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MASTER'S THESIS

ZAHİDE BEGÜM SEVGİ

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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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Director of Institute of Health Sciences

DECLERATION

I whereby declare that this thesis is my own study 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.

08.01.2022

Zahide Begüm SEVGİ

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Zahide Begüm Sevgi

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LIST OF ABBREVIATIONS

BED	Binge Eating Disorder
BMAL1	Brain and Muscle ARNT-like Protein 1
BMI	Body Mass Index
CLOCK	Circadian Locomotor Output Cycle Kaput
CSM	Composite Scale of Morningness
HPA	Hypothalamic–pituitary–adrenal Gland
MCTQ	Munich Chronotype Questionnaire
MEQ	Morningness Eveningness Questionnaire
NIH	National Institutes of Health
RHT	Retinohypothalamic Tract
SCN	Suprachiasmatic Nucleus
TEE	Total Energy Expenditure
TTFL	Transcriptional-translational Feedback Loop
WHO	World Health Organisation
YFAS	Yale Food Addiction Scale

ABSTRACT

Sevgi Z.B. (2022) Evaluation of Adult's Food Addictions According To Their Chronotype And The Number of Consulting To A Dietician, Department of Nutrition and Dietetics, Mater Thesis, Istanbul.

Chronotype, known as a circadian preference, may vary from person to person. Although a majority of people are intermediate type, evening type people closely linked with addiction behavior like food addiction. Food addiction is found to be more common in obese people who have difficulties maintaining their weight. This cross-sectional descriptive study was aimed to investigate the relationship between food addiction and the number of applications for a dietitian regarding the chronotypes of the participants. This study was conducted with 121 people who applied for a private nutrition counseling center in Istanbul between July 2021 and September 2021. People who are under the age of 18 and pregnant were excluded from the study. Anthropometric measurements, Morningness Eveningness Questionnaire (MEQ), Yale Food Addiction Scale (YFAS), and a questionnaire consisting of general characteristics and eating habits of the individuals were applied and collected. As a result of the study, the prevalence of food addiction was 15% in a sample. A significant difference was found between food addict people and non-food addicts in terms of Body Mass Index ($p=0.023$). While there was no relationship between food addiction and chronotype score, evening type was seen more commonly in food addict people. Regarding the number of applications for a dietitian, the highest application number was observed in food addict and evening type people.

Keywords: Eveningness, chronotype, food addiction, circadian rhythm

ABSTRACT (TURKISH)

Sevgi Z.B. (2022) Yetişkinlerin Yeme Bağımlılığı ile Diyetisyene Başvurma Sayısının Kronotiplerine Göre Değerlendirilmesi, Beslenme ve Diyetetik Bölümü, Master Tezi, İstanbul.

Sirkadyen tercihi olarak da bilinen kronotip, kişiden kişiye farklılık gösterebilir. Bireylerin büyük bir çoğunluğu orta tip kronotipine yatkın olsalarda, akşamcıl kronotipe sahip olanlar yeme bağımlılığı gibi bağımlılık davranışıyla yakından ilişkili bulunmuşlardır. Obez kişilerde ve kilo kaybı sağlamada güçlük çeken kişilerde yeme bağımlılığına daha sık rastlanmıştır. Kesitsel ve tanımlayıcı olarak tasarlanan bu çalışma yeme bağımlılığı ile diyetisyene başvuru sayısı arasındaki ilişkinin kronotiplerine göre araştırılmasını amaçlamıştır. Temmuz 2021 - Eylül 2021 tarihleri arasında İstanbul'da özel bir beslenme danışma merkezine başvuran 121 kişi ile yürütülmüştür. 18 yaşından küçük ve hamile olan kişiler çalışma dışı bırakılmıştır. Antropometrik ölçümler, Sabahçıl Akşamcıl Anketi (MEQ), Yale Yeme Bağımlılığı Ölçeği (YFAS) ve bireylerin genel özellikleri ve beslenme alışkanlıklarını içeren bir anket uygulanmıştır. Araştırma sonucunda örneklemde yeme bağımlılığı prevalansı %15 olarak bulunmuştur. Beden Kitle İndeksi (BKİ) açısından yeme bağımlısı olan ve olmayan kişiler arasında istatiksel olarak anlamlı farklılık bulunmuştur (p=0,023). Yeme bağımlılığı ile kronotip skoru arasında ilişki bulunmazken, yemek bağımlılarında akşamcıl kronotipi daha sık görülmüştür. Diyetisyene başvuru sayısı bakımından en yüksek başvuru sayısı yeme bağımlıları ve akşamcıl tipli kişilerde gözlenmiştir. Bireyin kronotipini dikkate alarak daha fazla çalışma yapılması, yeme bağımlılığının önlenmesi için faydalı olacaktır

Anahtar Kelimeler: Akşamcıl, kronotip, yeme bağımlılığı, sirkadiyen ritim.

