question the effect of environmental factors in the development of type 1 DM (45, 46).

Viruses are an environmental factor that has long been recognized as a potential trigger for disease. It has been determined that especially viral infections caused by enteroviruses [Coxsackie virus (CVB), echovirus] increase the risk of developing type 1 diabetes. The mechanism for how viral infections affect islet cell damage is still unknown. However, it has been reported that mechanisms such as molecular similarity, inflammation, endoplasmic reticulum (ER) stress, T cell activation or suppression may

be related to β-cell damage (44). On the other hand, it is stated that infections probably accelerate the clinical onset of type 1 diabetes due to the increase in insulin metabolism (46).

Epidemiological studies report that most of the children who develop type 1 diabetes before the age of 10 have seroconversion in the first two years of their lives, and environmental factors such as nutrition may play an important role in the early stages of life. It has been determined that shortening the duration of breastfeeding (2-4 months), giving cereals and cow's milk to the baby before the 4th month may be risk factors for the development of type 1 diabetes. It is thought that early exposure to cow's milk proteins causes inflammation of the intestinal mucosa, increased mucosal permeability, and dysregulated immune activity against milk proteins (44, 46). Islet cell damage occurs as a result of overreaction of the immune system with the effect of autoantibodies formed due to cross-reactivity between cow and human insulin in individuals with a genetic predisposition to type 1 diabetes (43). It has been reported that omega 3 fatty acids also play a role in regulating the immune system and reducing the inflammatory response, and with this effect, islet cells are protected from inflammation (44, 46). It is known that fruit consumption in the early period of life is associated with increased β-cell autoimmunity, and the immature intestinal immune system accelerates the formation of an abnormal immune response to solid food antigens (43). Studies investigating the role of cow's milk consumption on the risk of childhood islet autoimmunity and type 1 diabetes reveal conflicting results (47).

Excessive weight gain is another factor that leads to a higher β-cell load and increased insulin resistance (43). It has been suggested that excessive weight gain in early childhood causes insulin resistance and the need for insulin increases, so that β-cell stress and islet autoimmunity may begin and result in type 1 diabetes (47).

It has been reported that the addition of gluten to infant nutrition in the early period (<3 months) causes a serious increase in islet autoantibody production. The increase in T cell reactivity towards gluten-derived polypeptides in individuals with genetic predisposition accelerates inflammation and causes the development of β-cell autoimmunity (43). It has been found that gluten-free diet does not reduce islet autoimmunity in infants with genetically high risk, and islet autoantibody levels in children with islet autoimmunity (47).

It is known that the intestinal microbiota, which includes trillions of microorganisms living in the gastrointestinal tract, plays a role in the pathogenesis of type 1 diabetes. Interactions between bacterial components of the intestinal microbiota are important for the development of a functional immune system. Firmicutes/Bacteroidetes ratios are different in the intestinal microbiota of patients with type 1 diabetes. With dysbiosis, intestinal barrier function is impaired, intestinal permeability increases and an abnormal immune response occurs (45, 46).

2.4.4. Treatment of Type 1 Diabetes Mellitus

Since type 1 diabetes is a disease with multifaceted effects, follow-up should be carried out by a multidisciplinary and interdisciplinary team. This team should consist of an endocrinologist, nurse, dietitian, psychologist and social worker who specialize in diabetes (29, 37, 43). The aim of the team is to have the individual and his/her family have sufficient knowledge about diabetes and its treatment, to be able to successfully manage crisis situations, to provide glycemic control, to re-establish a routine lifestyle with diabetes, in short, to learn to live with diabetes in all aspects. In order for an individual with type 1 diabetes to control the disease, reach the targeted blood glucose level, provide short and long-term well-being, and increase the quality of life, first of all, individual with type 1 diabetes must be in adequate levels of insulin administration, meal planning, proper nutrition, self-control of blood glucose, and regular exercise. The support of the family and the environment is extremely important for the individual to cope effectively with diabetes and its complications. For this reason, it is expected that both the family and the environment should have sufficient knowledge about the diabetes process (37,43).

2.4.4.1. Insulin Therapy

Insulin is a hormone produced by β cells in the pancreas and regulates blood glucose level by increasing glucose breakdown in cells when glucose in the blood enters fat, muscle and liver cells (23, 48). In healthy individuals, peaks occur in insulin secretion in order to regulate the blood glucose level after meals. The absence of this oscillation in patients with type 1 diabetes leads to hyperglycemia and many other problems. Therefore, in the treatment of type 1 diabetes, it is aimed to imitate the

insulin deficiency in the body and physiological release with basal-bolus insulin injections, to correct all the problems arising from this deficiency and to prevent complications (24, 30).

The aim of insulin treatment, which is the most important element of type 1 diabetes treatment; it is to keep hyperglycemia under control, to prevent hypoglycemia, to provide ideal glycemic control and to increase the quality of life of the individual as a result of imitating insulin secretion in healthy individuals with exogenous insulin hormone (9, 24, 49).

Insulin therapy; it should be tailored to the individual, taking into account the age of the individual, duration of diabetes, meal and exercise times, and providing the most ideal metabolic control without changing the patient's routine life (9, 21, 23).

The duration of insulin action varies according to the peak time and duration of action. Table 2.2. includes insulin types and their properties. In insulin therapy, approximately half of a total dose of 0.4-1.0 Iu/kg/day insulin is administered as 40-60% basal and the rest as bolus. The treatment regimen is planned as fast/short-acting (bolus) three times a day on average half an hour before meals, and medium/long-acting (basal) insulin once or twice a day (30).

During the honeymoon period when insulin secretion in the body continues, it may be necessary to reduce the initial dose of insulin by 0.5–1 unit/kg/day in order to maintain the glycemic index (23, 30). In the adolescence period, the need for insulin increases with the acceleration of growth and the increase in the use of sex hormones and steroids. For this reason, it may be necessary to increase the daily insulin doses of adolescents up to 1.5 units/kg/day (21).

While the diagnosis of type 1 diabetes gives symptoms with weight loss, the lost fat and muscle tissue is regained with the initiation of insulin therapy. Weight gain begins with glycosuria, water and salt retention. For this reason, nutrition and weight control should be provided in children and adolescents taking insulin (21, 24).

Side effects of insulin therapy; hypoglycemia, injection site edema, bleeding, oozing, injection site pain, lipohypertrophy-atrophy, dawn and dawn phenomena. While the wrong injection to the same area or the use of insulin injections more than once cause lipohypertrophy, this situation affects the absorption rate and leads to blood sugar

irregularities (21, 29-31). This problem can be corrected by not using the lipohypertrophy area for a while and by continuous rotation of the injection site. Improper injection, not using the correct injection needle or applying at the wrong angle may cause bleeding, oozing and pain at the injection site (21, 24, 50).

Since there is no oral form of exogenous insulin hormone support, it is usually administered subcutaneously to the individual. Short-acting or rapid-short-acting insulins are not only subcutaneous; It can also be given using the intravenous or intramuscular route. It is used with injector, insulin pen and insulin pump during insulin injection (24, 50).

New insulin and insulin injection systems are constantly being developed in order to provide a comfortable life and ease of treatment for individuals with diabetes. One of these systems is pump therapy that provides continuous subcutaneous insulin infusion. Insulin pump is a system that contains enough insulin for 3-4 days in its reservoir, can be injected 24 hours through a catheter placed in the subcutaneous tissue, can be changed in basal and bolus insulin rate according to the amount of carbohydrate taken, reduces the frequency of hypoglycemia, provides glycemic control and facilitates the life of the person with diabetes. (48, 49, 51). While children with diabetes make insulin 3-4 times a day on their own, the number of injections decreases to once every three days with the use of an insulin pump. The insulin pump improves blood sugar control by reducing long- and short-term complications of diabetes. However; hyperglycemia, ketoacidosis, lipohypertrophy and local lesions may occur due to the dislocation of the insulin pump and its unrecognition. Hypoglycemia or insensitivity due to hypoglycemia may develop due to the sudden effect of stored insulin. With this; it has been reported that adolescents diagnosed with diabetes do not want to use an insulin pump because it impairs their body image (48-51).

It has been reported that during insulin injection, children experience anxiety, fear about the procedure, and therefore do not want to measure blood glucose (50). In order to cope with these problems, continuous glucose measurement systems have been developed that facilitate glucose measurement from the finger, determine the range of low and high blood sugar, and predict the upcoming hypoglycemia, thus aiming to prevent glucose fluctuations and related complications (52, 54). And also; in the artificial pancreas system, which is accepted as a state-of-the-art system in children with

diabetes, a continuous glucose measurement system and an insulin pump are used together and the physiological insulin hormone secretion of the pancreas is imitated (53-55).

Table 2.2. Types and Properties of Insulin (56)

Insulin type	Onset ofaction (h)	Peak ofaction (h)	Duration ofaction (h)
Ultra-rapid acting analog (faster aspart)[a,c]	0.1-0.2	1-3	3-5
Rapid-acting analogs (aspart, glulisine, and lispro)	0.15-0.35	1-3	3-5
Regular/soluble (short acting)	0.5-1	2-4	5-8
NPH*	2-4	4-12	12-24[a]
Basal long-acting analogs			
• **Glargine[b]**	2-4	8-12	22-24[a]
• **Detemir**	1-2	4-7	20-24[a]
• **Glargine U300*+***	2-6	Minimal peak	30-36
• **Degludec**	0.5-1.5	Minimal peak	>42

Abbreviations: NPH, neutral protamine hagedorn insulin. All insulins used must be produced under "Good Manufacturing Practice/Good Laboratory Practice"conditions.

[a]The duration of action may be shorter.

[b]biosimilar glargine approved in some countries.

[c]Not yet approved worldwide or not for pediatric indication

2.4.4.2. Medical Nutrition Therapy

Medical Nutrition Therapy is one of the cornerstones of diabetes care and education (57). An effective nutritional intervention contributes to improving clinical and metabolic outcomes in children with type 1 diabetes (58). Nutritional recommendations for children with diabetes are based on healthy eating recommendations suitable for all children and adults. In addition, nutritional therapy

should be arranged according to the cultural, ethnic, nutritional habits and psychosocial needs of the child (57).

The purpose of Medical Nutritional Therapy; targeting healthy eating principles, optimizing glycemic control and reducing cardiovascular risk factors (58).

ISPAD's recommendations for medical nutrition therapy of children and adolescents with diabetes:

- Promoting appropriate nutritional behavior and lifelong healthy eating habits while maintaining social, cultural and psychological well-being,
- To meet the requirements of various, healthy and all nutrients including all food groups with three meals a day and appropriate healthy snacks (if necessary), to maintain appropriate body weight and to prevent excessive food consumption,
- To maintain the appropriate BMI,
- Ensuring adequate energy intake for optimal growth and development,
- Establishing a balance between food intake, energy expenditure, metabolic requirements and insulin action profiles to achieve optimal glycemic control without excessive hypoglycemia,
- To prevent and treat hypoglycemia, hyperglycemia and exercise-related problems,
- Reducing the risk of micro- and macro-vascular complications, especially cardiovascular diseases, by optimizing glycemic control,
- Changing food intake and dietary habits to prevent and treat dyslipidemia, hypertension and obesity,
- Maintaining a good quality of life (57, 58).

Appetite and energy intake at diagnosis are usually high due to the pre-diagnosis catabolic state. After adequate body weight gain is achieved, energy intake should be reconsidered; should be replanned according to age, growth rate and physical activity status. Energy intake should be sufficient to achieve optimal growth and maintain ideal body weight. The energy intake of children with type 1 diabetes should be the same as that of healthy children of the same age (57, 58).

2.4.4.2.A. Carbohydrates and Fiber

The amount and type of carbohydrate taken in children and adolescents with type 1 diabetes have an important place in medical nutrition therapy (59). It is not recommended to achieve glycemic control by restricting carbohydrates in nutritional therapy (60). The total amount of carbohydrates taken should not be less than 130 g/day (59). When the amount of carbohydrates in the diet decreases, it is observed that the blood lipid and cholesterol levels increase in the patients and the risk of coronary heart disease increases accordingly (60).

Postmeal blood glucose levels are determined mainly by the amount of glucose that is digested and absorbed into the circulation. Dietary carbohydrates are the most important factor determining postprandial blood glucose (61). Carbohydrates are the nutrient that increases blood glucose the fastest. It is known that the amount of digestible carbohydrates contained in the food or meal and the determined glycemic index (GI) greatly affect post-meal blood glucose levels and glucose response. For this reason, recommendations to provide glycemic control in individuals with diabetes often focus on carbohydrates. Macronutrient intake recommendations according to ISPAD are shown in table 2.3 (62).

Table 2.3. ISPAD Macronutrient Intake Recommendations (62)

Carbohydrate	45 – 50 % Energy
Moderate sucrose intake	up to 10% total energy
Fat	30 – 35% Energy
• Saturated fat + trans fatty acids	<10%
Protein	15 – 20 % Energy

Consumption of various high-fiber foods such as legumes, fruits, vegetables and whole grain cereals is recommended. Soluble fiber in vegetables, legumes and fruits can be beneficial in lowering lipid levels. High-fiber diets containing insoluble fiber are associated with a lower risk of cardiovascular disease and coronary heart disease. Increasing dietary fiber intake has an important effect on improving glycemic control. A diet rich in whole grain foods provides long-term satiety, provides appetite control and

helps prevent excess weight gain by replacing foods with high energy content. The recommended daily fiber intake in children is calculated as shown in table 2.4 (57).

Tablo 2.4. ISPAD Pulp Intake Recommendations (57)

Age	**Fiber Recommendations**
Birth through 1 year	Not determined
1 year or greater	14g/4184 kilojoule (1000 kcals) 3.3g/megajoule
Alternative Formula	
Children > 2 years old	Age in years + 5 = grams of fiber per day

2.4.4.2.B. Protein

Proteins play a role in the basic function and reaction of all cells in the body. In their absorption, they do not raise blood sugar as much as carbohydrates and do not contribute to total energy as much as fats. For this reason, it is important to get enough protein in the diet in individuals with type 1 diabetes. Protein requirements in children and adults with type 1 diabetes are similar to healthy children and adolescents of the same age and gender (60). The recommended protein intake is approximately 2 g/kg/day in children, 1 g/kg/day at the age of 10 years, and 0.8-0.9 g/kg/day in adolescents. When protein intake is sufficient, it supports growth and development. High protein drinks and nutritional supplements are not recommended to increase dietary protein intake in children. Recommended for animal protein intake are fish, lean meat and low-fat dairy products. Legumes are recommended for plant-based protein intake (57).

Excessive protein intake (more than 25% of total energy) should be avoided in the presence of microalbuminuria or nephropathy. Protein intake during this period should be the lower limit of the recommended range. Changes in protein intake during adolescence should not be allowed to hinder growth and development, and should be adjusted by a dietitian specialized in this field (57).

2.4.4.2.C. Fat

The type and amount of dietary fat is important to maintain metabolic control and prevent the risk of complications. In order to keep LDL cholesterol within the normal range, high intake of dietary saturated fat and cholesterol should be avoided. A diet rich in monounsaturated fatty acids reduces the risk of developing insulin resistance. Compared to a diet rich in saturated fat, a diet rich in polyunsaturated fat lowers LDL cholesterol and total cholesterol (59).

Dietary fat intake is recommended as 30-35% of total energy in children and adolescents with diabetes. Polyunsaturated fats should be preferred instead of saturated fats and saturated fat should be kept below 10% of total energy. 10% of the energy should be met from polyunsaturated fats and the rest from monounsaturated fats (60).

Consumption of fatty fish rich in omega-3 fatty acids is recommended in the diet. Children should consume 80-120 g of oily fish once or twice a week. In the presence of high triglycerides, attention should be paid to omega-3 supplementation or consumption of oily fish (57).

2.4.4.2.D. Vitamins and Minerals

As long as dietary intake is sufficient, individuals with diabetes do not need vitamin and mineral supplements (60). Children and adolescents with type 1 diabetes have the same needs as their healthy peers. In the absence of any deficiency, vitamin-mineral supplementation has not been proven to provide any benefit (57).

2.4.4.2.E. Sweeteners and Diabetic Products

Foods and beverages containing sucrose should be consumed according to healthy nutrition recommendations and should be kept below 10% of daily energy (57).

Although sugar alcohols raise blood glucose less than other carbohydrates, they can cause diarrhea and cataract development. Therefore, it should not be recommended to patients with diabetes. Non-energy sweeteners used to sweeten some foods are also not recommended, especially for children with diabetes. Special diabetic products, on the other hand, may cause gastrointestinal side effects in children due to their high fat and energy content, and their consumption in children with diabetes is not considered

appropriate (60). ISPAD 2018 dietary guidelines suggest that moderate amounts of sucrose can be consumed and that diabetic products are not necessary (57).

2.4.4.2.F. Carbohydrate Count

Carbohydrate counting is the calculation of the amount of carbohydrates taken with meals and the creation of a nutrition program accordingly. Since insulin dose adjustments are made according to the amount of carbohydrates taken, it provides flexibility in the diet and facilitates glycemic control. It improves the quality of life by facilitating diabetes management in patients with diabetes. In individuals using an insulin pen and an insulin pump, the dose is adjusted according to the amount of carbohydrates consumed in the meal. The amount of carbohydrates that should be taken at meals is determined by the dietitian according to the individual (63).

Methods for determining the amount of carbohydrates are (57):

I. Counting how many grams of carbohydrates are
II. 10-12 gram servings of carbohydrates
III. 15 grams of carbohydrate replacement

It is controversial which method is better for determining the amount of carbohydrates. Whichever method will be used more effectively for the patient should be preferred. Accurate carbohydrate counting is important to ensure optimal post-meal glucose. However, there is no universal definition of truth. In a study conducted; demonstrates that children, adolescents, and their parents can count carbohydrates with a certain degree of accuracy. However, undercounting or overcounting is still one of the challenges in carbohydrate counting (57).

2.4.4.2.G. Carbohydrate Counting Steps

The American Academy of Nutrition and Dietetics has defined 3 stages for carbohydrate counting (64):

Stage 1: Patients with diabetes should understand that carbohydrates raise blood glucose and should be encouraged to consume recommended amounts of carbohydrates at meals. For carbohydrate counting, the method of counting carbohydrate grams, servings

of 10-12 grams of carbohydrates or replacing 15 grams of carbohydrates should be used. This phase is particularly useful for patients who use two doses of insulin per day and need a certain amount of carbohydrate intake.

Stage 2: This is the stage where patients can evaluate the effect of the amount of insulin and the amount of carbohydrates consumed together with physical activity on blood glucose. For this reason, insulin doses are adjusted after patients receive training. Patients are followed up frequently by pediatric teams and other methods such as carbohydrate intake or carbohydrate/insulin ratio are used.

Stage 3: This stage is advanced. At this stage, patients learn the carbohydrate/insulin ratio and how to use it.

The Turkish Society of Endocrinology and Metabolism has determined the carbohydrate counting method as three levels as simple, intermediate and advanced. He reported that carbohydrate counting training can be given by a dietitian with 30-90 minutes interviews at 1-4 week intervals at the first level, and 30-60 minutes at 1-2 week intervals at the second and third levels (65).

2.4.4.2.H. Carbohydrate/Insulin Ratio (C/I)

The amount of carbohydrates consumed in main and snack meals is important for the post-meal glycemic response and for adjusting the pre-meal insulin dose. The Dose Adjustment for Normal Diet study group demonstrated that carbohydrate counting and use of the carbohydrate/insulin (C/I) ratio to determine insulin dose facilitated diabetes management and decreased HbA1c values (66).

The carbohydrate/insulin ratio expresses how many grams of carbohydrates are contained in 1 unit of insulin. This rate is personal and depends on the patient's insulin sensitivity. The C/I ratio allows children to meet their insulin needs according to the amount of carbohydrates they will consume during the meal, pre-meal blood glucose levels and expected physical activity levels. The 300-450 or 500 rule is often applied to determine this ratio. When these fixed values are divided by the daily insulin dose, the C/I ratio is determined (64).

The C/I ratio is not constant throughout the day; tends to be higher in the morning, lower at lunch, and higher in the evening. Due to changes in daily physical activity level, it may vary more in children than in adults (64).

2.4.4.2.I. Insulin Sensitivity Factor (ISF)

Insulin sensitivity factor (ISF) is a correction algorithm for pre-meal blood glucose level. This value shows how many units 1 unit of insulin lowers the blood glucose level. It is calculated with 1500 and 1800 rules. The ISF value is obtained by dividing the value of 1500 in the use of short-acting insulin and the value of 1800 in the use of rapid-acting insulin by the total daily insulin dose. Infants and younger children usually have a higher ISF (approximately 100-150 mg/Dl) (64).

2.4.4.2.J. The Role of Protein, Fat and Fiber

During the meal, the insulin dose is determined by calculating the individual C/I ratio. However, the amount of fat and protein in the diet should be taken into account when determining the insulin bolus dose. It has been reported that diets high in protein and fat delay hyperglycemia (up to 3-6 hours after meals) and reduce early postprandial rise (1-2 hours) (57).

ISPAD recommends that insulin dosing be adjusted to reduce delayed hyperglycemia from fat and protein. Several methods have been identified for these adjustments. It is recommended to increase the insulin dose by 30-35% after a meal rich in protein and fat. However, 6-hour glucose monitoring is recommended after a high-fat and protein-containing meal. Currently, the optimal insulin bolus dose for meals high in fat and protein has not been determined (57).

It is reported that fiber, which is the indigestible and non-absorbable parts of plants, does not increase blood glucose. It is recommended to reduce the amount of fiber from the amount of carbohydrates taken in the consumption of foods high in fiber (>5 grams) (67).

2.4.4.2.K. Carbohydrate Counting Advantages and Disadvantages

Carbohydrate counting method provides variety and flexibility in diet. It facilitates better glycemic control compared to conventional nutrition therapy. However, increases in the number of meals and the amount of meals, frequent consumption of foods with high energy content, and avoiding adequate and balanced eating habits can cause a rapid increase in body weight. For this reason, it should be emphasized that while giving nutrition education to the patient, attention should be paid to the amount of carbohydrates in the meals and the frequency of consumption of sugary foods. Attention should be paid to the fact that foods containing high sugar are also high in fat and general healthy nutrition recommendations. Discussions about food consumption diary, label reading and carbohydrate count information should be conducted with the child with diabetes and their families (63).

2.4.4.3. Physical Activity

They are physical activities that accelerate the heart and respiration that cause energy expenditure by the voluntary use of muscles and joints in line with the aim of providing vitality (22, 30). Exercise, which is a part of the treatment of type 1 diabetes, increases the absorption of insulin by causing an increase in the use of glucose in the body (23, 33). This leads to a decrease in the body's need for insulin, helping the individual to manage diabetes more effectively, increasing metabolic control, and increasing the quality of life by preventing the emergence of chronic complications and cardiovascular problems. Studies examining the benefits of exercise on children and adolescents diagnosed with type 1 diabetes show that exercise increases the child's self-esteem, supports socialization, protects them from bad habits, and thus they are more successful in managing diabetes (28, 29, 33).

The exercise plan should be planned considering the age, weight, duration of exercise and glycemic control of the individual. Ensuring disciplined compliance with the exercise plan helps to support the healthy growth of children and adolescents and to provide weight control. In this way, obesity and other cardiovascular diseases that may occur in children and adolescents in adulthood are prevented (30). Exercise is important in terms of increasing insulin sensitivity, reducing the rate of hyperglycemia, providing blood glucose control, and preventing the occurrence of cholesterol and triglyceride problems (21, 68, 69).

An adult with type 1 diabetes can do any type of exercise. The time of exercise should be planned according to the period when insulin is effective, it should not be performed at a time when insulin is too effective, and it should be done in a state of satiety, usually one hour after eating (23, 28). If there is a planned exercise, insulin injection should not be made to the area that will be used intensively during exercise, as it will increase insulin absorption. For example, since the leg muscles will be used intensely during walking or running, insulin injection should be done in an area other than the leg (21, 22). Blood glucose should be measured before, during and after exercise. In order to start exercise, the blood glucose value should be above 100 mg/dl (21). If there is a history of hypoglycemia, it may be necessary to have snacks, take additional calories, or reduce the dose of insulin before exercise. Physical activity should be avoided as exercise when blood glucose level is >250mg/dl may lead to stimulation of anti-insulin hormones, hyperglycemia and ketoacidosis (33, 50). It is necessary to take plenty of fluids to prevent dehydration during exercise (21). Heavy exercises in the presence of diabetic retinopathy are not recommended as they may cause hemorrhage or tear in the retina. In the presence of neuropathy, decreased sensation and pain sensation, damage to the skin and joints, deformation and increased risk of infection. For this reason, diabetic patients should always wear appropriate shoes by paying attention to foot care (23, 50, 70).

2.4.5. Complications of Type 1 Diabetes Mellitus

The discovery of insulin has transformed type 1 diabetes from a deadly disease into a treatable one. Despite advances in treatment modalities, diabetes continues to be associated with significant medical, psychological, and financial burden. Hypoglycemia and diabetic ketoacidosis are life-threatening acute complications (71). Nephropathy, retinopathy, neuropathy and macrovascular diseases are among the chronic complications of diabetes (72).

2.4.5.1. Acute Complications

The strongest predictor of diabetes complications is glycemic control, and achieving normal HbA1c (7% or 53 mmol/mol) levels is considered the primary goal in

diabetes management (73). The most common acute complications of type 1 diabetes are hypoglycemic episodes and diabetic ketoacidosis (74).

2.4.5.1.A. Hypoglycemia

Hypoglycemia is one of the most common acute complications. It can lead to symptoms such as headache, tremor, tension, sweating, irritability, confusion, drowsiness and fatigue, weakness, dizziness, severe neuroglycopenia. In the most severe cases, it can result in seizures, unconsciousness, and death (75). According to the ISPAD 2014 guidelines, the threshold for hypoglycemia is defined as a blood glucose level of <3.6 mmol/L (65 mg/Dl). However, in clinical practice, a blood glucose value of ≤3.9 mmol/L (70 mg/Dl) is used as the threshold value to initiate the treatment of hypoglycemia in diabetes due to the tendency of glucose to decrease further (76). Hypoglycemia was standardized in the ADA 2005 hypoglycemia study group by dividing it into three categories (77).

1) 61-70 mg/Dl (3.4-3.9 mmol/L) "low"
2) 51 – 60 mg/Dl (2.8–3.3 mmol/L) "very low"
3) "dangerously low" <50 mg/Dl (2.8 mmol/L)

Clinically, the hypoglycemia picture arises due to the individual's administration of high doses of insulin, failure to balance nutrition-exercise-insulin, improper planning of exercise time, skipping meals, taking less carbohydrates than necessary, or eating problems such as anorexia nervosa, and not doing what is necessary despite the symptoms of hypoglycemia. (29, 78). Hypoglycemia treatment, according to blood glucose value and hypoglycemia classification; oral glucose can be done with intravenous dextrose infusion or subcutaneous glucagon (12).

2.4.5.1.B. Diabetic Ketoacidosis (DKA)

Patients with type 1 diabetes are often diagnosed with acute diabetes symptoms and high blood glucose levels, and diabetic ketoacidosis (DKA) is seen in approximately one third of these diagnosed patients (79). Hyperglycemia resulting from insulin deficiency/insufficiency and stress (cortisol, catecholamines, growth hormone and glucagon) cause lipolysis. As an alternative energy source, hepatic metabolism of

free fatty acids (ketogenesis) causes the accumulation of acidic substances and metabolites (ketones and ketoacids) (80). It exacerbates hyperglycemia by increasing glycogenolysis in the liver. In addition, glycosuria causes dehydration by triggering osmotic diuresis, the release of hormones (renin-angiotensin-aldosterone) (81). Disruption of normal physiological mechanisms results in hyperglycemia, hyperosmolality, ketosis and acidosis (82). The diagnosis of DKA is made with a combination of hyperglycemia (11 mmol/L or 200 mg/Dl), venous blood Ph <7.3, and bicarbonate 15 mmol/L (80). An important component of DKA treatment is to provide fluid and electrolyte restoration of intravascular, interstitial and intracellular volume (81).

2.4.5.2. Chronic Complications

The prevalence of diabetes is increasing worldwide, and the concern about the number of new diabetes cases is related to the development of chronic complications. It is accepted that diabetic chronic complications are an important cause of morbidity and mortality worldwide and negatively affect the quality of life in individuals with diabetes. Chronic complications are classified as microvascular (retinopathy, nephropathy, and neuropathy) and macrovascular complications (83).

2.4.5.2.A. Microvascular Complications

Microvascular complications of the disease primarily occur as retinopathy, neuropathy and nephropathy, but also affect cognitive function, heart and other organs. Hyperglycemia is the primary risk factor for the development of microvascular complications, and good glycemic control reduces the risk of developing microvascular complications (84).

2.4.5.2.A.1. Retinopathy

Retinopathy is an important complication of type 1 diabetes. In the Diabetes Control and Complications Study, individuals with lower HbA1c (~7%) were found to have significantly reduced microvascular complications, including retinopathy,

compared with individuals with higher HbA1c (~9%) in a long-term intensive diabetes treatment (85).

The development of retinopathy consists of at least four stages. In the first stage, microaneurysms (small balloon-like swellings that form in the thin blood vessels of the retina) occur. This stage is called mild nonproliferative retinopathy. As the disease progresses, some of the blood vessels feeding the retina become blocked, leading to moderate nonproliferative retinopathy. As the process continues, many blood vessels become blocked and a large portion of the retina cannot be nourished. These areas of the retina send signals to the body to form new blood vessels for nourishment, causing the final and most advanced stage called severe proliferative retinopathy (86). The risk of developing proliferative diabetic retinopathy is associated with high HbA1c value, high systolic blood pressure, proteinuria and high body mass index. It has been shown that decreases in HbA1c and diastolic blood pressure cause improvement in diabetic retinopathy (87).

ADA recommends a comprehensive eye examination within 5 years of the onset of diabetes in adults and adolescents over 10 years of age with type 1 diabetes (88).

2.4.5.2.A.2. Nephropathy

Another important complication of diabetes that causes metabolic abnormalities is diabetic nephropathy. It has been reported that nephropathy occurs in 20-40% of patients with diabetes and is the only cause of end-stage renal disease (88, 89). Generally, diabetic nephropathy is defined as increased urinary albumin excretion in the absence of other kidney diseases. The earliest stage of diabetic nephropathy in type 1 diabetes is microalbuminuria, which is defined as albumin excretion of 30-299 mg/24 hours. The more advanced stage of nephropathy (macroalbuminuria) is stated as albumin excretion ≥300 mg / 24 hours (88).

It is known that diabetic nephropathy is associated with an increased risk of death, especially from cardiovascular causes. Hyperglycemia, hypertension and genetic predisposition are the main risk factors for the development of diabetic nephropathy (89). The general principle in the prevention of diabetic nephropathy is the effective

treatment of known risk factors (hypertension, hyperglycemia, dyslipidemia) that contribute to the development of diabetic nephropathy (88, 89).

2.4.5.2.A.3. Neuropathy

Diabetes can have effects on the somatic and autonomic nervous systems. Sensory disturbances such as pain, numbness, tingling or burning sensation and muscle weakness can be seen due to peripheral neuropathy. The prevalence of peripheral neuropathy in young people varies between 10-27%. Clinical symptoms of autonomic neuropathy are rare in the pediatric population. The most important factors in the prevention of diabetic neuropathy are good glycemic control and diabetes age (90).

Peripheral neuropathy screening is recommended annually from the age of 11 in individuals with diabetes for 2-5 years. While evaluating diabetic neuropathy, sensation, vibration and reflex measurements are made in the feet for peripheral neuropathy, while the variability in heart rate is checked in cardiac autonomic neuropathy (90).

2.4.5.2.B. Macrovascular Complications

Cardiovascular disease mortality and morbidity are significantly higher in diabetic patients than in the general population. Diabetic patients are 2-4 times more likely to develop coronary disease. Atherosclerosis, which occurs with the narrowing of the arterial walls throughout the body, constitutes the main pathological mechanism in macrovascular disease. Hypertension and dyslipidemia often coexist in individuals with diabetes. Hypertension plays a more important role in the development of coronary vascular disease in diabetic patients than in healthy individuals. Cholesterol is one of the main causes of the onset and progression of atherosclerosis. Therefore, control of blood pressure and lipids is important (91).

Individuals with type 1 diabetes are at risk of hypercholesterolemia (90). In one study, the prevalence of hypercholesterolemia in young adults was approximately 50% (92), and in another study conducted on individuals under the age of 21 with type 1 diabetes, the prevalence of high nonHDL cholesterol was 25% (93).

Non-HDL cholesterol level is defined as an important marker in the development of atherosclerosis in children and adolescents. In both children and adults,

non-HDL cholesterol levels are seen as a more predictive marker for the development of dyslipidemia and atherosclerosis than total cholesterol, LDL cholesterol and HDL cholesterol levels. An important advantage of non-HDL cholesterol is that it can be calculated accurately even in the state of satiety and screening tests are practical in clinical practice (94).

2.5. Homeostatic Hunger

The term hunger was previously used to describe the situation that occurs as a result of biological energy needs. However, today this situation is defined as homeostatic hunger and it is the control of energy balance by increasing the desire to eat when the energy stores are empty (1). Food intake and body weight are homeostatically controlled. At the same time, hormonal and neural signals are critical in the regulation of individual meals and body fat (95).

The feeling of hunger that occurs as a result of the decrease in the glucose level in the blood and the increase in the free fatty acid level and the desire to consume food due to this are regulated by homeostatic mechanisms. Although it has been reported in many studies that it varies, food deprivation for at least 8 hours is defined as homeostatic hunger (95, 96).

It is the situation in which the body does not receive enough nutrients and the energy requirement is met from the stores. Fasting plasma glucose level in humans is physiologically kept in balance between 70-110 mg/Dl (97). When starvation occurs, the glucose requirement of metabolism is provided by the destruction of glycogen stores in the liver (glucogenolysis) and glucose synthesis from different sources (gluconeogenesis) (98). The increase in nutrients such as glucose and amino acids and insulin levels after absorption supports the feeling of satiety until the next meal (99). The feeling of satiety and fullness are also different concepts and should not be confused. While satiety defines the cessation of food intake, the concept of fullness defines the time until the feeling of hunger develops again after the cessation of food intake (100, 101).

The regulation of hunger and food intake is based on a neuroendocrine network that integrates central nervous pathways with peripheral signals. In particular, intestinal hormones such as glucagon-like peptide 1 (GLP-1), peptide YY (PYY) and ghrelin act on hypothalamic pathways that regulate energy homeostasis and eating behavior either directly through the central nervous structures or via the neuronal afferent pathway of the vagal nerve. Because of the complex and highly integrated nature of this network, distress in nutrient intake and body weight control is difficult to ameliorate (102).