1 INTRODUCTION AND PURPOSE

Whilst less processed, high in protein, high in fiber and poor in saline foods were intaken in the pre-industrial period, the consumption of processed foods which are fortified with taste and flavor enhancing additives has risen rapidly, particularly in western countries (1) .These kinds of foods have led to the development of the sense of reward and rise in the desire to eat again (2). This condition indicated that some special foods might have an addictive effect on people. Thus, this behavior can contribute to the development of food addiction (3,4).

Particular foods such as hyperpalatable foods with added fats and refined carbohydrates share pharmacokinetic characteristic with drug addiction. As reported by the recent Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5), substance addiction and food addiction resemble each other in terms of unintended overconsuming (3).

It is stated that food addiction is mainly connected with body size, emotional eating, uncontrolled eating, overeating, and calorie control (5). On the other hand, food consumption and the sleep-wake cycle are managed by circadian rhythm (6). Chronotype is a circadian preference which reflects the individual difference in sleep-wake cycle and daily activities (7). It is closely linked with impaired eating behavior and well-being (6). Individuals' chronotype could influence by genetic and also external factors and including light exposure, age, and sex. There are three main chronotypes, morning, intermediate, and evening types. The vast majority of people are intermediate type. Evening type has been related to unhealthy lifestyle behavior and depression, and it has been accepted that they have more tendency to be addicted. Indeed, the circadian rhythm disturbances may lead to diabetes, cardiovascular disease, and cancer (6,8). According to previous study, significant relationship was found between chronobiology and obesity. Increased obesity was linked to bright light exposure, sleep deprivation, and shift work (9). Although the link between chronotype and weight status has already been established, there are relatively few studies focused on weight loss success

regarding chronotypes of the individuals (10 - 13). A study indicated that morning chronotypes are more successful in maintaining weight loss (13).

A high score of food addiction is linked with higher energy intake; accordingly people who have food addiction have high dietary fat intake when compared to those who have not food addiction. Therefore, a high level of BMI and regain weight is more common in food addict people. (14, 15) It might be envisaged that people who have difficulties to maintain their weight after following weight lost, are more frequently applying for a dietitian (16). Therefore, this study aimed to examine the relationship between food addiction and the number of consulting a dietitian according to the chronotypes of the clients.

2 GENERAL INFORMATION

2.1 Obesity

Obesity is a massive public health problem increasing exceptionally all around the world. According to the World Health Organisation (WHO), obesity is related to an increase in body fat mass excessively and abnormally, which can lead to many harmful effects on human health. Individuals lost their lives in the past and still have lost due to nutrient deficiencies although obesity that can generate many diseases as well as premature death, is a serious global public health problem (17, 18).

Body Mass Index (BMI) has been defined as a criterion specifying obesity by The National Institutes of Health (NIH) and the WHO (19, 20). BMI eliminates the requirement of sex-specific height/weight tables, and it gives an understanding of individual's adiposity. WHO clarify healthy body weight as a BMI between 18.5 and 24.9 kg/m², overweight between 25.0 and 29.9 kg/m², and obesity ≥30 kg/m² in adults. There are three grades of obesity: grade 1 (BMI ranging from 30 to 34.9 kg/m²), grade 2 (BMI ranging from 35.0 to 39.9 kg/m²), and grade 3 (BMI ≥ 40 kg/m²) (21).

In 2016, WHO reported that there were more than 1.9 billion overweight adults over the age of 18, and 650 million of them were obese. Meanwhile, 39% of adults aged 18 and over (39% of men and 40% of women) were overweight, and 13% (15% women and 11% men) were obese (22).

Certain foods have a rewarding effect on humans by means of including high-sugar and high-fat content. It has been known that this rewarding impact may increase the motivation for seeking and acquiring nutritional sources. In addition, to these rewarding properties of certain foods can restrain both homeostatic mechanisms and cognitive restriction, which may lead to increase in weight. Therefore, in recent times, it was highlighted that increase in obesity prevalence can reflect the development of 'food addiction' in a significant portion of population (23).

2.2 Addiction

Addiction is closely linked with the incapability of control or stop usage of substance or behavior. According to the international literature, it has been stated that the concept of addiction is used as ‘dependence’ and ‘addiction.’ Despite that, the Diagnostic and Statistical Manual, 4th edition (DSM-IV) prefer to use the terms “dependence” and ‘abuse’ instead of ‘’addiction’’ (24)

Addiction diseases are also known as the most common modern disease. They can affect all stages of a human’s life and their life cycle, and they can also affect their family directly or indirectly. In addition to this, smoking as well as alcoholism are the oldest patterns of substance abuse. Smoking is associated with many diseases which can lead to death, cardiovascular disease and cancer (25 - 28).