2.5.1. Homeostatic Regulation of Eating Behavior

The hypothalamus is a primary brain region that plays a role in the regulation of energy balance (103). It consists of multiple nuclei, including the paraventricular nucleus (PVN), lateral hypothalamic area (LHA), dorsomedial hypothalamus (DMH), ventromedial hypothalamus (VMH), and arcuate nucleus (ARC), which stimulate hunger by stimulating feeding with a series of neuroendocrine, nutritional, and neuronal signals. It creates the sense of satiety by suppressing the sense of satiety (104, 105, 106).

It is known that many hypothalamic neurotransmitters affect energy intake and that the lateral hypothalamus is the center that receives “hunger” and ventromedial hypothalamus “fullness” signals (104).

Peptides that regulate food intake are grouped as orexigenic and anorexigenic peptides according to their effects on feeding behavior (107). “Orexins”, which are concentrated in the lateral hypothalamic area known as the feeding center, are peptides first identified in the rat hypothalamus. As a result of the increased appetite of rats by intraserobroventricular administration, the name “orexin” meaning “appetite” was given in ancient Greek (108). While orexigenic peptides stimulate food intake by initiating the feeling of hunger, anorexigenics are peptides that stop food intake by creating a feeling of fullness (109). Among the main orexigenics; ghrelin receptors are primarily expressed on nutrition-promoting neuropeptide Y (NPY)/agouti-related peptide (AgRP) neurons in the ARC, and activation of ghrelin signaling stimulates these neurons, promoting feeding behavior. Emerging evidence supports the idea that hormones known to regulate feeding, such as leptin and ghrelin, also have an impact on motivation to obtain food through regulation of mesolimbic dopamine signaling (110).

NPY and AgRP are co-secreted and released from a subset of neurons concentrated in the ARC. The primary task of NPY is to stimulate food intake by acting on receptors located in the brain and concentrated in regions containing PVN, VMH and LHA in the hypothalamus. On the other hand, AgRP inhibits anorexigonic receptors in PVN. Activation of neurons secreting NPY and AgRP (via ghrelin) has a double orexigenic effect, as it has an activating effect on orexingic signaling and an inhibitory effect on aneroxygenic signaling (103). Sensory nutrient sensing inhibits AgRP neurons within a few seconds, but this inhibition is valid until subsequent consumption of the nutrient (111).

Leptin, one of the main anorexigenics, is synthesized from white adipose tissue and its circulating levels vary in proportion to body fat mass. The main mechanism of action of leptin is to inhibit the release and expression of NPY from ARC, which is involved in the regulation of many pituitary hormones and whose main effect is to increase appetite. Thus, leptin crosses the blood-brain barrier, binds to receptors in the hypothalamus, strongly suppresses food intake by activating signals, and stimulates metabolic processes to use energy stores (112).

In the ARC, leptin receptors are expressed on two distinct subsets of neurons. First, the peptide neurotransmitter pro-opiomelanocortin (POMC) and its cocaine-amphetamine-regulated transcript (CART) are expressed. Leptin receptor signaling stimulates the activity of POMC/CART neurons and suppresses feeding while increasing metabolic rate. Second, long-term blockade of leptin signaling in the ventral tegmental area (VTA) increases locomotor activity and food intake, as well as inhibiting the release of VTA dopamine neurons. Imaging studies in humans confirm the role of leptin in influencing mesolimbic dopamine signaling (110). In addition to regulating the basic activity of AgRP and POMC neurons, leptin can modulate their sensitivity to other signals, including the sensory perception of food (113).

2.6. Hedonic Hunger

If eating behavior were regulated solely by homeostatic systems, food consumption would only be a response to a purely physiological need, and the vast majority of people would maintain a body weight considered normal (114). However,

the regulation of appetite in humans is much more complex, because people experience subjective pleasure when eating and enjoy the presentation of food, its aroma, texture, and even the sound of chewing crunchy foods (115). All these stimuli act on the reinforcement system and the brain produces subjective sensations of pleasure that can even lead a person to eat compulsive. In this context, hedonic pathways can cancel the homeostatic system by increasing the individual's desire to consume highly palatable foods with high energy density, without a physiological energy need, with the participation of cognitive, reward and emotional factors (116, 117).

Seeing or smelling food, seeing people eating and advertisements are called environmental (external) triggers, while being stressful or emotional and rewarding experiences are called emotional (internal) triggers. It is claimed that exposure to these triggers triggers the expectation of reward through foods that encourage eating, which is misinterpreted as hunger. In particular, "snacks", which are defined as food options that are consumed arbitrarily apart from the main meals, are more affected by these environmental triggers. A longitudinal study shows that it is environmental and emotional triggers rather than hunger that trigger snacking behavior. However, not every individual responds to food-related environmental and emotional triggers in the same way. Some individuals may be more sensitive to common food-related triggers and therefore consume more food (118, 119). Apart from these, eating attitudes such as restricted eating behavior and excessive food cravings are risk factors that trigger excessive eating behavior. Restricted eating behavior is defined as the deliberate restriction of food intake and is associated with overeating behaviors. Excess food cravings, on the other hand, is a situation where there is an intense and strong desire for a certain food, and this desired food creates a psychological or physiological motivation (120).

2.6.1. Hedonic Regulation of Eating Behavior

One study shows that hedonic responses to food occur rapidly, without being conscious of what they are eating. Unlike the homeostatic regulatory systems that regulate the internal metabolic systems in the hypothalamus and brainstem, it is a non-homeostatic system based on the reward value of food, with a cognitive and emotional principle. The reward system is mediated by the subconscious processes of "liking"

(pleasure or reward level) and “wanting” (motivation to eat). Opioid receptor signals related to non-homeostatic food intake and cannabinoid receptor type 1 (CB1) signaling networks are thought to have connections to other brain areas, including the hippocampus, amygdala, and orbitofrontal cortex (121). Findings in brain imaging studies show that the amygdala and nucleus accumbens regions of the brain are activated by the perception of the image of food and shape daily eating behavior (122, 123). They demonstrated that stimulation of GABAergic, opioid, or dopaminergic systems in the nucleus accumbens modulates food intake and foraging behavior. Stimulation of these systems in the nucleus produces some behavioral effects related to hunger (123).

Changes that occur in the mesolimbic dopaminergic system can create changes in the brain reward circuit, resulting in a pattern of palatable food addiction-like behavior. The effects of central dopamine signals on feeding are thought to be mediated by dopaminergic receptor 1 and dopaminergic receptor 2, and dopamine deprivation may increase hedonic responses to food (124, 125). The theory developed by Wang et al. (126) may lead to hyperjagia and obesity as a result of the hypodopominergic system function that occurs with the D2 receptor.

Reward Deficiency Syndrome, caused by brain reward cascade dysfunction, is defined as a form of sensory deprivation of reward mechanisms. In this hypothesis, it was revealed that hypo-dopaminergic function causes abnormal eating behavior, leading to disruption of brain reward circuits. Compensatory eating behavior may develop to activate reward circuits as a result of dopamine deficiency (127).

The endocannabinoid system is a physiological system that has a critical role in maintaining the energy balance defined in recent years. In this system; endocannabinoids, cannabinoids, and cannabinoid receptors. Endocannabinoids, which are endogenous fats; It binds to CB1 and cannabinoid receptor type 2 (CB2) receptors. Studies have shown that overproduction of peripheral endocannabinoids can increase food intake in both healthy and obese individuals by hedonic modulation (128,129). In the hypothalamus, CB1 receptors are located in neurons in the mesolimbic system, which is believed to mediate the formation of food cravings that control appetite and food intake. Stimulation of CB1 causes the release of dopamine in the nucleus accumbens and some appetitive and suppressive mediators in the hypothalamus (128-130).

There is a strong relationship between endocannabinoids and endogenous opioid peptides that functionally contribute to food intake control. Opioid receptor agonists and antagonists that increase or decrease food intake create changes in the hedonic evaluation of food. In a study by Kelley et al. (131), it was revealed that potentiation of hedonic properties through the opioid system provides a higher motivational effect to obtain that nutrient. In the simplest way, the food reward system is divided into two components: "like" and "want". It reflects the hedonic evaluation of incentive processes and food stimuli that stimulate and guide behavior towards food intake. The mesolimbic dopamine system is the best known neural substrate that can increase the 'wanting' process from liking. 'Liking' processes are accompanied by opioid and endocannabinoid signals in the shell of the nucleus accumbens (130, 132).

Brain-derived neurotrophic factor (BDNF) has been identified as an essential component of the hypothalamic pathway that controls energy homeostasis and body weight. Impaired BDNF signals play a role in the regulation of hedonic hunger, as it inhibits the activity of the mesolimbic dopamine pathway and causes excessive consumption of reward-derived tasty foods (133).

Apart from basic metabolic processes, psychological factors and food chemistry also regulate eating behavior. It has been stated that chronic stress affects both homeostatic and hedonic appetite control (134). In a study conducted by Tomiyama et al. (135), it was found that women under chronic stress scored higher on the emotional nutrition scale. In addition, like chronic stress, physical inactivity and insufficient sleep increase reward-oriented eating behavior. The preference for very tasty foods increases with perceived stress (136). In a study, it was shown that individuals with increased stress and anxiety levels tend to consume excessively fatty and sugary foods. It is stated that people may exhibit eating behavior to cope with stress and negative emotions that disturb them. Therefore, stress has a close relationship with emotional nutrition (137). In a population-based study (2359 men, 2791 women), especially women, stress-related food consumption was found to be the highest. Among the preferred foods, sausage, hamburger, pizza and chocolate come to the fore (138). It is becoming increasingly clear that the energy-dense delicious foods (foods containing high sugar and fat) that we are currently exposed to have a stimulating effect on the hedonic/rewarding hypothalamic systems that regulate the energy balance. This puts food consumption beyond homeostatic needs (139).

3. MATERIALS AND METHODS

3.1. Research Location, Time and Sample Selection

This research was conducted with 302 adult individuals aged 18-64 years, who were diagnosed with type 1 diabetes and were not diagnosed with diabetes, who applied to the Turkish Diabetes Foundation in Istanbul between October 2021 and January 2022. Before the study, the individuals in the sample were read the "Informed Consent Form for Scientific Research" (Appendix 1) and the individuals who wanted to participate in the study voluntarily were included in the study by asking whether they wanted to participate. Male and female volunteers under the age of 18, over the age of 65 and with type 2 diabetes and gestational diabetes were not included in the study. This study was approved by the decision of Usküdar University Non-Interventional Clinical Research Ethics Committee dated 30.09.2021 and numbered 61351342/September 2021-32 (Appendix 4).

3.2. Research General Plan, Data Collection and Statistical Evaluation

3.2.1. Personal Characteristics and Research General Plan

This study is a non-intervention survey study consisting of case and control groups. The case group consists of people with type 1 diabetes and the control group is non-diabetic. Inclusion criteria for the case group; going to the Turkish Diabetes Foundation, having been diagnosed with type 1 diabetes, being between the ages of 18-64 and willing to participate in the study voluntarily. Exclusion criteria for the case group; not attending the Turkish Diabetes Foundation, having been diagnosed with type 2 diabetes or gestational diabetes, not being between the ages of 18-64 and not wanting to participate in the study voluntarily. Inclusion criteria for the control group; not being diagnosed with diabetes, being between the ages of 18-64 and willing to participate in the study voluntarily. Exclusion criteria for the control group; diagnosis of type 1 diabetes, type 2 diabetes or gestational diabetes, not being between the ages of 18-64 and not wanting to participate in the study voluntarily.

A questionnaire consisting of 28 questions was used to determine the personal characteristics of individuals (Appendix 2). The questionnaire form consists of

demographic characteristics (age, marital status, educational status, employment status), smoking-alcohol consumption habits, general eating habits (frequency of main meal consumption, etc.), PFS (Appendix 2), FCQ (Appendix 2), VAS (Appendix 2), CSEI (Appendix 2) and PEMS (Appendix 2). The height (cm) and body weight (kg) values of the participating individuals were taken based on the declaration. The application of the questionnaire was carried out by self-filling method under observation in the classrooms where the students were present. Body mass indexes of individuals were calculated with the formula BMI = [Body weight (kg) / height $(m)^2$] using the values of height and body weight taken based on the statement (140). The BMI results of the individuals were evaluated according to the WHO classification. BMI classification according to WHO standards is indicated in table 3.1 (141).

Table 3.1. BMI Classification According to WHO Standards (141)

Classification	BMI (kg/m2)
Underweight	under 18.5 kg/m^2
Normal weight	18.5 to 24.9 kg/m^2
Overweight	25 to 29.9 kg/m^2
Obesity	30 kg/m^2 or more

3.2.2. Power of Food Scale (PFS)

PFS was developed by Cappelleri et al. (142) in 2009. The Turkish validity and reliability study of the scale was conducted by Hayzaran (134) in 2018. The scale, which originally consisted of 21 items, was reduced to 15 items by the researchers during the analysis. Compliance tests were conducted to show that PFS had sufficient internal consistency and that it was acceptable to adapt it to Turkish (134).

PFS is a scale developed to assess the motivation for food consumption in an obesogenic environment where highly palatable foods are abundant, in order to measure the nature of hedonic hunger. PFS measures the craving/desire to consume delicious foods (foods high in sugar and fat), independent of the frequency and amount of daily food consumption (134).

PFS is a 5-item Likert assessment ranging from 1 (strongly disagree) to 5

(strongly agree). It has 3 sub-factors that measure responses to food situations;

1) food availability; it is assumed that there are tasty foods in the environment. Therefore, these substances are the most abstract. Because they describe responses to an 'implicit' nutrient environment where nutrients are always imaginatively present but not physically present.

2) food present; tasty food is physically present in the environment but has not yet been tasted.

3) food tasted; delicious foods have only been tasted, but not all of them have been consumed yet (134).

Evaluation of PFS is done over 5 points. The scale score is calculated by dividing the sum of the values ranging from one to five by the number of questions. The hedonic hunger level of individuals increases as the total score of PFS rises to 2.5 and above. High scores indicate that the individual is more sensitive to the food environment and is psychologically controlled by food (142).

3.2.3. Food Craving Questionnaire (FCQ)

Cepeda-Benito et al. (143) developed FCQ scale in England in 2000 to objectively measure excessive food cravings. The Turkish validity and reliability study of FCQ was performed by Müftüoğlu et al. The scale consists of nine factors and 39 items. Three items in the sub-factor of FCQ as food consumption intention and plan; five items in the expectation of positive support sub-factor that may occur as a result of the meal; three items in the expectation of relief from negative emotions and situations as a result of eating; six items in the sub-factor no control over eating; seven items in the food-related thoughts or preoccupation sub-factor; four items in the physiologically excessive desire sub-factor; four items in the sub-factor of food cravings and feelings experienced during or before feeding; four items in the sub-factor of stimuli that trigger excessive food cravings; There are three items in the sub-factor of guilt felt in case of wanting to eat and/or not being able to resist wanting to eat. All of the items in the scale are in six-point Likert type and the answers are "6= Always, 5= Often, 4= Often, 3= Occasionally, 2= Rarely, 1= Never". According to this scoring, a minimum of 39 and a maximum of 234 points are obtained from FCQ. The higher the individual's score on the scale, the more hedonic hunger appears and the greater the food craving. (144).

3.2.4. Visual Analog Scale (VAS)

VAS is used to digitize some values that cannot be measured digitally. Two end definitions of the parameter to be evaluated are written at both ends of a 10 cm line, and individuals are asked to indicate where their situation is appropriate on this line by drawing a line or by placing a dot or pointing. This line can be straight, or it can be divided into equal intervals. The average of the values obtained for the individuals is taken. The fact that the test does not have a language and is easy to implement is an important advantage. It has been shown that it is not affected by the horizontal or vertical line and its length. After the test was repeated at short intervals, no significant difference was found in the answers given. The evaluation is made by taking the average of the values obtained for the individuals. The test has proven itself for a very long time and has been accepted in the whole world literature. It is safe and easy to administer (145).

In this study, it was aimed to determine which food types individuals are more interested in with VAS.

3.2.5. Coopersmith Self-Esteem Inventory (CSEI)

CSEI; it is a scale developed by Stanley Coopersmith in 1986 to be applicable to various age groups, especially adults (146). The Turkish validity and reliability study of the scale was carried out by Tufan and Turan in 1987 (147). The scale consists of 25 items covering factors such as self-contempt, popularity, family, assertiveness and anxiety related to self-esteem. Individuals are asked to mark one of the options "like me" or "not like me" for the statements in the scale. Individuals score points when they mark "like me" for some items and "not like me" for some items. Expected answers to 1, 4, 5, 8, 9, 14, 19 and 20 numbered items are "like me" and 2, 3, 7, 10, 11, 12, 13, 15, 16, 17, 18, 21, 22, 23, 24 and 25 numbered items are "not like me". When the items are answered as expected, they get 1 point, unexpected answers get 0 points, and the result is multiplied by 4 to get the total score. The scores that can be obtained from the scale range from 0 to 100. Therefore, a person's self-esteem score can be 100. If both options are checked, these items are not scored. High scores mean high self- esteem, low scores mean low self-esteem levels (148).

3.2.6. Palatable Eating Motives Scale (PEMS)

PEMS was developed by Burgess et al (149). There is no Turkish validity and

reliability study of the PEMS scale. In this study, it was used for the relationship according to the standards in the questionnaire.

The scale, which originally started with 20 items, was reduced to 19 items after validity and reliability analysis. The PEMS scale was developed to identify the reasons why individuals consume delicious foods and beverages;

1) typical characteristics of foods selected when eating or passive eating for non-metabolic reasons (without hunger),

2) difficult to limit because such foods are more palatable, and

3) all factors that facilitate weight gain, which are typically energy-dense. It is aimed to measure their behavior specifically (149).

The instructions at the beginning of the PEMS scale include examples of what is meant by the terms delicious foods and beverages (for example, fast food, sweets, junk food, fried foods, salty snacks, and sugary drinks) (150). It is a Likert-like questionnaire consisting of five-choice answers, originally 20 items. It includes 4 sub-factors: socialization, coping, reward development and conformity motivations;

1) the motivation to socialize is to consume delicious foods or drinks for social reasons (For example; celebrating with friends, being more intimate, meetings, parties, etc.),

2) coping motivation is for consuming delicious items to overcome negative emotions (For example; anxiety, depression, irritability, desire to forget problems, etc.),

3) in reward motivation, there is rewarding oneself with delicious foods and drinks in order to increase positive experiences or emotions (For example, consuming because it is fun, exciting or gives a pleasant feeling, etc.),

4) conformity motivation includes the consumption of delicious items as a result of external pressures (For example, the desire of friends or family to be consumed, adapting to the environment, not feeling excluded, etc.) (149).

Except for coping motivation, all motivations consist of 5 items, and coping motivation consists of 4 items. Scoring in the original PEMS scale is obtained by calculating the average of the responses among the items containing each motivation or after adding all the responses to the 19 items. Except for coping motivation, the possible

score range for each motivation varies between 5-25, and the coping score is between 4-20. Therefore, the scoring ranges from 19 to 95 (150). Since statistics are given over the average of the scores in study, average scores out of 5 are given in this study as well. A score above 2.5 indicates an increased tendency to consume delicious foods (134).

3.3. Statistical Evaluation of Data

The analysis of the data obtained from 302 participants as a result of the research was evaluated with appropriate statistical methods in the IBM SPSS Statistics 22 (SPSS Inc., Chicago, IL) program. In the study, the form consisting of demographic questions and the PFS, FCQ, VAS, CSEI and PEMS scales were used. Since the skewness and kurtosis values of the scale scores were found to be in the range of +1.5 -1.5, it can be said that the distribution is normal. For this reason, parametric tests were used while comparing the scale scores. In addition, reliability analyzes of the scales used in the research were made and the Cronbach Alpha coefficients were calculated. Cronbach Aplha for FCQ was 0.980, Cronbach Alpha for VAS was 0.794, Cronbach Alpha for CSEI was 0.617, Cronbach Alpha for PFS was calculated as 0.923, and Cronbach Alpha for PEMS was calculated as 0.912. While it can be said that the reliability of the FCQ, PFS and PEMS is perfectly reliable, it can be said that the CSEI and VAS Scale are highly reliable. In the analysis of data; descriptive categorical data are shown as number (n) and percentage (%), while quantitative data mean and standard deviation values, skewness, kurtosis, minimum and maximum values are shown. It has been determined that there is no missing value in the data. The Independent Sample T Test was used to compare the means of two independent groups, and the One Way ANOVA test was used to compare the means of more than two groups. Pearson Chi-Square test was used to examine the relationship between categorical variables, while Pearson Correlation test was used to examine the relationship between quantitative variables. In addition, the significance value of $p<0.05$ was taken as a basis for all results.

4. RESULTS

4.1. Examination of Participants Regarding Categorical Variables

Descriptive statistics for the categorical variables used in the study are given in table 4.1. When the gender variable is examined, 225 (74.5%) of the participants are female and 77 (25.5%) are male, when the age variable is examined, 178 participants (58.9%) between the ages of 18-28, 73 participants (24.2%) between the ages of 29-39 and 51 participants (16.9%) in the age range of 40 and over. When the marital status variable is examined, 110 (36.4%) of the participants are married and 192 participants (63.6%) are single. When the participants were examined with whom they live, it was stated that there are 28 participants (9.3%) living alone, 266 participants living with their families (88.1%), and 8 participants (2.6%) living with a roommate. When the education level variable was examined, it was determined that 39 participants (12.9%) are at the under bachelor level which is the sum of education level ofliterate, primary, secondary and high school all, 208 participants (68.9%) are at the bachelor level, and 55 participants (18.2%) are at the master or doctorate level. When the employment status variable is examined, it is determined that 124 participants (41.1%) are not working, 178 participants (58.9%) are working. When the family income variable is examined, it is seen that there are 21 participants (7%) whose income is less than their expenses, 76 participants (25.2%) whose income is equal to their expenses, and 205 participants (67.9%) whose income is more than their expenses.

Table 4.1. Examination of Descriptive Statistics Regarding the Categorical Variables Used in the Research

Variables	Categories	Frequence (n)	Percent (%)
Gender	Woman	225	74.5
	Man	77	25.5
Age	18-28	178	58.9
	29-39	73	24.2
	40 +	51	16.9
Merital status	Married	110	36.4
	Single	192	63.6
Who do you live with?	Alone	28	9.3
	With the family	266	88.1
	With a roommate	8	2.6
Education situation	Under bachelor	39	12.9
	Bachelor	208	68.9
	Master and doctorate	55	18.2
Working situation	Not working	124	41.1
	Working	178	58.9
Describe your family's income situation	Income less than expenses	21	7
	Income equals expense	76	25.2
	Income more than expenses	205	67.9

4.2. Distribution of Participants According to their General Habits

Table 4.2. shows the distribution of participants according to their general habits. When the smoking status of the participants was examined, 71 participants (23.5%) are smokers, 208 participants (68.9%) are non-smokers, 23 participants (7.6%) have use and quit before. When the alcohol use status was examined, it was determined that 129 participants (42.7%) use alcohol and 173 participants (57.3%) do not use alcohol. When the alcohol consumption status was examined, it was determined that 129 participants (42.7%) consume alcohol and 173 participants (57.3%) do not consume alcohol. When the frequency of alcohol consumption was analyzed, 72 participants (23.8%) are social drinkers, 15 participants (5%) consume it every week, 26 participants

(8.6%) consume it once every 15 days, and 18 participants (43.4%) consume it once a month.

Table 4. 2. Distribution of Participants According to their General Habits

Variables	Categories	Frequence (n)	Percent (%)
Do you smoke?	Yes	71	23.5
	No	208	68.9
	I was using but quit	23	7.6
Do you drink alcohol?	Yes	129	42.7
	No	173	57.3
How often do you consume alcohol?	I am a social drinker (rarely)	72	23.8
	Every week	15	5
	1 in 15 days	26	8.6
	1 per month	18	43.4

4.3. Examination of BMI Values of Participants

Table 4.3. contains information about the BMIs of the participants. According to this, 26 participants with underweight (8.6%), 183 participants with normal weight (60.6%), 74 participants with overweight, and 19 participants (6.3%) who are obese was determined.

Table 4.3. Examination of BMI Values of Participants

Variables	Categories	Frequence (n)	Percent (%)
BMI	< 18.5 Underweight	26	8.6
	18.5 - 24.9 Normal weight	183	60.6
	25 - 29.9 Overweight	74	24.5
	> 30 Obese	19	6.3

4.4. Examination of the General Health Status of Participants

Table 4.4. provides information on the general health status of participants. When the status of being diagnosed with type 1 diabetes was examined, it was found that 150 (49.7%) of the participants were diagnosed with type 1 diabetes and 152 (50.3%) were not diagnosed with diabetes. When the presence of other chronic diseases was examined, it was determined that 35 participants (32.1%) of them have a chronic disease and 267 participants (67.9%) of them do not have a chronic disease. Considering those with chronic diseases, 5 participants (19.2%) have hashimoto, 3 participants (11.5%) have hypothyroidism, 3 participants (11.5%) have hypertension, 2 participants (7.7%) have asthma, 13 participants (50%) have other chronic diseases.

Table 4.4. Information on the General Health Status of Participants

Variables	Categories	Frequence (n)	Percent (%)
If you have a diagnosis of type 1 diabetes?	Yes	150	49.7
	No	152	50.3
Do you have any other chronic disease diagnosis?	Yes	35	32.1
	No	267	67.9
Other chronic disease diagnosis	Hashimoto	5	19.2
	Hypothyroidism	3	11.5
	Hypertension	3	11.5
	Asthma	2	7.7
	Other	13	%50

4.5. Examination of Participants According to their Nutritional Habits

Information according to the nutritional habits of the participants in table 4.5. is given. When the status of individuals having breakfast in the morning is examined, 255 participants (84.4%) who have breakfast every morning, 33 participants who have breakfast occasionally (10.9%), 9 participants who only have breakfast on the weekend (3%), 5 participants who never have breakfast (1.7%) has been detected. When the

situation of consuming snacks was examined, it was determined that 147 participants (48.7%) consume snacks, 30 participants (9.9%) do not, and 125 participants (41.4%) sometimes consume them. When the meal skipping status of the participants is examined, it is seen that 126 participants (41.7%) skip meals, 76 participants (25.2%) do not skip meals, and 100 participants (33.1%) sometimes skip meals. When it is examined which meal is generally skipped, it was determined that 11 participants (15.1%) skip the breakfast, 14 participants (19.2%) skip the mid-morning meal, 12 participants (16.4%) skip the lunch, 14 participants (19.2%) skip the afternoon meal, 8 participants (11%) skip the dinner, 14 participants (19.2%) skip the night meal. When the reason for skipping meals was examined, it was found that 11 participants (15.1%) do not want to, 11 participants (15.1%) could not find time, 9 participants (12.3%) to lose weight, 9 participants (12.3%) do not think of it, and 9 participants (12.3%) are lazy. It was determined that 24 participants (32.9%) skip meals due to other reasons. When examining how individuals evaluate their weight, it was found that 171 participants (56.6%) wanted to be thinner, 115 participants (38.1%) are satisfied with their weight, and 16 participants (5.3%) want to gain weight. When the dieting status of the individuals within 1 year was examined, it was determined that 142 participants (47%) of them were on a diet and 160 participants (53%) were not on a diet. When the participants are on a diet, what kind of diet they follow is examined, it was observed that 65 participants (21.5%) aimed to lose weight, 2 participants (0.7%) aimed to gain weight, 37 participants (12.3%) were on disease-related diets, 37 participants (12.3%) were on diet for healthy nutrition, 2 participants (0.6%) were on other types of diets. When the mood of the participants was examined when they were on a diet, 20 participants (8.96%) feel unhappy, 30 participants (13.45%) feel distressed, 18 participants (8.07%) feel anxious, 60 participants (20.91%) feel enthusiastic, 5 participants (2.24%) feel alone, 27 participants (1.21%) feel under pressure, 43 participants (19.28%) feel happy, 16 participants (7.17%) feel excited, and 4 participants (1.79%) were in other moods. When the eating speed of the individuals was examined, it was determined that there were 37 participants (12.3%) who eat slowly, 141 participants who eat moderately (46.7%), and 124 participants (41.1%) who eat fast.

Table 4. 5. Information on the Nutritional Habits of Participants

Variables	Categories	Frequence (n)	Percent (%)
Do you have breakfast in the morning?	Every morning	255	84.4
	Sometimes	33	10.9
	Only the weekend	9	3
	Never	5	1.7
Do you consume snacks?	Yes	147	48.7
	No	30	9.9
	Sometimes	125	41.4
Do you skip meals?	Yes	126	41.7
	No	76	25.2
	Sometimes	100	33.1
Which meal do you usually skip?	Morning	11	15.1
	Midnight	14	19.2
	Afternoon	12	16.4
	Afternoon	14	19.2
	Evening	8	11
	Night	14	19.2
If you are skipping meals, what is the reason?	Because I don't want it	11	15.1
	Because I can't find the time	11	15.1
	To lose weight	9	12.3
	Because I didn't think of it	9	12.3
	Because I feel lazy	9	12.3
	Other	24	32.9
How do you find your current weight?	I wish I was weaker	171	56.6
	I am satisfied with my current weight.	115	38.1
	I wish I was heavier.	16	5.3
Have you applied any dietary treatment in the last year?	Yes	142	47
	No	160	53
If your answer is 'Yes', what kind of diet did you follow?	A diet for weight loss	65	21.5
	A diet for weight gain	2	0.7
	A diet for the disease	37	12.3
	A diet for healthy eating	37	12.3
	Other	2	0.6

Please indicate your mood at the time of dieting	Unhappy	20	8.96
	Distressed (Overwhelmed)	30	13.45
	Anxious	18	8.07
	Enthusiastic	60	20.91
	Alone	5	2.24
	Under pressure	27	1.21
	Happy	43	19.28
	Excited	16	7.17
	Other	4	1.79
What is your eating speed?	Slow	37	12.3
	Moderately	141	46.7
	Fast	124	41.1

4.6. Examination of Participants Regarding Quantitative Variables

Table 4.6. includes descriptive statistics for the quantitative variables used in the study. It was determined that the mean age is 30.83∓11, the minimum age is 18, the maximum age is 64, the average height of the participants is 182.02∓6.80, the minimum height is 138 cm, and the maximum height is 205 cm. It was determined that the average weight of the participants is 86.31∓13.26, the minimum weight is 41,7, and the maximum weight is 120. When examining the age at which they were diagnosed with type diabetes, it was found that the mean age is 13.05∓9.09, the minimum age is 0, and the maximum age is 45. When the number of main meals consumed daily is examined, it is seen that the average is 2.69∓0.58, minimum 2, maximum 5, and when daily water consumption is examined, it is seen that the average is 2055∓10.65, minimum 500 ml, maximum 5500 ml.

Table 4.6. Examination of Descriptive Statistics Regarding the Quantitative Variables Used in the Research

Variables	Mean∓SD	Min	Max
Age	30.83∓ 11	18	64
Height length (cm)	182.02 ∓6.80	138	205
Body weight? (kg)	86.31 ∓13.26	41,7	120
At what age were you diagnosed with type 1 diabetes	13.05∓9.09	0	45
How many main meals do you usually consume per day	2.69∓0.58	2	5
How much water do you consume on average per day (ml)	2055∓10.65	500	5500

4.7. Descriptive Statistics on the Scales Used in the Study

When the scales used in the research are examined, the mean score of the FCQ scale is 165.66∓50.21, the minimum score is 29, the maximum score is 234, the skewness value is -0.753, the kurtosis value is 0.343, the mean score of the VAS scale is 5.96∓1.66, the minimum score is 1, the maximum score is 8.23, the skewness value is -0.779, the kurtosis value is 0.301, the mean score of the CSEI scale is 75.16∓15.89, the minimum score is 36, the maximum score is 96, the skewness value is -0.782 and the kurtosis value is -0.365, the mean score of the PFS is 2.55∓0.85, the minimum score is 1, the maximum score was 4.40, the skewness value is 0.137, the kurtosis value is -0.762, the mean score of PEMS is 2.03∓0.62, the minimum score is 1, the maximum score is 3.47, the skewness value is 0.572, and the kurtosis value is -0.038. When the skewness and kurtosis values of the scales are examined, it can be said that all values are in the range of ±1.5, therefore all scales show normal distribution. For this reason, it was decided that parametric tests should be used in comparisons of scale scores.

Table 4.7. Descriptive Statistics on the Scales Used in the Study

Scale	Mean∓SS	Min	Max	Skewness	Kurtosis
FCQ	165.66∓50.21	29	234	-0.753	0.343
VAS	5.96∓1.66	1	8.23	-0.779	0.301
CSEI	75.16∓15.89	36	96	-0.782	-0.365
PFS	2.55∓0.85	1	4.40	0.137	-0.762
PEMS	2.03∓0.62	1	3.47	0.572	-0.038

4.8. Examining the Results of the Reliability Analysis of the Scales

The Cronbach Alpha coefficients obtained as a result of the reliability analysis of the scales are given in table 4.8. Accordingly, the Cronabach Alpha calculated for the FCQ scale is 0.980, that is highly reliable, the Cronbach Alpha for the VAS scale is 0.794, that is highly reliable, the Cronbach Alpha for the CSEI scale is 0.617, that is reliable, the Cronbach Alpha calculated for the PFS is 0.923, that is highly reliable and the Cronbach's Alpha calculated for PEMS is 0.912, that is highly reliable.

Table 4.8. Examining the Results of the Reliability Analysis of the Scales

Scale	Cronbach Alpha
FCQ	0.980
VAS	0.794
CSEI	0.617
PFS	0.923
PEMS	0.912

4.9. The Relationship between Demographic Variables of those with Type 1 Diabetes and those without Diabetes

In table 4.9., Pearson Chi-Square analysis was performed to examine the relationship between the gender variable and some demographic characteristics of individuals with and without type 1 diabetes.

There was no significant relationship between the gender variable and marital status of the participants with type 1 diabetes ($p=0.236>0.05$). There was no significant relationship between the gender variable and marital status of the non-diabetic participants ($p=0.773>0.05$).

There was no significant relationship between the gender variable and the age variable of the participants with type 1 diabetes ($p=0.149>0.05$). There was no significant relationship between the gender variable and age of the non-diabetic participants ($p=0.131>0.05$).