2.2.1 Food Addiction

Recently, there has been reported to an increase in scientific publications displaying neurobiological and behavioral relationships between substance use and food consumption. A primary research using animal and human models shows that some foods, especially very tasty foods, may have addictive properties; also, exposure to food and drugs has been observed to exert similar effects on the dopaminergic and opioid systems. Thus, these common properties between food and drugs led to the revealing of the hypothesis of food addiction (29).

Nearly 60 years ago, ‘food addiction’ is first defined by Randolph, it is a particular variation of one or more regular food consumptions which can lead to sensitivity by a human. This kind of food consumption may produce a typical pattern of symptoms specifically common in those of other addictive processes including addictive-like consumption of coffee, wheat, corn, potatoes, eggs, and milk (30).

The manufacturing industry has designed processed products enhanced with sugar, salt, and oil to supply traditional nutrients. The intense taste (hedonic value) of such

processed foods causes them to be more consumed. Therefore, some foods may have a high addictive potential, which may be responsible for some eating disorders. (31, 32)

Over the past decades with the increase in obesity, the concept of food addiction has become more mainstream both amongst researchers and the public as a feasible way to gain insight into the effect of psychological factors of weight gain (33).

The changes in dopaminergic signaling caused by obesity and binge eating and the findings of hyperactivation in brain areas related to food-cue and reward were comparable to the process seen in drug users. Some studies have triggered the increase in scientific interest in the subject, and followed by animal studies it was revealed the neural changes and addiction-like behavior in rodents several weeks after intermittent access to sugar (33).

2.2.2 Comparison of Food Dependence and Other Shapes of Addictive Behaviours In Terms of Mechanism

It is reported to many common properties between people showing signs of food addiction and people diagnosed with substance addiction. The director of neuro clinical science and behavioral researcher Joseph Frascella, the National Institute on Drug Abuse (NIDA), and colleagues, investigated the overlap of obesity and addiction. The study stated that the processes that are happened by people who are drug addicts or alcoholics are the same. They also indicate similarities between brain processes developing during usage of drugs, and food intake. It may emphasise the function of dopamine, a neurotransmitter which is a significant part of the reward system and motivation in the brain (34, 35).

According to the sketch of the brain, the particular area of mesolimbic reward systems, like the caudal nucleus and hippocampus, are activated by food. These substances can both release striatal dopamine. In addition to this, sweet, salty, and fatty food can activate endogenous opiates, which are another group of participants in the rewarding system (36, 37).

2.2.3 Neurophysiology of Food Addiction

The intake of a delightful meal, the mixed with different flavours, and food textures are best appreciated when people start post-absorptive state. In addition to this, according to preclinical studies carried out in the non-homeostatic as well as homeostatic features of nutrition and their relationships, eating attitude is controlled by two main systems. They are known as hedonic and homeostatic (38).

Firstly, homeostatic systems can control the nutritional status at the ideal weight of everyone. However, hedonic system is stimulated with the relationship between the reward system of brain and the taste as well as the pleasure process. Due to this, some nutrients are consumed excessively (38, 39).

However, the taste can affect body weight and meal size; the neural substrate is not explained clearly. Dopamine, which is located in the nucleus accumbens, is known that it has been involved natural and nonnatural rewards.

Hajnal et al. studied on the relationship between sham intake of sucrose and the change in extracellular dopamine in the nucleus accumbens, and they demonstrated that extracellular dopamine increased when intake of sucrose concentration rose. This study can provide solid, and additional evidence for the significance of mesolimbic dopamine mechanisms in the rewarding and motivating effects on sweet taste (39).

They explained that obese people have more tendency to be food addict therefore, these people a greater reward effect and intake more food than those who are non-obese (40 - 42).

2.2.4 Diagnosis of Food Addiction

In the past, experimental studies regarding food addiction were rare because of a lack of psychometrically valid instruments. Indeed, Cassin and Ranson utilized a organized clinical interview which consists of the addiction criteria in the DSM IV, and later improved an interview on the basis of Gudmans criteria for addictive disorders (43).

In 2009, Merlo et al. utilised the Eating Behaviors Questionnaire (EBQ) to determine the concept of ‘food addiction’ (44). This questionnaire contains three criteria; obsessive usage of food over time, struggle to reduce the food consumption, and continuous use, although it has harmful consequences. Moreover, it includes a straight question which is ‘Do you think you are addicted to food?’ (45, 46).

The new standardization of scale is Yale Food Addiction Scale (YFAS), the most commonly used, and it is also an appropriate tool for gaining complete knowledge to determine food addiction. Additionally, it was found by Ashley Gerhardt in 2008, it is used for identifying those who indicate signs of dependence on specific types of food which are saturated with sugar, fat, or salt (47).