There was no significant relationship between the gender variable of the participants with type 1 diabetes and the variable of educational status ($p=0.999>0.05$). There was no significant relationship between the gender variable and educational status of the non-diabetic participants ($p=0.127>0.05$).

There was no significant relationship between the gender variable of the participants with type 1 diabetes and the variable of working status ($p=0.206>0.05$). There was no significant relationship between the gender variable of the non-diabetic participants and their working status ($p=0.317>0.05$).

There was no significant relationship between the gender variable of the participants with type 1 diabetes and the variable of income status ($p=0.158>0.05$). There was no significant relationship between the gender variable and income status of the non-diabetic participants ($p=0.308>0.05$).

Table 4.9. The Relationship between Demographic Variables of those with Type 1 Diabetes and those without Diabetes

Variables		Type 1 Diabetes (+)				Diabetes (-)			
		Woman		Man		Woman		Man	
		n	%	n	%	n	%	n	%
Marital status	Married	52	76.5	16	23.5	28	66.7	14	33.3
	Single	69	84.1	13	15.9	76	69.1	34	30.9
	Total	121	80.7	29	19.3	104	68.4	48	31.6
	χ^2	1.404				0.083			
	p	0.236				0.773			
Age	18-28	66	86.8	10	13.2	75	73.5	27	26.5
	29-39	36	75	12	25	15	60	10	40
	40 +	19	73.1	7	26.9	14	56	11	44
	Total	121	80.7	29	19.3	104	68.4	48	31.6
	χ^2	4.005				3.924			
	p	0.149				0.131			
Education status	Under bachelor	15	83.3	3	16.7	13	61.9	8	38.1
	Bachelor	89	80.2	22	19.8	63	64.9	34	35.1
	Master and doctorate	17	81	4	19	28	82.4	6	17.6
	Total	121	80.7	29	19.3	104	68.4	48	31.6
	χ^2	0.097				4.126			
	p	0.999				0.127			
Working situation	Not working	50	86.2	8	13.8	48	72.7	18	27.3
	Working	71	77.2	21	22.8	56	65.1	30	34.9
	Total	121	80.7	29	19.3	104	68.4	48	31.6
	χ^2	1.861				1.001			
	p	0.206				0.317			
Describe your family's income situation	Income less than expenses	8	88.9	1	11.1	9	75	3	25
	Income equals expense	36	90	4	10	28	77.8	8	22.2
	Income	77	76.2	24	23.8	67	64.4	37	35.6

	more than expenses								
	Total	121	76.2	29	19.3	104	68.4	48	31.6
	χ^2	3.610				2.337			
	p	0.158				0.308			

4.10. The Relationship between the General Habits of those with Type 1 Diabetes and those without Diabetes

In table 4.10., Pearson Chi-Square analysis was applied to examine the relationship between the gender of individuals diagnosed with type 1 diabetes and those who were not diagnosed with diabetes, and smoking and alcohol use.

It was determined that there was a significant relationship between the gender variable and smoking in those diagnosed with type 1 diabetes ($p=0.038<0.05$). Accordingly, 19.8% of women diagnosed with type 1 diabetes smoke, while 27.6% of men do not smoke.

It was found that there was no significant relationship between the gender variable and smoking in those who were not diagnosed with diabetes ($p>0.05$).

It was found that there was no significant relationship between the gender variable and alcohol use in those diagnosed with type 1 diabetes ($p>0.05$).

It was found that there was no significant relationship between the gender variable and alcohol use in those who were not diagnosed with diabetes ($p>0.05$).

Table 4.10. The Relationship between the General Habits of those with Type 1 Diabetes and those without Diabetes

Variables		Type 1 Diabetes (+)				Diabetes (-)			
		Woman		Man		Woman		Man	
		n	%	n	%	n	%	n	%
Do you smoke?	Yes	24	19.8	8	27.6	16	15.4	23	47.9
	No	88	72.7	15	51.7	83	79.8	22	45.8
	I was using but quit	9	7.4	6	20.7	5	4.8	3	6.3
	Total	121	100	29	100	104	100	48	100
	χ^2	6.077				18.419			
	p	0.038				0.001			
Doyou alcohol?	Yes	45	37.2	14	48.3	46	44.2	24	50
	No	76	62.8	15	51.7	58	55.8	24	50
	Total	121	100	29	100	104	100	48	100
	χ^2	1.205				0.440			
	p	0.272				0.507			

4.11. The Relationship between the Nutritional Habits of those with Type 1 Diabetes and those without Diabetes

In table 4.11., the relationship between men and women who were diagnosed with type 1 diabetes but not diagnosed with diabetes, which meal they skipped, the rate of eating and the amount of daily water consumption were examined by Pearson Chi-Square analysis.

There was no significant relationship between gender and usually skipped meals in those diagnosed with type 1 diabetes ($p>0.05$). There was no significant relationship between gender and skipped meals in patients who were not diagnosed with diabetes ($p>0.05$).

A significant relationship was found between gender and eating speed in those diagnosed with type 1 diabetes (p=0.001<0.05). Accordingly, 51.2% of women stated that they ate at a moderate pace, while 72.4% of men stated that they ate fast.

A significant relationship was found between gender and eating speed in those who were not diagnosed with diabetes (p=0.001<0.05). Accordingly, 57.7% of women stated that they ate at a moderate pace, while 70.8% of men stated that they ate fast.

It was determined that there was a significant relationship between the amount of daily water consumption and gender in those diagnosed with type 1 diabetes (p=0.001<0.05). Accordingly, 83.5% of women consume less than 2 liters of water per day, while 62.1% of men consume less than 2 liters of water per day.

There was no significant relationship between daily water consumption and gender in those who were not diagnosed with diabetes (p>0.05).

Table 4.11. The Relationship between the Nutritional Habits of those with Type 1 Diabetes and those without Diabetes

Variables		Type 1 Diabetes (+)				Diabetes (-)			
		Woman		Man		Woman		Man	
		n	%	n	%	n	%	n	%
Which meal do you usually skip?	Morning	31	25.6	5	17.2	16	34.8	3	25
	Afternoon	84	69.4	23	79.3	26	56.5	9	75
	Evening	6	5	1	3.4	4	8.7	0	0
	Total	121	100	29	100	46	100	12	100
	χ^2 p	0.951 0.571				1.248 0.506			
What is your eating speed?	Slow	18	14.9	0	0	16	15.4	3	6.3
	Middle	62	51.2	8	27.6	60	57.7	11	22.9
	Fast	41	33.9	21	72.4	28	26.9	34	70.8
	Total	121	100	29	100	104	100	48	100
	χ^2 p	15.255 0.001				25.649 0.001			
How much water do you consume on average per day?	Less than 2 ml	101	83.5	18	62.1	83	79.8	35	72.9
	Between 2-3 ml	19	15.7	6	20.7	20	19.2	10	20.8
	More than 3 ml	1	0.8	5	17.2	1	1	3	6.3
	Total	121	100	29	100	104	100	48	100
	χ^2 p	13.269 0.001				3.470 0.186			

4.12. Comparison of Power of Food Scale Scores According to Demographic Information in Patients Diagnosed with Type 1 Diabetes and those not Diagnosed with Diabetes

In table 4.12., the Independent Sample T Test was used to examine whether there was a difference between the mean scores of the two groups according to gender, marital status, employment status, educational status, and income status, and the One Way ANOVA test was used to compare the mean of more than two groups. When comparing the mean of more than two groups, post-hoc multiple comparison test was

applied and Scheffe test was used when variances were homogeneous, and Tamhane's T2 test was used when variances were not homogeneous.

When the gender variable was examined, there was no significant difference between the PFS scores of women and men with type 1 diabetes, but a significant difference was found between the PFS scores of women and men without diabetes ($p=0.015<0.05$). Accordingly, it is seen that the PFS (mean=2.93) score of the women who were not diagnosed with diabetes is higher than the score of the men (mean=2.55).

When the marital status variable was examined, there was no significant difference between the PFS scores of married and single people diagnosed with type 1 diabetes, while a significant difference was found between the PFS scores of married and single people who were not diagnosed with diabetes ($p=0.001<0.05$). Accordingly, it was determined that the PFS score of singles (mean=2.95) was higher than the score of married people (mean=2.44).

When the variable of employment status was examined, it was observed that the PFS scores of those who were diagnosed with type 1 diabetes and those who were not diagnosed with diabetes did not change according to their employment status.

A significant difference was found between the education levels of those diagnosed with type 1 diabetes and the mean PFS score ($p=0.023<0.05$). According to the post hoc comparison made to determine which groups the difference originated from, it was determined that the PFS score of those with under bachelor level (average=2.29) was lower than those with bachelor level (mean=2.87). There was no significant difference between the education levels of those who were not diagnosed with diabetes ($p>0.05$).

When the income status of the families of those who were diagnosed with type 1 diabetes and those who were not diagnosed with diabetes was examined, no significant difference was found in terms of PFS scores ($p>0.05$).

Table 4.12. Comparison of Power of Food Scale Scores According to Demographic Information

Variables		Categories	n	Mean∓ SD	t / F value	p
Gender	Type 1 diabetes +	Woman	121	2.76∓0.79	-1.072	0.285
		Man	29	2.94∓0.96		
	Diabetes -	Woman	104	2.93∓0.89	2.471	0.015
		Man	48	2.55∓0.85		
Marital status	Type 1 diabetes +	Married	68	2.69∓0.95	-1.374	0.172
		Single	82	2.88∓0.71		
	Diabetes -	Married	42	2.44∓0.91	-3.283	0.001
		Single	110	2.95∓0.85		
Working situation	Type 1 diabetes +	Not working	58	2.94∓0.71	1.865	0.064
		Working	92	2.70∓0.88		
	Diabetes -	Not working	66	2.87∓0.87	0.770	0.443
		Working	86	2.76∓0.91		
Your education status	Type 1 diabetes +	Under bachelor	18	2.29∓0.98	3.868	0.023
		Bachelor	111	2.87∓0.78		
		Master and doctorate	21	2.84∓0.80		
	Diabetes -	Bachelor down	21	2.47∓0.95	1.913	0.151
		Bachelor	97	2.84∓0.93		
		Master and doctorate	34	2.94∓0.69		
How would you describe your family's income situation	Type 1 diabetes +	Income less than expenses	9	3.07∓0.89	0.530	0.590
		Income equals expense	40	2.79∓0.87		
		Income more than expenses	101	2.77∓0.81		
	Diabetes -	Income less than expenses	12	3.30∓1.07	0.698	0.499
		Income equals expense	36	2.69∓0.90		
		Income more than expenses	104	2.83∓0.87		

4.13. Examination of the Power of Food Scale Scores of People between with Type 1 Diabetes and those not Diagnosed with Diabetes in terms of Demographic Variables

In table 4.13., the Independent Sample T Test was performed to examine the mean PFS scores of those with and without type 1 diabetes in terms of demographic variables.

When the gender variable was examined, no significant difference was found in terms of the mean PFS scores of men and women with type 1 diabetes and those not diagnosed with diabetes ($p>0.05$).

When the marital status variable was examined, no significant difference was found in terms of the mean PFS scores of married and single individuals with type 1 diabetes and those not diagnosed with diabetes ($p>0.05$).

When the variable of employment status was examined, no significant difference was found in terms of the mean PFS scores of the employees and those who did not work with type 1 diabetes and those not diagnosed with diabetes ($p>0.05$).

When the educational status variable was examined, no significant difference was found in terms of the mean PFS score of those with type 1 diabetes and those not diagnosed with diabetes under bachelor level, bachelor level and master or doctorate level ($p>0.05$).

When the income status variable was examined, no significant difference was found between the income status levels of those with type 1 diabetes and those not diagnosed with diabetes in terms of mean PFS scores ($p>0.05$).

When the age variable was examined, no significant difference was found between the age levels of those with type 1 diabetes and those without diabetes in terms of average PFS scores ($p>0.05$).

Table 4.13. Examination of the Power of Food Scale Scores of People between with Type 1 Diabetes and those not Diagnosed with Diabetes in terms of Demographic Variables

Variables		Categories	n	Mean∓ SD	t value	p
Gender	Woman	Type 1 diabetes +	121	2.76∓0.79	-1.538	0.126
		Diabetes -	104	2.93∓0.89		
	Man	Type 1 diabetes +	29	2.94∓0.96	1.849	0.068
		Diabetes -	48	2.55∓0.85		
Marital status	Married	Type 1 diabetes +	68	2.69∓0.95	1.366	0.175
		Diabetes -	42	2.44∓0.91		
	Single	Type 1 diabetes +	82	2.88∓0.71	-0.633	0.527
		Diabetes -	110	2.95∓0.85		
Working situation	Not working	Type 1 diabetes +	58	2.94∓0.71	0.479	0.633
		Diabetes -	66	2.87∓0.87		
	Working	Type 1 diabetes +	92	2.70∓0.88	-0.472	0.637
		Diabetes -	86	2.76∓0.91		
Your education status	Under bachelor	Type 1 diabetes +	18	2.29∓0.98	-0.576	0.568
		Diabetes -	21	2.47∓0.95		
	Bachelor	Type 1 diabetes +	111	2.87∓0.78	0.218	0.827
		Diabetes -	97	2.84∓0.93		
	Master and doctorate	Type 1 diabetes +	21	2.84∓0.80	-0.486	0.629
		Diabetes -	34	2.94∓0.69		
How would you describe your family's income situation	Income less than expenses	Type 1 diabetes +	9	3.07∓0.89	0.092	0.927
		Diabetes -	12	3.03∓1.07		
	Income equals expense	Type 1 diabetes +	40	2.79∓0.87	0.492	0.624
		Diabetes -	36	2.69∓0.90		
	Income more than expenses	Type 1 diabetes +	101	2.77∓0.81	-0.489	0.625
		Diabetes -	104	2.83∓0.87		
Age	18-28	Type 1 diabetes +	76	2.92∓0.69	-0.598	0.550
		Diabetes -	102	2.99∓0.84		
	29-39	Type 1 diabetes +	48	2.71∓0.87	1.092	0.279

		Diabetes -	25	2.47∓0.97		
	40 +	Type 1 diabetes +	26	2.58∓1.07	0.570	0.571
		Diabetes -	25	2.43∓0.81		

4.14. Comparison of Power of Food Scale Scores According to General Habits in Patients Diagnosed with Type 1 Diabetes and those not Diagnosed with Diabetes

In table 4.14., the One Way ANOVA test was used to compare the mean scores of more than two groups in order to compare the PFS scores according to the general habits of the individuals. In case of significant difference, post-hoc multiple comparison test was performed to determine from which group or groups the difference originated. Scheffe test was applied when homogeneity of variances was provided, and Tamhane's T2 test was applied when homogeneity was not provided.

When smoking status was examined, a significant difference was found between smokers and non-smokers diagnosed with type 1 diabetes in terms of PFS score averages ($p=0.033<0.05$). Accordingly, it can be said that the mean PFS score of non-smokers is higher than that of smokers. There was no significant difference between the smoking status of people who were not diagnosed with diabetes in terms of PFS score averages.

There was no significant difference between the mean PFS scores of people who were diagnosed with type 1 diabetes and those who were not diagnosed with diabetes in terms of alcohol use ($p>0.05$).

Table 4.14. Comparison of Power of Food Scale Scores According to General Habits

Variables		Categories	n	Mean∓ SD	t / F value	p
Do you smoke?	Type 1 diabetes +	Yes	32	2.46∓1.13	3.507	0.033
		No	103	2.87∓0.71		
		I was using but quit	15	2.99∓0.70		
	Diabetes -	Yes	39	2.77∓1.06	0.775	0.463
		No	105	2.85∓0.83		
		I was using but quit	8	2.46∓0.81		
Do you drink alcohol?	Type 1 diabetes +	Yes	59	2.73∓0.91	-0.740	0.460
		No	91	2.83∓0.77		
	Diabetes -	Yes	70	2.93∓0.89	1.487	0.139
		No	82	2.71∓0.89		

4.15. Examination of the Power of Food Scale Scores of People between with Type 1 Diabetes and those not Diagnosed with Diabetes in terms of General Habits

In table 4.15., the Independent Sample T Test was performed to compare the mean PFS scores of those who were diagnosed with type 1 diabetes and those who were not diagnosed with diabetes, according to their smoking and alcohol use status. When $n<30$, the medians of the two groups were compared and the Mann Whitney U test was used.

There was no significant difference in the mean PFS between smokers who were diagnosed with type 1 diabetes and those who were not diagnosed with diabetes ($p>0.05$). There was no significant difference between non-smokers diagnosed with type 1 diabetes and those not diagnosed with diabetes in terms of mean PFS ($p>0.05$).

There was no significant difference in the mean PFS between those who used alcohol and those who were diagnosed with type 1 diabetes and those who were not diagnosed with diabetes ($p>0.05$). There was no significant difference in the mean PFS

between those who did not drink alcohol and those who were diagnosed with type 1 diabetes and those who were not diagnosed with diabetes (p>0.05).

Table 4.15. Examination of the Power of Food Scale Scores of People between with Type 1 Diabetes and those not Diagnosed with Diabetes in terms of General Habits

Variables		Categories	n	Mean∓ SD /Mean rank	t value / MW U	p
Do you smoke?	Yes	Type 1 diabetes +	32	2.46∓1.13	-1.170	0.246
		Diabetes -	39	2.77∓1.06		
	No	Type 1 diabetes +	103	2.87∓0.71	0.137	0.891
		Diabetes -	105	2.85∓0.83		
	I was using but quit	Type 1 diabetes +	15	13.67	35	0.115
		Diabetes -	8	8.88		
Do you drink alcohol?	Yes	Type 1 diabetes +	59	2.73∓0.91	-1.232	0.220
		Diabetes -	70	2.93∓0.89		
	No	Type 1 diabetes +	91	2.83∓0.77	0.965	0.336
		Diabetes -	82	2.71∓0.89		

4.16. Comparison of Power of Food Scale Scores According to Body Mass Index in Patients Diagnosed with Type 1 Diabetes and those not Diagnosed with Diabetes

In table 4.16., the One Way ANOVA test was used to compare the PFS scores of individuals according to their BMI, to compare the averages of more than two groups. In case of significant difference, post-hoc multiple comparison test was performed to determine from which group or groups the difference originated. Scheffe test was applied when homogeneity of variances was provided, and Tamhane's T2 test was applied when homogeneity was not provided.

There was no significant difference between BMI levels of people with type 1 diabetes and non-diabetic people in terms of mean PFS score (p>0.05).

Table 4.16. Comparison of Power of Food Scale Scores According to Body Mass Index

Variables		Categories	n	Mean∓ SD	t / F value	p
BMI	Type 1 diabetes +	Underweight	12	2.64∓0.91	0.833	0.478
		Normal weight	90	2.75∓0.80		
		Overweight	39	2.85∓0.74		
		Obese	9	3.15∓1.29		
	Diabetes -	Underweight	14	2.90∓0.35	1.186	0.317
		Normal weight	93	2.88∓0.90		
		Overweight	35	2.56∓0.97		
		Obese	10	2.87∓0.99		

4.17. Examination of the Power of Food Scale Scores of People between with Type 1 Diabetes and those not Diagnosed with Diabetes in terms of Body Mass Index

In table 4.17., the Independent Sample T Test was performed to examine the mean PFS scores of those with type 1 diabetes and those who were not diagnosed with diabetes in terms of BMI levels. When n<30, the medians of the two groups were compared and the Mann Whitney U test was used.

When the BMI levels were examined, no significant difference was found between the patients who were diagnosed with type 1 diabetes and those who were not diagnosed with diabetes in terms of the mean PFS (p>0.05).

Table 4.17. Examination of the Power of Food Scale Scores of People between with Type 1 Diabetes and those not Diagnosed with Diabetes in terms of Body Mass Index

Variables		Categories	n	Mean∓ SD /Mean rank	t value / MW U	p
BMI	Underweight	Type 1 diabetes +	12	12.42	71.00	0.527
		Diabetes -	14	14.43		
	Normal weight	Type 1 diabetes +	90	2.75∓0.80	-1.150	0.295
		Diabetes -	93	2.88∓0.90		
	Overweight	Type 1 diabetes +	39	2.85∓0.74	1.463	0.148
		Diabetes -	35	2.56∓0.97		
	Obese	Type 1 diabetes +	9	10.67	39.00	0.661
		Diabetes -	10	9.40		

4.18. Comparison of Power of Food Scale Scores According to Nutritional Habits in Patients Diagnosed with Type 1 Diabetes and those not Diagnosed with Diabetes

In table 4.18., the One Way ANOVA test was used to compare the PFS scores of individuals according to their nutritional habits and to compare the averages of more than two groups. In case of significant difference, post-hoc multiple comparison test was performed to determine from which group or groups the difference originated. Scheffe test was applied when homogeneity of variances was provided, and Tamhane's T2 test was applied when homogeneity was not provided.

When people with type 1 diabetes and non-diabetic people generally skipped which meal, no significant difference was found ($p>0.05$).

A significant difference was found between the eating speeds of people without diabetes in terms of the mean PFS score ($p=0.033<0.05$). Accordingly, it was determined that slow eaters' PFS score (mean=2.87) was lower than fast eaters (mean=2.88). There was no significant difference between the eating speeds of those with type 1 diabetes in terms of the mean PFS score.

When the daily water consumption of those with type 1 diabetes and non-diabetic people was examined, no significant difference was found between them in terms of the mean PFS score.

Table 4.18. Comparison of Power of Food Scale Scores According to Nutritional Habits

Variables		Categories	n	Mean∓ SD	t / F value	p
Which meal do you usually skip?	Type 1 diabetes +	Morning	36	2.82∓0.81	2.827	0.062
		Afternoon	107	2.83∓0.83		
		Evening	7	2.07∓0.60		
	Diabetes -	Morning	19	3.10∓0.90	1.055	0.355
		Afternoon	35	2.94∓0.97		
		Evening	4	2.36∓0.47		
What is your eating speed?	Type 1 diabetes +	Slow	18	2.38∓0.53	3.677	0.028
		Middle	70	2.75∓0.73		
		Fast	62	2.96∓0.96		
	Diabetes -	Slow	19	2.87∓1	0.462	0.631
		Middle	71	2.74∓0.86		
		Fast	62	2.88∓0.90		
How much water do you consume on average per day?	Type 1 diabetes +	Less than 2 liters	119	2.76∓0.84	0.544	0.582
		Between 2-3 liters	25	2.95∓0.80		
		More than 3 liters	6	2.76∓0.83		
	Diabetes -	Less than 2 liters	118	2.78∓0.85	0.422	0.657
		Between 2-3 liters	30	2.93∓1.06		
		More than 3 liters	4	3∓0.71		

4.19. Examination of the Power of Food Scale Scores of People between with Type 1 Diabetes and those not Diagnosed with Diabetes in terms of Dietary Habits

In table 4.19., the Independent Sample T Test was performed to examine the PFS scores of those who were diagnosed with type 1 diabetes and those who were not diagnosed with diabetes, according to the nutritional habits of the participants. When $n<30$, the medians of the two groups were compared and the Mann Whitney U test was used.

When examining which meal the participants skipped, no significant difference was found between the PFS averages of those diagnosed with type 1 diabetes and those who were not diagnosed with diabetes who skipped morning, lunch and evening meals. ($p>0.05$). In addition, there was no significant difference between the participants' eating speeds and the amount of water consumed daily in terms of PFS scores ($p>0.05$).

Table 4.19. Examination of the Power of Food Scale Scores of People between with Type 1 Diabetes and those not Diagnosed with Diabetes in terms of Dietary Habits

Variables		Categories	n	Mean∓ SD /Mean rank	t value / MW U	p
Which meal do you usually skip?	Morning	Type 1 diabetes +	36	2.82∓0.81	-1.168	0.248
		Diabetes -	19	3.10∓0.90		
	Afternoon	Type 1 diabetes +	107	2.83∓0.83	-0.621	0.536
		Diabetes -	35	2.94∓0.97		
	Evening	Type 1 diabetes +	7	5.43	10.00	0.527
		Diabetes -	4	7.00		
What is your eating speed?	Slow	Type 1 diabetes +	18	2.38∓0.53	-1.890	0.069
		Diabetes -	19	2.75∓0.73		
	Middle	Type 1 diabetes +	70	2.74∓0.86	0.134	0.893
		Diabetes -	71	2.96∓0.96		
	Fast	Type 1 diabetes +	62	2.96∓0.96	0.481	0.631
		Diabetes -	62	2.88∓0.90		
How much water do you consume on average per day?	Less than 2 liters	Type 1 diabetes +	119	2.76∓0.84	-0.125	0.900
		Diabetes -	118	2.78∓0.85		
	Between 2-3 liters	Type 1 diabetes +	25	2.95∓0.80	0.101	0.920
		Diabetes -	30	2.93∓1.06		
	More than 3 liters	Type 1 diabetes +	6	5.17	10.00	0.762
		Diabetes -	4	6		

4.20. Examination of the Relationship between the Scale Scores of those with Type 1 Diabetes and those not Diagnosed with Diabetes

In table 4.20., Pearson Correlation analysis was performed to examine the relationships between the scale scores of those who were diagnosed with Type 1 diabetes and those who were not diagnosed with diabetes.

When the relationship between FCQ, VAS, CSEI, PFS, and PEMS scores of type 1 diabetics was examined, a moderately significant negative correlation was found

between FCQ and VAS ($p=0.001<0.05$, $r=-0.400$). Accordingly, it can be said that the VAS score will decrease as the FCQ increases in people diagnosed with type 1 diabetes. A positive, significant and weak relationship was found between FCQ and CSEI ($p=0.009<0.05$, $r=0.212$). It can be said that as FCQ increases, CSEI will also increase. A negative, significant and weak correlation was found between FCQ and PFS ($p=0.001<0.05$, $r=-0.365$). In other words, it can be said that as FCQ increases, PFS will decrease. A negative, significant and weak relationship was found between FCQ and PEMS ($p=0.001<0.05$, $r=-0.343$).

There was no significant relationship between VAS score and CSEI score in people diagnosed with type 1 diabetes ($p=0.877>0.05$). A significant, positive and moderate correlation was found between VAS and PFS scores. Accordingly, it can be said that as VAS score increases, PFS will also increase. A negative, significant, and weak correlation was found between VAS and PEMS ($p=0.001<0.05$, $r=0.351$). In other words, it can be said that as the VAS increases, PEMS will decrease.

There was no significant correlation between CSEI score and PFS in patients diagnosed with type 1 diabetes ($p=0.077>0.05$). There was no significant relationship between CSEI and PEMS ($p=0.724>0.05$).

It was found that there was a significant, positive and moderate relationship between PFS score and PEMS in type 1 diabetics ($p=0.001<0.05$, $r=0.541$). In other words, it can be said that as PFS increases, PEMS will increase.

When the relationship between FCQ, VAS, CSEI, PFS and PEMS scores of those who were not diagnosed with diabetes were examined, it was observed that there was a weak and significant negative correlation between FCQ and VAS ($p=0.001<0.05$, $r=-0.261$). It can be said that VAS will decrease as FCQ increases. A positive, significant and weak relationship was found between FCQ and CSEI ($p=0.001<0.05$, $r=0.280$). It can be said that as FCQ increases, CSEI will also increase. A negative, significant and weak correlation was found between FCQ and PFS ($p=0.001<0.05$, $r=-0.384$). In other words, it can be said that as FCQ increases, PFS will decrease. A negative, significant and weak correlation was found between FCQ and PEMS ($p=0.001<0.05$, $r=-0.269$). According to this, it can be said that as FCQ increases, PEMS will decrease.

There was a negative, significant and very weak relationship between the VAS score and the CSEI score of people who were not diagnosed with diabetes ($p=0.001<0.05$, $r=-0.261$). Accordingly, it can be said that as the VAS score increases, the CSEI score will decrease. A weak, significant and positive correlation was found between VAS score and PFS score ($p=0.001<0.05$, $r=0.327$). There was no significant correlation between VAS score and PEMS scores ($p=0.194>0.05$).

A negative, weak and significant relationship was found between CSEI score and PFS ($p=0.001<0.05$, $r=-0.358$). Accordingly, it can be said that as the CSEI increases, the PFS score will decrease. It was determined that there was a significant, negative and weak correlation between CSEI and PEMS ($p=0.001<0.05$, $r=-0.307$). In other words, it can be said that as CSEI increases, PEMS will decrease.

A moderately significant positive correlation was found between PFS and PEMS ($p=0.001<0.05$, $r=0.478$). Accordingly, it can be said that as PFS increases, PEMS will also increase.

Table 4.20. Examination of the Relationship Between the Scale Scores

	Variables		FCQ	VAS	CSEI	PFS	PEMS
Type 1 diabetes +	FCQ	r p	1	-0.400* 0.001	0.212* 0.009	-0.365* 0.001	-0.343* 0.001
	VAS	r p		1	-0.013 0.877	0.443* 0.001	0.351* 0.001
	CSEI	r p			1	-0.145 0.077	-0.029 0.724
	PFS	r p				1	0.541* 0.001
	PEMS	r p					1
Diabetes -	FCQ	r p	1	-0.368* 0.001	0.280* 0.001	-0.384* 0.001	-0.269* 0.001
	VAS	r p		1	-0.261* 0.001	0.327* 0.001	0.106 0.194
	CSEI	r p			1	-0.358* 0.001	-0.307* 0.001
	PFS	r p				1	0.478* 0.001
	PEMS	r p					1

4.21. Comparison of those Diagnosed with Type 1 Diabetes and those not Diagnosed with Diabetes in terms of Scale Scores

In table 4.21., the Independent Sample T Test was performed to compare the scale scores of those diagnosed with type 1 diabetes and those who were not diagnosed with diabetes.

There was no significant difference between the FCQ scores of those who were diagnosed with type 1 diabetes and those who were not diagnosed with diabetes ($p=0.857>0.05$).

A significant difference was found between those who were diagnosed with type 1 diabetes and those who were not diagnosed with diabetes in terms of VAS scores. ($p=0.026<0.05$). Accordingly, it can be said that the mean score of those not diagnosed with type 1 diabetes (mean=5.57) is higher than those diagnosed with type 1 diabetes (mean=5.18).

There was no significant difference between those diagnosed with type 1 diabetes and those who were not diagnosed with diabetes in terms of CSEI scores ($p=0.950>0.05$).

A significant difference was found between those who were diagnosed with type 1 diabetes and those who were not diagnosed with diabetes in terms of PEMS scores. ($p=0.019<0.05$). Accordingly, it can be said that the mean score of those who were not diagnosed with diabetes (mean=2.14) was higher than those who were diagnosed with type 1 diabetes (mean=1.97).

There was no significant difference between those who were diagnosed with type 1 diabetes and those who were not diagnosed with type 1 diabetes in terms of PFS scores ($p=0.860>0.05$).

Table 4.21. Comparison of those Diagnosed with Type 1 Diabetes and those not Diagnosed with Diabetes in terms of Scale Scores

Variables	Categories	n	Mean∓ SD	t value	p
FCQ	Type 1 diabetes +	150	164.78∓47.72	-0.180	0.857
	Diabetes -	152	165.74∓45.24		
VAS	Type 1 diabetes +	150	5.18∓1.47	-2.235	0.026
	Diabetes -	152	5.57∓1.54		
CSEI	Type 1 diabetes +	150	38.83∓3.14	0.060	0.950
	Diabetes -	152	38.80∓3.54		
PEMS	Type 1 diabetes +	150	1.97∓0.57	-2.354	0.019
	Diabetes -	152	2.14∓0.70		
PFS	Type 1 diabetes +	150	2.79∓0.83	-0.176	0.860
	Diabetes -	152	2.81∓0.89		

5. DISCUSSION

Changes in the food environment have created an obesogenic environment with easily accessible large portions, high-calorie and very tasty food options. Such foods can be highly rewarding and attractive even when there is no physiological need for energy intake (151). The state of frequent exposure to tasty foods, resulting in a strong and persistent urge to consume these foods, is called "hedonic hunger." (134). It influences when and in what quantities we consume food and directs food intake through rewarding, emotional and cognitive impulses rather than feeling hungry (152). Almost most individuals consume food when they are not physiologically hungry (for example, consuming sweets after eating), but some individuals experience more preoccupation with delicious foods, called hedonic hunger (153). These consumed foods have high salt, sugar, and fat content and the constant and frequent consumption of such foods leads to an increase in obesity and obesity-related diseases (154). In addition to obesity, it leads to an increase in diabetes and diabetes-related complications.

The food environment is highly effective on hedonic-directed appetite activities. It is thought that many factors such as individual differences (age, gender, etc.), reward value of foods, excessive food cravings, self-esteem and motivation to consume delicious foods may be effective on hedonic hunger. Hedonic mechanisms interact with homeostatic mechanisms to make adjustments taking into account body weight and environmental conditions (155). This new conceptual framework has a significant impact in terms of revealing the factors that may affect the orientation of individuals to food intake without physiological need in environments where delicious foods are widely available, and providing a new perspective in diabetes treatment.

A total of 302 adults, 74.5% female and 25.5% male, participated in this study. While 150 of the 302 people participating in the study have type 1 diabetes, 152 are adults without diabetes. When the mean PFS scores of women with type 1 diabetes and women without diabetes were examined, no significant difference was found ($p>0.05$). Likewise, no significant difference was found between the mean PFS scores of men with type 1 diabetes and men without diabetes ($p>0.05$). On the other hand, while there was no significant difference between the PFS scores of men and women with type 1

diabetes, there was a significant difference between the PFS scores of men and women without diabetes ($p<0.05$). Accordingly, it is seen that the PFS (mean=2.93) score of women without diabetes is higher than the score of men (mean=2.55). In a study, individual differences in sensitivity to food cues and daily snack consumption were examined and it was found that women's PFS scores were higher than men, but this difference between them was small and not statistically significant (156). In a study by Lowe et al., no difference was found between the PFS scores of male and female individuals in 466 university students aged 18-42, 86% of whom were female (157). The reason why there was no significant difference was attributed to the fact that the number of female individuals was higher than male individuals (157). In the study examining the gender differences in motivation to consume homeostatically and hedonically delicious foods, it is stated that female rats exhibit a motivation to consume delicious foods with high sugar and fat content compared to males, that is, hedonic hunger for consuming delicious foods is higher in female rats (156).