YFAS was filled by the subjects with 25 questions, which interprets two different values. First of all, it reveals the diagnosis of food addiction in parallel with the DSM-IV substance addiction criteria and the qualitative characteristics of food addiction (36). Variety of scoring choices are considered, including frequency, dichotomous, and Likert scale. The combination of dichotomous and frequency scoring was considered the most appropriate for the diagnostic criterion. Accordingly, two different scoring options were created: a dichotomous diagnosis (yes/no) and the number of symptoms. Similar to the substance abuse diagnosis for the diagnostic version, individuals must meet three or more criteria and at least one of two clinically significant items (disorder or distress). The symptom score is found by simple count of seven diagnostic criteria (48).

2.2.5. Symptoms of Food Addiction

Adults accepted the point that they have compulsive eating (especially craving) and attempt to decrease consumption, like in children (46). According to another study, there are three most common symptoms (49):

- Having a persistent desire or repetitive attempts in order to decrease consumption of some foods.

- Continued consumption although problems.

- Spent excessive time to acquire food, consume or retrieve from consuming when the YFAS was applied.

2.3. Circadian Rhythm

Almost all organism, from archaea to mammals, regulate their physiology, behavior, and metabolism according to the 24-hour solar cycle (50, 51). Additionally, in a daily life cycle of an organism; cellular adaptations occur with many processes such as active and resting times, hunger-satiety cycles, gastrointestinal functions, metabolic processes, and cellular transcriptions and translations (52).

The definition of circadian can be explained with two different words. ‘Circa’ means ‘approximately’ or ‘around’ and, ‘dian’ means ‘day’, to sum up, this expression clarifies ‘approximately one day’ (50). The circadian rhythm regulates and optimizes the functions of cells, organs, systems as well as behaviors on a daily basis with 24 hours (53). For instance, this modifies an extensive range of metabolic targets, which are glucocorticoids (54), the master energy sensor AMPK (55), rate-limiting steps in cholesterol and fatty acid synthesis (56, 57), and hepatic CREB in order to regulate gluconeogenesis (58). Moreover, these rhythms are physiologic daily cycle and behavior controlled by an endogenous oscillator (59).

Circadian rhythms are governed by the suprachiasmatic nucleus (SCN) which is located in the anterior hypothalamus. As well as that body core temperature rhythm, sleep-wake cycle, and secretion of some hormones (growth hormone, cortisol, and melatonin) are under the control of SKN (60). In addition to the SCN, multiple peripheral clocks in the brain and amongst the body, including the pancreas, liver, gastrointestinal tract, adipose tissue and skeletal muscle, also play a role in managing these rhythms. These clocks are fundamentally synchronized based on the light/darkness cycle, tough it can differ between individuals. Neuroendocrine pathways are essential in the management of peripheral clocks by the SCN (61).

2.3.1. Circadian Rhythms in Molecular Basis

By means of working in multiple species, the transcriptional-translational feedback loop (TTFL) molecular model of circadian rhythms was developed. Primary loop including transcription factors named Circadian locomotor output cycle kaput CLOCK and brain and muscle ARNT-like protein 1 (BMAL1) stimulate Period (Per 1, 2, and 3) and Cryptochrome (Cry 1 and Cry 2), which occur at the center of this model (62). Afterward the translated PER and CRY proteins translocate into the nucleus, followed by this step; these protein complexes suppress the stimulating of transcriptional activity of their own genes by CLOCK and BMAL1. The specific temporal dynamics of this loop are governed by posttranscriptional and posttranslational modifications (62, 63).

2.3.2. Circadian Rhythms in Metabolism

Energy and nutrient metabolism are organized to coordinate usage or storage with light-dark cycles (64). Diurnal patterns have an effect on the metabolites and hormones in terms of flowing into the circulation. In major metabolic tissues adipose tissue, liver and skeletal muscle, rhythmic metabolic gene expression is common. Some metabolic activities are restricted for unique periods during the day (65).

2.3.2.1. Lipid Metabolism

Adiponectin and leptin are known as the adipocyte secreted hormones regulating energy balance and metabolism, and they have an essential role in developing obesity and the metabolic syndrome (66, 67). Additionally, it has been reported that the concentration of adiponectin is falling (68) while leptin is rising during the night (69, 70).

BMAL1 and CLOCK loop are mainly responsible for the circadian rhythm of leptin; in addition to this, it can be influenced by other clock genes, like Per and Cry (71). With a lack of BMAL1 in mice, especially in their adipocytes, it can be shown that they have a high level of leptin concentrations, which might lest to greater adipose tissue mass (72).