In this study, 72 type 1 diabetic and 102 non-diabetic people with a mean age of 18-28 years, 48 people with type 1 diabetes and 25 non-diabetic people with a mean age of 29-39, 26 people with type 1 diabetes and 25 non-diabetic people with a mean age of 40-64 were included in this study. When the hedonic hunger statusof individuals in the 18-28 age group, 29-39 age group and 40-64 age group is examined; no significant difference was found. However, the mean PFS score of those with type 1 diabetes, which is also seen in the 3 age category, was higher than those without diabetes for all 3 categories, but no significant difference was found ($p>0.05$). On the other hand, PFS scores decreased with increasing age in patients with and without type 1 diabetes. In a study, 315 adults with a mean age of 37.95±12.30 years participated (158). When the hedonic hunger status of individuals in the 18-27 age group, 28- 38 age group, 39-48 age group and ≥49 age group is examined; the PFS scale total score is gradually decreasing (158). Studies have shown that there is a decrease in the sense of taste with aging, and when the taste perceptions of individuals are evaluated, women and men in the 20-30 age group are more sensitive than men and women in the 30-40 age group (1). It can be thought that hedonic hunger will decrease due to the decrease in the sense of taste with aging.

Living in an "obesogenic" environment, where we are constantly surrounded by delicious foods, poses a serious challenge in terms of weight control. The stimuli for

high-calorie foods are stronger in overweight and restricted (chronic dieters) individuals who have overnutrition and/or difficulty in controlling their weight (159). It has been determined that the pleasure obtained from consuming delicious foods continues to motivate food consumption even in the absence of physiological hunger (160).

Individual susceptibility to weight gain may be affected by food reward sensitivity, neurological response to the rewarding properties of food stimuli, and increased motivation to eat in the absence of metabolic need. Food reward sensitivity can lead to overeating behavior in an environment where foods are readily available and may increase weight gain and deliberate weight loss behaviors. In a study on individuals in the transition period from adolescence to young adulthood; It has been observed that individuals who follow a weight loss diet more frequently and who find themselves overweight have higher PFS scores. This shows that the PFS scale is more sensitive for individuals to overestimate their own weight and deliberate weight loss behaviors (161). However, when the BMI levels of the participants in this study were examined, no significant difference was found between those with type 1 diabetes and those without diabetes in terms of the mean PFS ($p>0.05$).

When we look at the general habits of the participants, no significant difference was found in terms of PFS averages between smokers with type 1 diabetes and those without diabetes ($p>0.05$). There was no significant difference in the mean PFS of non-smokers with and without type 1 diabetes ($p>0.05$). There was no significant difference in the mean PFS of alcohol users with type 1 diabetes and those without diabetes ($p>0.05$). There was no significant difference in the mean PFS between non- alcoholic type 1 diabetics and non-diabetics. On the other hand, a significant difference was found between smokers and non-smokers diagnosed with type 1 diabetes in terms of PFS score averages ($p=0.033<0.05$). Accordingly, it can be said that the mean PFS score of non-smokers with type 1 diabetes is higher than that of smokers with type 1 diabetes. There was no significant difference between the smoking status of people without diabetes in terms of PFS score averages. There was no significant difference between the mean PFS scores of people with and without type 1 diabetes in terms of alcohol use ($p>0.05$).

When the nutritional habits of the participants were examined, there was no significant difference between the meals skipped, the speed of eating, the amount of

water they consumed daily and the PFS averages of type 1 diabetics and non-diabetics ($p>0.05$). Also, when the type 1 diabetes and non-diabetic people generally skipped which meal, no significant difference was found ($p>0.05$). However, a significant difference was found between the eating speeds of people without diabetes in terms of the mean PFS score ($p=0.033<0.05$). Accordingly, slow eaters' PFS score (mean=2.87) was found to be lower than fast eaters (mean=2.88). There was no significant difference between the eating speeds of those with type 1 diabetes in terms of the mean PFS score.

Food craving is defined as an intense desire to consume a particular food, created by emotional and environmental triggers that affect food intake. The Food Craving Questionnaire is used to evaluate the hedonic food intake of individuals (162). There was no significant difference between the FCQ scores of those with and without type 1 diabetes ($p=0.857>0.05$). When the relationship between FCQ, VAS, CSEI, PFS and PEMS scores of those with type 1 diabetes were examined, a moderately significant negative correlation was found between FCQ and VAS ($p=0.001<0.05$, $r=-0.400$). Accordingly, it can be said that VAS scores will decrease as FCQ increases in people with type 1 diabetes. A positive, significant and weak relationship was found between FCQ and CSEI ($p=0.009<0.05$, $r=0.212$). It can be said that as FCQ increases, CSEI will also increase. In other words, it was observed that those with type 1 diabetes who participated in the study had higher self-esteem and higher food cravings. A negative, significant and weak correlation was found between FCQ and PFS ($p=0.001<0.05$, $r=-0.365$). In other words, it can be said that as FCQ increases, PFS will decrease. A negative, significant and weak relationship was found between FCQ and PEMS ($p=0.001<0.05$, $r=-0.343$). On the other hand, when the relationship between FCQ, VAS, CSEI, PFS, and PEMS scores of non-diabetics was examined, it was observed that there was a weak and significant negative correlation between FCQ and VAS ($p=0.001<0.05$, $r=-0.261$). It can be said that VAS will decrease as FCQ increases. A positive, significant and weak relationship was found between FCQ and CSEI ($p=0.001<0.05$, $r=0.280$). It can be said that as FCQ increases, CSEI will also increase. In other words, those with higher self-esteem were also found to have higher food cravings in non-diabetic participants. A negative, significant and weak correlation was found between FCQ and PFS ($p=0.001<0.05$, $r=-0.384$). In other words, it can be said that as FCQ increases, PFS will decrease. A negative, significant and weak correlation was found between FCQ and PEMS ($p=0.001<0.05$, $r=-0.269$). According to this, it can be said that as FCQ increases, PEMS will decrease. In a study conducted with a total of

315 adults, 158 women and 157 men, in 2019, it was seen that hedonic hunger increased as the total score of the FCQ increased, and all of these relationships were found to be statistically significant (164). Among the reasons why there was no positive relationship between FCQ and PFS in this study, it may be due to the lack of homogeneous participation of both men and women in patients with type 1 diabetes and without diabetes.

A significant difference was found between the patients with and without type 1 diabetes in terms of VAS scores. ($p=0.026<0.05$). Accordingly, it can be said that the mean score of those with type 1 diabetes (mean=5.18) is lower than those without diabetes (mean=5.57). In other words, when we look at the participants in the study, it was seen that non-diabetic people were more interested in foods rich in carbohydrates and fats such as hamburgers, pasta, chips and chocolate compared to those with type 1 diabetes. However, there is no distinction between type 1 diabetics participating in the study whether they know carbohydrate counting or not. It is observed that when people with type 1 diabetes interviewed at my institution start counting carbohydrates and learn how to keep their blood sugar under control when they consume such foods, which are rich in carbohydrates and fat, from prohibitions, their interest in such foods decreases over time. There was no significant relationship between VAS score and CSEI score in people who are type 1 diabetes ($p=0.877>0.05$). A significant, positive and moderate correlation was found between VAS and PFS scores. Accordingly, it can be said that as VAS score increases, PFS will also increase. In other words, when we look at the type 1 diabetics who participated in the study, it was seen that those who were more interested in foods rich in carbohydrates and fats such as hamburger, pasta, chips had higher hedonic hunger scores. A negative, significant, and weak correlation was found between VAS and PEMS ($p=0.001<0.05$, $r=0.351$). In otherwords, it can be said that as the VAS increases, PEMS will decrease. On the other hand, there was a negative, significant and very weak relationship between the VAS score and the CSEI score of people without diabetes ($p=0.001<0.05$, $r=-0.261$). Accordingly, it can be said that as the VAS score increases, the CSEI score will decrease. A weak, significant and positive correlation was found between VAS score and PFS score ($p=0.001<0.05$, $r=0.327$). There was no negative, weak and significant relationship between VAS score and PEMS scores ($p=0.194>0.05$).

Self respect; it is called a mental, social and partly physical phenomenon that starts to develop from birth, continues its development until adulthood, and is affected

by environmental factors in adulthood and later periods (163). There was no significant difference between the CSEI scores of those with type 1 diabetes and those without diabetes ($p=0.950>0.05$). There was no significant correlation between CSEI score and PFS in patients with type 1 diabetes ($p=0.077>0.05$). There was no significant relationship between CSEI and PEMS ($p=0.724>0.05$). On the other hand, a negative, weak and significant relationship was found between CSEI score and PFS in people without diabetes ($p=0.001<0.05$, $r=-0.358$). Accordingly, it can be said that as the CSEI increases, the PFS score will decrease. It was determined that there was a significant, negative and weak correlation between CSEI and PEMS ($p=0.001<0.05$, $r=-0.307$). In other words, it can be said that as CSEI increases, PEMS will decrease. In study conducted with college-university students in Turkey, no gender difference was found in the level of self-esteem scores (164). In study, it has been determined that low self-esteem is found in women, obese and morbidly obese individuals, and individuals with low education level, and low self-esteem decreases as age increases (165). In a study conducted with adults, it is seen that hedonic hunger increases as the CSEI score increases ($r=0.060$). However, this relationship between them was not found to be statistically significant ($p=0.291$) (164).

A significant difference was found between those with type 1 diabetes and those without diabetes in terms of their PEMS scores. ($p=0.019<0.05$). Accordingly, it can be said that the mean score of those without diabetes (mean=2.14) is higher than those with type 1 diabetes (mean=1.97). In other words, when we look at the PEMS scale, the mean score of the non-diabetic people was found to be higher than the type 1 diabetes group, just like the VAS scale result. This may be due to the fact that most of the type 1 diabetics who participated in the study knew how to count carbohydrates. When the patients with type 1 diabetes were examined, it was found that there was a significant, positive and moderate relationship between the PFS score and the PEMS ($p=0.001<0.05$, $r=0.541$). In other words, it can be said that as PFS increases, PEMS will increase. On the other hand, when non-diabetic subjects were examined, a moderately significant positive correlation was found between PFS and PEMS ($p=0.001<0.05$, $r=0.478$). Accordingly, it can be said that as PFS increases, PEMS will also increase. In the study carried out in order to provide the Turkish adaptation of the PFS and PEMS scales and to determine the hedonic hunger status of 363 university students by these scales and to reveal the effect of the factors affecting the hedonic hunger drive, a strong positive correlation was observed between the total scores

obtained from the PFS and PEMS scales (134).

There are no studies in the literature on hedonic hunger in type 1 diabetes patients. In this sense, this study is the first study on hedonic hunger in type 1 diabetes patients. As a result of the study, no significant difference was found between adult individuals with type 1 diabetes and non-diabetes, regardless of the individual's daily food consumption, in terms of PFS scores, which are the measure of individual differences in thoughts, feelings and motivations related to food control and appetite in environments with delicious foods. Although 150 of the participants in this study were adults with type 1 diabetes and 152 without diabetes, 121 of the 150 people with type 1 diabetes were women and 29 were men, and of the 152 people without diabetes, 104 were women and 48 were men. The inequality in the number of women and men may have affected the result. In addition, blood glucose measurements were not performed on 152 people who did not have diabetes, that is, they were not diagnosed with diabetes. There is a large group of people with diabetes who are unaware of it.

6. CONCLUSION

As a result, food intake in the modern world is not only related to the need for energy and nutrients, but also to the easy availability of energy-dense foods in every environment, depending on the presence of environmental nutritional cues. Although many people have experienced hedonic hunger, some individuals are much more sensitive to environmental food cues. In this study, it was revealed that the factors that cause differences in sensitivity, individual differences such as age and gender, excessive food cravings, motivation to consume delicious foods and psychological factors such as self-esteem affect food intake motivations and hedonic hunger. Determining the factors that cause hedonic hunger will contribute to more accurate guidance in the nutrition programs to be planned for individuals and to improve the nutritional habits of individuals. The fact that an environment full of extremely delicious foods paves the way for the formation of hedonic hunger with the cultural norms that make these foods "psychologically accessible" triggers the increase in the epidemic of mild obesity and obesity, creates obstacles in the practices related to body weight control for the treatment of obesity, reduces the success of the treatment, and contributes to the formation of diabetes and diabetes-related complications. For this reason, it is important to determine the factors affecting hedonic hunger. More studies are needed on this subject.

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8. APPENDIXES

8.1. Appendix 1 (Informed Consent Form)

BİLGİLENDİRİLMİŞ GÖNÜLLÜ OLUR FORMU (BGOF)

ÇALIŞMANIN ADI: Tip 1 Diyabetli ve Diyabetli Olmayan Erişkin Bireylerin Hedonik Açlık Durumlarının İncelenmesi ve Karşılaştırılması

Aşağıda bilgileri yer almakta olan bir araştırma çalışmasına katılmanız istenmektedir. Çalışmaya katılıp katılmama kararı tamamen size aittir. Katılmak isteyip istemediğinize karar vermeden önce araştırmanın neden yapıldığını, bilgilerinizin nasıl kullanılacağını, çalışmanın neleri içerdiğini, olası yararları ve risklerini ya da rahatsızlık verebilecek yönlerini anlamanız önemlidir. Lütfen aşağıdaki bilgileri dikkatlice okumak için zaman ayırınız. Eğer çalışmaya katılma kararı verirseniz, Çalışmaya Katılma Onayı Formu'nu imzalayınız. Çalışmadan herhangi bir zamanda ayrılmakta özgürsünüz. Çalışmaya katıldığınız için size herhangi bir ödeme yapılmayacak ya da sizden herhangi bir maddi katkı/malzeme katkısı istenmeyecektir.

ÇALIŞMANIN KONUSU VE AMACI: Tip 1 diyabetli ve diyabetli olmayan erişkin bireylerin hedonik açlık durumları arasında fark olup olmadığı bize bazı besinlerin yasaklanması insanları nasıl etkiliyor, uyum sağlayabiliyorlar mı yoksa o besine karşı daha mı fazla istekli oluyorlar bunu gösterecek. Aynı zamanda haz durumları ile benlik saygısı, lezzetli besinleri tüketme motivasyonu ve aşırı besin istekleri arasındaki ilişkiyi de bize gösterecek. Böylelikle diyabetli olmayan ve tip 1 diyabetli yetişkinlerin hedonik açlıkları arasında fark var mı, varsa bu fark neyden kaynaklı bununla ilgili çıkarımda bulunabileceğiz.

ÇALIŞMA İŞLEMLERİ: Yapılacak bu araştırmada, öncelikle çalışmaya katılımın gönüllülük esasıyla gerçekleşecek olduğu bilgisi verilecektir. Araştırma yöntemi anket

çalışmasından oluşmaktadır. Katılımcılara Genel Bilgi ve Beslenme Alışkanlıkları Formu, Besin Gücü Ölçeği, Aşırı Besin İsteği Ölçeği, Görsel Analog Skalası, Coopersmith Benlik Saygısı Envanteri ve Lezzetli Besinleri Tüketme Motivasyonu Ölçeği uygulanacaktır. Daha sonra veri toplama araçlarından elde edilen verilerin analiz işlemleri gerçekleştirilecektir.

ÇALIŞMAYA KATILMAMIN OLASI YARARLARI NELERDİR?

Bu çalışmaya katılmış olan bireyler, tip 1 diyabetli ve diyabetli olmayan erişkin bireylerin hedonik açlık durumlarının karşılaştırılmasına destek vermiş olacaklardır. Katılımcılara araştırmanın sonucu ile ilgiler bilgiler verilip, kendileri hakkında düşünme şansına sahip olacaklardır. Katılımcılara istedikleri takdirde araştırma sonuçlarına ulaşabilecekleri fakat uyguladıkları form ve ölçeklerle ilgili bireysel geri bildirim verilmeyeceği iletilecektir.

KİŞİSEL BİLGİLERİM NASIL KULLANILACAK?

Çalışmaya katılım gönüllülük esasına dayanmaktadır. Bu çalışmada kişisel bilgileriniz kesinlikle bir başka kişi ya da kurumlarla paylaşılmayacak ve araştırma sınırları içerisinde tutulacaktır. Ayrıca dolduracağınız ölçeklerde genel bilgi formunun doldurulması gerekmektedir. Yaş, cinsiyet gibi bilgilerin dışında belirtmeniz gereken kişisel bir bilgi veya isim vermenize de gerek yoktur.

SORU VE PROBLEMLER İÇİN BAŞVURULACAK KİŞİLER :

1. Dilan DİLEK

GSM: 0534 442 11 24

E-mail: dytdilandilek@gmail.com

Çalışmaya Katılma Onayı

Yukarıdaki bilgileri ilgili araştırmacı ile ayrıntılı olarak tartıştım ve kendisi bütün sorularımı cevapladı. Bu bilgilendirilmiş olur belgesini okudum ve anladım. Bu araştırmaya katılmayı

kabul ediyor ve bu onay belgesini kendi hür irademle imzalıyorum. Bu onay, ilgili hiçbir kanun ve yönetmeliği geçersiz kılmaz. Araştırmacı, saklamam için bu belgenin bir kopyasını çalışma sırasında dikkat edeceğim noktaları da içerecek şekilde bana teslim etmiştir.

Gönüllü Adı Soyadı:

Tarih ve İmza:

Telefon:

8.2. Appendix 2 (Scales)

I. GENEL BİLGİLER

1. Cinsiyetiniz?

- Erkek
- Kadın

2. Yaşınız? ……

3. Boy uzunluğu? (cm) ……

4. Vücut ağırlığı? (kg) ……

5. Medeni durumunuz?

- Evli
- Bekar

6. Kiminle yaşıyorsunuz?

- Yalnız
- Aile ile birlikte
- Ev arkadaşı ile

7. Eğitim durumunuz?

- Okur-yazar değil
- Okur-yazar
- İlkokul
- Ortaokul
- Lise
- Lisans
- Yüksek Lisans
- Doktora

8. Çalışma durumunuz?