Above all else, the homeostasis of leptin has a vital role in food intake, lipid metabolism, food-anticipatory rhythms, and insulin sensitization (73 - 76). Furthermore, leptin resistance a feature of obesity in humans can perform a main role in development of obesity and metabolic syndromes due to circadian dysfunction (71).

On the other hand, according to one study which is conducted on mice, for unraveling the connection between metabolic circadian systems, the core circadian gene CLOCK was mutated to create a mutant mouse whose endogenous circadian period was extended. In addition to developing obesity at a young age, mutant mice fed high-fat diets showed various endocrine and metabolic irregulates which is consistent in metabolic syndrome. However, the feeding routine in normal mice was significantly blunted in mutant mice. It has been determined that when they are left in light and dark environment between twelve hours, they consume 75-80% of their total energy. In contrast, it has been revealed that they consume approximately 50% of the food during the dark phase (77, 78).

2.3.2.2. Glucose metabolism

Glucose tolerance relies on the preiod when glucose is consumed in a healthy person, and following this, it is known that glucose tolerance is mostly greater in the morning time rather than the evening (79, 80). Furthermore, according to the study, which utilizes hyperglycaemic clamping (81) as well as a triple-tracer mixed-meal technique (82), the time-dependent glucose tolerance in healthy humans is vigorously intervened by the rhythm in pancreatic β-cell glucose sensitivity that is pancreatic glucose-induced insulin secretion. In another study conducted in 2015 use a circadian misalignment protocol that displayed the diurnal rhythm in glucose tolerance is strongly governed by the circadian timing system, apart from effects on behavioral and environmental changes. By means of diurnal studies, constant findings can be revealed that the endogenous circadian effect on glucose tolerance results from a stronger β-cell response in the circadian morning (83).

Gathered pancreatic islets in mice demonstrate an insulin secretion is related to circadian rhythm (84). BMAL1 and CLOCK stimulate the gene transcription implicated in some processes including insulin synthesis, secretion, and transportation (85). Therefore,

disrupting the pancreatic clock can lead to defective insulin secretion. Correspondingly, one group of pancreatic islets in human has verified that the pancreatic clock manages secretion of insulin (86 - 88).

2.3.2.3. Energy Metabolism

It is reported that metabolism of energy is governed by various hormones, enzymes, and transport systems; additionally, circadian rhythm can efficiently regulate their secretion, expression, and activation (89). Some metabolic activities such as basal metabolism, physical activity and the thermal effect of foods require energy store (90).

Furthermore, it has been revealed that the resting metabolic rate (RMR) is significantly high in the afternoon compared to the morning hours (91). In addition to this, energy metabolism includes two main parts: sleep and circadian rhythm (90, 92) .

On the other hand, some metabolic activity can change during the sleep phases. And there are two different phases called REM and non-REM (93). Most importantly, during the period of REM, dream and sympathetic nervous system activity upswing, blood pressure, body temperature, respiratory and heart rate rise during this period. In particular, the metabolic rate rises and reaches at the peak during the sleep in the REM phase (94). Thus, degeneration of the sleep cycle as a consequence of having a shift work, jet lag or sleeping lately, and so forth may cause a reduction of basal metabolic rate.

Additionally, the thermal effect of nutrients is another key constituent of entire energy expenditure. Whilst lipids have minimum effect on thermogenesis, proteins have greater effect (95). Compared with the times of day, diet-induced thermogenesis experiences a higher level in the morning rather than evening (96). According to a study carried out by Morris et al., the effect of thermogenesis from nutrients can see a high level at 44% in the morning compared with the evening. Moreover, the decrease in the thermal effect of foods might mainly be a result of the impact of the endocrine circadian system on gastrointestinal physiology (97). However, in accordance with some studies carried out with adults, the

findings showed that the gastric emptying rate in the morning around eight was greater than in the evening between eight and ten (98).

Elsewhere, disruption of circadian rhythm can lead to some gastrointestinal system disorders like constipation, diarrhoea or bloating. These considerations disclose a relationship between gastrointestinal physiology and circadian rhythms. For this reason, Hoogerwerf et al. conducted research to show the association between these variables, and it displayed that BMAL1 and PER2 protein expressions were related with the circadian rhythm in the myenteric plexus region, where is an essential part for the coordinating of intestine motility and epithelial cells (99).

2.3.3. Regulation of circadian rhythm

The circadian timing system contains 3 separate components; oscillators, periodic environmental timers (zeitgeber), and outputs of rhythms regulated by cells in the system (100).

In addition to the SCN, multiple peripheral clocks in the brain and throughout the body also play a role in the management of these rhythms. Although these clocks are basically synchronized according to the light/dark cycle, the way of synchronization differs amongst individuals. Neuroendocrine pathways are also key in the management of peripheral clocks by the SCN (101).

2.3.3.1. Effects of Light

Our modern lifestyle alteration, which is an increase in light exposure during the nights, has a vital impact on the alignment of our circadian timing system to the solar day (102).

Environmental ambient light is the most crucial zeitgeber which can reach the SCN. Firstly, the process begins with the retina carrying the photic information from the retinohypothalamic tract (RHT) to the SCN. In addition to the RHT, the geniculohypothalamic tract (*GHT*) connects the retina and SCN via the intergeniculate

leaflet (*IGL*) in the thalamus. Furthermore, the SCN can accept non-photic information from the body, and the SCN activity is also modified by non-photic information by way of neurotransmitters and hormones (103, 104).

SCN neurons are responsible for the regulation of their circadian phase which is related to the input of surrounding light levels and its composition of the spectrum. Moreover, these neurons relay this information through humoral, signals and the remaining part of the body. These output pathways are mutual; therefore, they can feed the information back to the SCN. To be more precise, the vigilance levels can be altered according to the circadian phase from serotonergic wakefulness-promoting projections to the hypothalamus and the cortex (105, 106).

Some animal model studies have been reported that dim light during the nights can agitate diurnal rhythms of food intake and locomotor behaviour (107 - 109). which lead to obesity and decreased insulin tolerance (108, 109). Furthermore, in harmony with these findings, studies carried out in humans, have demonstrated the relationship between light exposure during the night and obesity (110, 111) and type two diabetes (112).

2.3.3.2. Melatonin

Melatonin is a pineal hormone and it is also known as a darkness hormone (113) (114). It broadly exists in nature, and most living organisms such as unicellular organisms, plants, microbiota and animals are able to synthesize it (114).

Pinealocytes manage the synthesis of melatonin from the tryptophan, which is hydroxylated using the tryptophan-5-hydroxylase enzyme in 5-hydroxytryptophan. Following by this step, it is decarboxylated through the 5-hydroxytryptophan decarboxylase in serotonin. These two enzymes are located in the pineal gland and responsible for converting serotonin into melatonin (115, 116)**.** Furthermore, norepinephrine stimulates the melatonin biosynthesis enzymes by activating adenylate cyclase (117).

Secretion and melatonin synthesis are broadened by darkness, while they are inhibited by exposure to light (118). Melatonin secretion mainly starts with the sun set, and it reaches its peak in the middle of the night, approximately from 2.00 am. to 4.00 am. almost 80% of the melatonin is produced at night (119). Additionally, it was reported that serum concentrations gradually decrease during the daylight hours (120).

Melatonin performs via various molecular pathways. The activation of two types of membrane-specific receptors is the greatest characterized pathway. These receptors are known as a high-affinity ML1 sites and low-affinity ML2 sites, and the activation of ML2 receptors, currently called MT3 which is revealed in different parts of the brain (121, 122) (123). In addition to this, two sub-types of the ML1 receptor have been explained as MT1 and MT2. Despite widely spreading of MT2 in retina, hippocampus, cerebellum and paraventricular nucleus, MT1 is mainly spreading in the SCN (123 - 125).

However, melatonin can modulate circadian rhythms like neuroendocrine rhythms, body temperature cycles, or the sleep-wake rhythm via the activity of MT1 and MT2 receptors (120). Therefore, melatonin helps the reduction of sleepiness, fatigue, and decrease in sleep latency (126).

Not only circadian rhythms disturbance is associated with sleep disorders, but it is also related to impaired health. Additionally, when circadian rhythms are recovered, mood, behaviour and health start to improve (127). It needs to be taken into account that circadian rhythms are vital for normal neurodevelopment (128, 129).

Apart from renowned effect of melatonin on sleep-wake cycle, melatonin is also known as an endogenous synchronizer and a chronobiotic molecule. And this molecule can strengthen oscillations or regulate the timing of the central biological clock situated in the SCN in order to balance bodily rhythms (130).

Furthermore, this synchronization provided by melatonin of peripheral oscillators. They can reflect the adaptation of individuals to their internal and external environment. For instance, the synchronized impacts of melatonin on insulin and cortisol secretion enable

people to be entirely awake in the morning and provide them start the day by eating and getting some energy from foods. It is undoubtedly considered that melatonin is the best peripheral indices of human circadian timing by means of the major synchronizing effects of melatonin on central and peripheral oscillators (131).

Besides all these effects of melatonin, it is closely associated with body mass and bone mass regulation. It is widely known that melatonin has a key role concerning energy expenditure and body mass regulation by restraining the growth of fat mass (132).

2.3.3.3. Cortisol

An essential component of the human neuroendocrine system is the hypothalamic–pituitary–adrenal gland known as the HPA axis producing cortisol, a glucocorticoid hormone which is extremely related to the circadian rhythms (133, 134) . Primarily in humans, cortisol is the main glucocorticoid, and it is secreted depends on a range of stressors (135). Furthermore, cortisol has a vital role in variety of physiological functions like metabolism, electrolyte balance, development and cognition. It is also involved in several organ systems, named, immune, nervous, cardiovascular, neuroendocrine and reproductive systems (136, 137).