- İşsiz
- Öğrenci
- Özel Kurum
- Kamu Kurumu
- Emekli
- Diğer

9. Sigara kullanıyor musunuz?

- Evet
- Hayır
- Kullanıyordum ama bıraktım

10. Alkol kullanıyor musunuz? (Cevabınız ‘Hayır’ ise bir sonraki soruyu boş bırakın.)

- Evet
- Hayır

11. Ne sıklıkla alkol tüketirsiniz?

- Sosyal içiciyim (nadiren)
- Her gün
- Her hafta
- 15 günde 1
- Ayda 1

12. Tip 1 diyabet tanısı aldınız mı? (Cevabınız 'Hayır' ise sonraki 2 soruyu cevaplamayın.)

- Evet
- Hayır

13. Tip 1 diyabet tanınızı kaç yıl önce aldınız? ……

14. Tip 1 diyabet tanınızı kaç yaşında aldınız? ……

15. Tip 1 diyabet tanınız varsa başka bir kronik hastalık tanınız var mı? Tip 1 diyabetli değilseniz herhangi bir kronik hastalık tanınız var mı?

- Evet (Cevabınız 'Evet' ise 'Diğer' kısmını seçip tanınızı yazınız.)
- Hayır
- Diğer ……

16. Ailenizin gelir durumunu nasıl tanımlarsınız? (Eve giren toplam aylık gelir)

- Gelir giderden az
- Gelir gidere eşit
- Gelir giderden fazla

II. BESLENME ALIŞKANLIKLARI

17. Genellikle günde kaç ana öğün tüketirsiniz? ……

18. Sabahları kahvaltı yapar mısınız?

- Her sabah
- Arada sırada
- Sadece hafta sonu
- Hiçbir zaman

19. Ara öğün tüketir misiniz?

- Evet
- Hayır
- Bazen

20. Öğün atlar mısınız? (Cevabınız 'Hayır' ise sonraki soruyu cevaplamayın.)

- Evet
- Hayır
- Bazen

21. Genellikle hangi öğünü atlarsınız? (Birden fazla seçeneği işaretleyebilirsiniz.)

- Sabah
- Kuşluk
- Öğlen
- İkindi
- Akşam
- Gece

22. Öğün atlıyorsanız sebebi nedir? (Birden fazla seçeneği işaretleyebilirsiniz.)

- Canım istemediği için
- Zaman bulamadığım için
- Zayıflamak için
- Aklıma gelmediği için
- Üşendiğim için
- Diğer ……

23. Şimdiki kilonuzu nasıl buluyorsunuz?

- Daha zayıf olmayı isterdim.
- Şimdiki kilomdan memnunum.
- Daha kilolu olmayı isterdim.

24. Son bir yıl içerisinde herhangi bir diyet tedavisi uyguladınız mı? (Cevabınız 'Hayır' ise sonraki 2 soruyu boş bırakın.)

- Evet
- Hayır

25. Yanıtınız 'Evet' ise ne tür bir diyet uyguladınız?

- Kilo vermeye yönelik bir diyet
- Kilo almaya yönelik bir diyet
- Hastalığa yönelik bir diyet
- Sağlıklı beslenmeye yönelik bir diyet
- Diğer ……

26. Diyet uyguladığınız dönemdeki ruh halinizi belirtiniz. (Birden fazla seçenek işaretleyebilirsiniz.)

- Mutsuz
- Sıkıntılı (Bunalmış)
- Kaygılı
- Hevesli
- Yalnız

- Baskı altında
- Mutlu
- Heyecanlı
- Diğer ……

27. Yemek yeme hızınız nasıldır?

- Çok yavaş
- Yavaş
- Orta
- Hızlı
- Çok hızlı

28. Günlük ortalama ne kadar su tüketiyorsunuz? (ml) ……

III. BESİN GÜCÜ ÖLÇEĞİ

Aşağıdaki cümlelerden her birini okuduktan sonra, ne ölçüde katıldığınızı/katılmadığınızı gösteren sütundaki kutucuğu işaretleyiniz.

	Kesinlikle katılmıyorum	Katılmıyorum	Fikrim yok	Katılıyorum	Kesinlikle katılıyorum
Fiziksel olarak aç olmadığım zamanlarda bile kendimi yiyecek düşünürken buluyorum					
Yemek yemek, başka bir şey yapmaktan daha çok zevk veriyor					
Sevdiğim bir yemeği gördüğüm ya da kokusunu aldığım zaman, biraz yemek için güçlü bir dürtü hissederim.					
Bulunduğum ortamda sevdiğim yağlı/şişmanlatıcı yiyecekler varsa, kendimi tatlarına bakmak için durdurmakta					

zorlanıyorum.					
Besinlerin üzerimdeki gücünü düşünmek oldukça korkutucu.					
Lezzetli bir yemeğin hazırda var olduğunu bildiğimde, onu yeme konusunda kendime engel olamıyorum.					
Bazı besinlerin tadını o kadar çok seviyorum ki, benim için zararlı olduklarını bilsem bile onları yemeyi bırakamıyorum.					
Çok sevdiğim bir besini tatmadan önce, o besinle ilgili yoğun bir beklenti içerisine giriyorum.					
Lezzetli bir yemek yediğimde, tadının ne kadar iyi olduğuna çok odaklanıyorum.					
Bazı zamanlarda, günlük aktiviteler yaparken, 'aniden' yemek yeme isteği duyuyorum (belirgin bir sebep yok iken).					
Diğer insanlara göre yemek yemekten daha fazla zevk aldığımı düşünüyorum.					
Biri bana çok güzel bir yemeği tarif ettiğinde, bir şeyler yeme isteği					

duyuyorum.					
Aklımın sürekli yemekle meşgul olduğunu düşünüyorum.					
Yediğim besinlerin mümkün olduğunca lezzetli olması benim için çok önemlidir.					
Çok sevdiğim bir besini yemeden önce, ağzımın sulandığını hissediyorum.					

IV. AŞIRI BESİN İSTEĞİ ÖLÇEĞİ

Aşağıdaki cümlelerden her birini okuduktan sonra, ne kadar sıklıkla olduğunu gösteren sütundaki kutucuğu işaretleyiniz.

	Her zaman	Çoğunlukla	Sık sık	Ara sıra	Nadiren	Hiçbir zaman
Çok sık yemek yiyen birinin yanında olmak beni acıktırır.						
Bir besine aşırı istek duyduğumda, bir kez yemeye başlayınca kendimi durduramayacağımı biliyorum.						
Eğer aşırı istediğim bir şeyi yersem, sıklıkla kontrolümü kaybederim ve çok yerim.						
Aşırı besin isteğine teslim olduğum zaman bundan nefret ederim.						
Aşırı besin isteği bende sürekli istediğim besini elde etmenin yollarını düşündürür.						
Her zaman aklımda yiyecekler varmış gibi hissediyorum.						
Bazı yiyeceklere karşı aşırı istek duyduğumda kendimi sıklıkla suçlu hissederim.						

Kendimi sürekli yiyecekleri düşünürken bulurum.						
Kendimi daha iyi hissetmek için yerim.						
Bazen yemek yemek bazı şeylerin mükemmel görünmesini sağlar.						
Sevdiğim yiyecekleri düşünmek ağzımı sulandırır.						
Midem boş olduğu zaman besinlere karşı aşırı istek duyarım.						
Vücudumun bazı besinleri istediği düşüncesine kapılırım.						
Öyle açlık hissederim ki, midem bana dipsiz bir kuyu gibi görünür.						
Aşırı derecede istediğim bir yiyeceği yemek beni daha iyi hissettirir.						
Aşırı istediğim yiyecekleri yediğimde, kendimi daha az depresif hissederim.						
Aşırı istediğim bir yiyeceği yediğim zaman suçluluk hissederim.						
Bir besini aşırı istediğim zaman, kendimi onu yemek için plan yaparken bulurum.						
Yemek beni sakinleştirir.						
Sıkıldığım, sinirlendiğim ya da üzgün olduğum zaman, besinlere aşırı istek duyarım.						
Yemek yedikten sonra kendimi daha az kaygılı hissederim.						
Eğer aşırı istek duyduğum besini elde edersem, onu yemekten kendimi alamam.						
Bazı yiyeceklere aşırı istek duyduğumda, olabildiğince çabuk onları yemeye çalışırım.						
Aşırı istek duyduğum besini yediğim zaman, kendimi çok iyi hissederim.						
Aşırı besin isteğime karşı						

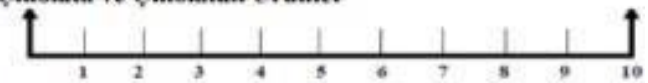
direnecek gücüm yoktur.						
Bir kez yemeğe başlarsam durmakta zorlanırım.						
Ne kadar uğraşsam da yemek yemeği düşünmeyi durduramam.						
Bir dahaki sefere ne yiyeceğimi düşünmek için çok zaman harcarım.						
Eğer aşırı besin isteğime teslim olursam, tüm kontrolümü kaybederim.						
Aşırı stresli olduğum zaman, aşırı besin isteğim olur.						
Yiyecek konusunda hayallere dalarım.						
Ne zaman bir yiyeceğe karşı aşırı isteğim olsa, gerçekten o yiyeceği yiyinceye kadar yemeği düşünmeye devam ederim.						
Eğer bir besine aşırı istek duyarsam, onu yemekle ilgili düşünceler beni tüketir.						
Duygularım sıklıkla bende yemek yeme isteği oluşturur.						
Ne zaman bir açık büfeye gitsem, ihtiyacımdan çok daha fazlasını yerim.						
Hemen ulaşabileceğim lezzetli yiyecekleri yememek benim için çok zordur.						
Aşırı yemek yiyen biriyle beraberken genellikle bende aşırı yerim.						
Yemek yiyince kendimi rahatlamış hissederim.						
Üzgün olduğum zaman besinlere karşı aşırı istek duyarım.						

V. GÖRSEL ANALOG SKALASI

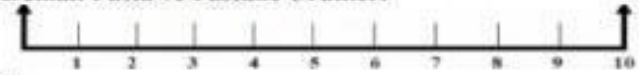
Aşağıdaki besinleri yemek için duyduğunuz aşırı isteği ‘1 çok az’ ile ’10 çok fazla’ arasında nasıl değerlendirirsiniz? (Lütfen size uygun rakamı yuvarlak içine alınız.)

BESİNLER

1.Çikolata ve Çikolatalı Ürünler



2.Kremalı Pasta ve Pastane Ürünleri



3.Cips

4.Gazlı İçecekler

5.Fast-Food Yiyecekler

6.Patates Kızartması

7. Ekmek Çeşitleri

8.Makarna

9.Hamur İşleri

10.Kuru Yemiş Çeşitleri

11.Çekirdek

12.Dondurma

13.Meyve

VI. COOPERSMITH BENLİK SAYGISI ENVANTERİ

Aşağıda insanların kendileri ile ilgili bazı duygularını açıklayan ifadeler yer almaktadır. Bu cümlelerden size uygun olanlarını 'Benim Gibi', uygun olmayanlarını ise 'Benim Gibi Değil' seçeneğini işaretleyin.

	Benim Gibi	Benim Gibi Değil
Çevremde olup bitenlerden genellikle rahatsız olmam.		
Başkalarının önünde konuşmak bana zor gelir.		

Eğer elimde olsaydı kendimdeki pek çok şeyi değiştirmek isterdim.		
Karar vermede fazla zorluk çekmem.		
İnsanlar benimle olmaktan hoşlanırlar.		
Evde kolayca moralim bozulur.		
Yeni şeylere kolayca alışamam.		
Yaşıtlarım arasında sevilen bir kişiyim.		
Ailem genellikle duygularıma önem verir.		
Başkalarının söylediğini kolaylıkla kabul ederim.		
Ailem benden çok şey bekler.		
Benim yerimde olmak oldukça zordur.		
Hayatımın karmakarışık olduğuna inanıyorum.		
Genellikle başkaları düşüncelerimi kabul eder.		
Kendimi yetersiz buluyorum.		
Sık sık evden kaçmayı düşünüyorum.		
Yaptığım işten çoğunlukla memnun olmam.		
Başkaları kadar güzel / yakışıklı değilim.		
Söylenecek sözüm varsa onu söylemekten çekinmem.		
Ailem benim duygularımı anlar.		
Çok sevilen bir kimse değilim.		
Genellikle ailemin beni dışladığını hissediyorum.		
Yaptığım şeyler genellikle cesaretimi kırar.		
Sık sık keşke başka biri olsam diye düşünürüm.		
Güvenilir bir kişi olmadığımı düşünüyorum.		

VII. LEZZETLİ BESİNLERİ TÜKETME MOTİVASYONU ÖLÇEĞİ

Aşağıda, bazı zamanlarda insanların lezzetli besin ve içecekleri tüketme nedenlerini sorgulayan bir liste bulunmaktadır. Bu besin ve içeceklere örnek verilecek olursa;

– Çikolata, kurabiye, kek, şekerleme, dondurma, baklava, diğer tatlılar gibi tatlılar.

– Cips, patlamış mısır, çekirdek gibi çerezler ve simit, kraker gibi tuzlu atıştırmalıklar.

– Hamburger, cheeseburger, pizza, döner, pide, kızarmış tavuk ve patates kızartması gibi fast food besinler.

– Gazlı içecekler, hazır meyve suları, tatlı aromalı çay ve kahve (latte, mocha) gibi kremalı ve şekerli içecekler.

Yukarıda bahsedilen yiyecek ve içecekleri tükettiğiniz zamanları düşünerek bunları tüketim sıklığınız için ne söyleyebilirsiniz?
Size uygun olanı işaretleyin.

	Hiçbir zaman	Bazen	Sıklıkla	Çoğu zaman	Her zaman
Endişelerinizi unutmak için.					
Arkadaşlarınız bunları yemenizi / içmenizi istediği için.					
Bir partideyken eğlencenin keyfini çıkarmanıza yardımcı oldukları için.					
Depresif ya da sinirli olduğunuz zamanlarda, size yardımcı oldukları için.					
Sosyalleşebilmek için.					
Kötü bir ruh halinde olduğunuzda neşelenmek için.					
Yemek yeme hissini sevdiğiniz için.					
Bu besinleri / içecekleri tüketmediğiniz zaman, insanların sizinle alay etmesinden kaçınmak için.					
Heyecan verici bulduğunuz için.					
Size kendinizi mükemmel hissettirdiği için.					
Sosyal ortamları daha eğlenceli hale getirdikleri için.					
Beğendiğiniz bir grup ile kaynaşmak için.					
Keyifli hissettirdikleri için.					
Özel gün ve kutlamaları daha iyi hale getirdikleri için.					
Kendinizi daha özgüvenli ve emin hissettirdikleri için.					
Arkadaşlarınızla özel bir olayı kutlamak için.					
Problemlerinizi unutmak için.					
Eğlenceli bulduğunuz için.					
Dışlanmış hissetmemek için.					

8.3. Appendix 3 (Curriculum Vitae)

Personal Information

Name	Dilan	Surname	Çevik

Working Status

	Time
Turkish Diabetes Foundation	November 2018-Now

Education Status

Degree	Department	Name of the School	Year of Graduation
Master	Nutrition and Dietetics	Yeditepe University	2019-Now
Bachelor	Psychology	Yeditepe University	2015-2018
Bachelor	Nutrition and Dietetics	Yeditepe University	2013-2018
High School		Habire Yahşi High School	2009-2013

Foreign Languages	Level
English	Upper-intermediate
French	Beginner

Computer Knowledge

Program	Usage
Microsoft Office	Very good

Others (Projects / Certificates /Awards)

Hey Young Take Action Project, Dietician (October 2019–May 2021)
Turkish Diabetes Foundation, 3rd Diabetes Technologies Symposium (May 2021)
Yeditepe University Continuing Education Center, Phytotherapy Training (March 2021-April 2021)
KEPAN, Adult Nutrition Digital Meeting Meeting (April 2021)
KEPAN, Nutrition Teams Digital Meeting (April 2021)
Diabetes Dietician Association, Diabetes with Cases and Medical Nutrition Therapy Course (November 2020-January 2021)
Dietitian Banu Belkıs Güner, Addiction and Microbiota (September 2020)
Koç University Hospital/RMK AIMES Diabetes Technologies Training Center, Effective Use of Continuous Glucose Monitoring Course (June 2020)

8.4. Appendix 4 (Research Approval Form)

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ÜSKÜDAR ÜNİVERSİTESİ
GİRİŞİMSEL OLMAYAN ARAŞTIRMALAR
ETİK KURULU BAŞKANLIĞI

SAYI: 61351342/EYLÜL 2021-32 **30/09/2021**

Sayın Dr.Öğr.Üyesi Hülya DEMİR
(Dilan DİLEK)

Üsküdar Üniversitesi Girişimsel Olmayan Araştırmalar Etik Kurulunun **28/09/2021** tarihinde yapılan **09** No.lu toplantısında **"Tip 1 Diyabetli ve Diyabetli Olmayan Erişkin Bireylerin Hedonik Açlık Durumlarının İncelenmesi ve Karşılaştırılması"** adlı araştırma projenizin etik açıdan uygun olduğuna karar verilmiştir.

Bilgilerinize rica ederim.

Doç. Dr. Cumhur TAŞ
Girişimsel Olmayan Araştırmalar Etik
Kurulu Başkanı