It is reported that cortisol is secreted into the bloodstream by the adrenal glands in a circadian rhythm in absence of any stressors during the normal circumstances. Additionally, it experiences its peak in the 07.00-08.00 a.m. in the morning, known as the active phase, although it has its trough level about 02:00–04:00 a.m. at night (137, 138).

During the darkness of an ordinary physiological setting, melatonin activates sleepiness while cortisol secretions are responsible for sustainable daytime consciousness amongst the morning. As a factor diurnal rhythm, consciousness and the sleep–wake cycle can influence cortisol secretion along with neural pressure signals (139).

It is observed that initially, cortisol secretion is lower compared to the stages of sleep. It increases consistently during stage 2 of sleep. In addition to this, under the stress or pressure, secretion of cortisol increases (139, 140).

The excess cortisol level due to the impairment of circadian rhythm might cause Cushing's syndrome. Beside this, hypercortisolism has also been displayed to provoke insulin resistance (141, 142).

Moreover, cortisol is vital for lung maturation while development of the central nervous system and stimulation of important enzymes in fetal development, excess cortisol level might lead to delayed fatal growth (143).

2.4. Chronotype

Chronotype is defined as an individual drift phase and individuals' preference in sleep and waking times (144). These preferences are partially on the basis of genetics (145). Chronotype reflects an individual's characteristic tendency regarding morningness or eveningness, and it is generally measured usage of self-assessment questionnaires. As well as that Morningness–Eveningness Questionnaire (MEQ) is the most applied questionnaire (146). Apart from MEQ, Munich Chronotype Questionnaire (MCTQ) and the Composite Scale of Morningness (CSM) are also well-known questionnaires for determining an individual's chronotype (147). In 1976, it was primarily developed by Horne and Ostberg, however it was used amongst youths (148). Moreover, Pündük et al. adjusted into Turkish in 2005 (149). This scale involves 19 different questions answered in accordance with the likert type scale. Five different types are revealed depends on cut-off scores. These types are named 'definitely evening type', 'moderate evening type', 'intermediate type' 'moderate morning type' and 'definitely morning type'.

Predominantly, people belong the morning type, and they demonstrate a preference to go to bed and wake up early. Additionally, they reach a peak of their physical and mental performance in the early part of the day. On the contrary of this type, evening types tend to accomplish their peak approaching end of the day (150).

It is seen that serum cortisol level can differ from morning type to evening type. The cortisol level of the person belonging the morning type is greater than evening type person. Beside this difference, morning type person feels more energetic in the morning compared with the evening type person (151).

It needs to be considered that age and sex highly influence chronotype. To be more precise, women and older people display a strong tendency amongst morningness rather than men and young people (152). In addition to this, it is recently reported that patients having mood disorders, sleep disturbances and substance abuse, show more a predisposition towards eveningness type (153, 154). As well as that evening type people are more prone to obesity (155).

On the other hand, approximately 40% of adults belong in one of the two extreme circadian types, whilst the vast majority of people show a preference towards intermediate type (150).

2.5. Chronotype and Addictive Disorders

Amongst young generation, the eveningness is reviewed a significant risk factor for addiction of substance (156 - 158). It has been reported that usage of more alcohol and cigarette are seen amongst young people belonging evening chronotype. According to some research, it is observed that evening types report higher consumption of drugs comparing with intermediate and morning types.

In another study, the findings noted that Ethiopian college students belonging to evening types are more prone to use of drugs, a herbal stimulant. Additionally, this attitude can show that the relationship between addiction and eveningness is revealed in non-Western countries (158). Beside this, in recent years the eveningness has been closely associated with compulsive internet use amongst young people (159).

Remarkably, recent studies indicated that evening type individuals were more commonly smokers and consumed more caffeine and alcohol rather than other chronotypes

(160, 161). Additionally, people having an addictive disorder are apparently belonging evening type (162).

According to the neuroimaging study conducted with thirteen morning and twenty-one evening-type people, it is observed that evening types demonstrated enhanced ventral striatum reactivity in retaliation to acquiring the reward. This change was advance associated with alcohol consumption and more symptoms of alcohol dependence. It can also reveale that changed process of reward might clarify the higher tendency to evening-type people to usage of substance (157). On the other hand, it has been demonstrated that some circadian rhythm genes such as PER1, PER2, PER3 and CLOCK are also regulators of dopaminergic activity in the brain reward system and implicated in the vulnerability for addiction (163, 164).

Eveningness is also closely linked with a character type defined by higher disinhibition, impulsivity and sensation seeking, which might lead to the propensity of unhealthy behaviors (165 - 167). In addition to this, evening type also showed lower psychological well-being comparing with other chronotypes (168) .

From all these studies, it can be seen the fact that there is a strong relationship between substance use and circadian typology. And the evidences also encourage the hypothesis that evening types can be a risk factor for greater intake of both legal and illegal substances and behaviors that can cause to lose control of consumption and addiction (169).

2.6. Chronotype and Eating Behaviors

Not only negative health outcomes such as obesity, cardiovascular disease and diabetes mellitus are associated with misalignment circadian rhythm, but eating behavior, enhanced size of meal, mistimed hunger and preference of innutritious food are also related to the misalignment between the signals of internal and external (170, 171) .

Moreover, morning-type people have a tendency to display healthier and more regular eating habits and they have a high level of control for their nutrition comparing with evening-

type people (172 – 174, 10). In addition, evening type people are also inclined to be less physically active, and they generally note that they have poor health condition compared to intermediate and morning types (175). In fact, evening type is closely connected with eating disorder, unhealthy food preferences and night eating behavior (176 - 178).

In one study, large cross-sectional, it was observed that people having evening chronotype consumed little fruit and fish, drunk too much soft drinks and chocolate than those having morning chronotype. Following with this finding, it was also observed that eveningness is related to enhanced alcohol intake, fat and sucrose (172). Beside this, evening type people consumed less energy and micronutrient in the morning, and more calorie in the evening (179). Despite some study reports that eveningness is related to a greater BMI, chronotype cannot seem to be a key risk for development of obesity (173).

Findings for a relationship between specific eating disorders and chronotype are restricted. However, in university students, it has been proven that there is a link between bulimic behavior and evening types (180). Less morning attentiveness has also been associated with greater emotional eating (181). Furthermore, evening-type students have reported a failure with dietary restriction and had more uncontrolled eating (10).

According to one study, eveningness found more prevalent through eating disorders patients rather than healthy controls. Following by this, some patients had a decrease in eating disorder symptoms by means of a shift towards morningness (182). On the other hand, in another study, conducted with psychiatric inpatients, revealed that there is no association with eating disorder diagnosis and circadian type (183).

2.7. Chronotype and Food Addiction

As mentioned earlier, increased palatable foods like high sugar or fat, are excessively being a part of stimulation of brain's reward pathways (184). This pathway might cause to consume more foods and trigger some symptoms related to substance use disorders. Additionally, this food-related behaviour is considered as Food Addiction (3,4).

Moreover, psychical and emotional factors are main features for comprehend eating behaviour and expand desirability of extremely palatable foods. Beside this, eating behaviour can be affected by stress level, and stress is also known to be an influence of the hypothalamic- pituitary-adrenal axis functioning (185). To be more precise, stress can contribute the development of food addiction (186). Not only food addiction is related to exposure of stress, it is also revealed to link with sleep quality in a study previously conducted in 2016 (187).

It has been reported that circadian rhythm can manage the sleep wake cycle as well as food intake. According to the previous studies, eveningness was linked between addictive behaviours (6). In addition to this, there is restricted study concerning direct linear relationship between food addiction and chronotype. But, based on one study examined links between them, it was revealed that evening-type circadian preferences were implicitly related to increased food addiction scores mediated by impulsivity and insomnia (6). Therefore, insomnia and impulsivity appear to have a mediative role for the links between food addiction and circadian rhythm differences.

It is widely known that sleep deprivation can rise appetite and food intake. Additionally, in accordance with the brain functional magnetic resonance imaging study, it is demonstrated that acute sleep deprivation enhances the reward response to food cue without considering weight and blood sugar level (188). Thus, it can be resulted that this process might affect growth of food addiction in evening type individual.

2.8. Vulnerability of Food Addiction

Despite having a significant importance of genetic in growth of substance use disorders (189), there is restricted study related to food addiction. But food addiction is likely more prevalent amongst subjects having low socio-economic status (190).

Bellisle et al. summarize results on subjects consuming more food in the lack of hunger to stimulate reward. It was revealed that this attitude was associated with stress.

Precisely, amongst overweight people with excessive visceral adiposity, who might have reward deficiency. As a result of this, they might be more prone to food addiction (191).

Moreover, adolescent psychiatric in-patients show a high rate of around 25% for a co-morbid diagnosis of food addiction, beside this, females are influenced twice more than males (23). According to Albayrak et al., addictive- like eating behaviour may be related to adverse mental health (192).

In addition, it is reported that obesity with Binge Eating Disorder (BED) and food addiction is linked with elevated depression negative affect. Therefore, BED patients who additionally reports Food Addiction symptoms, have more severe disturbed symptoms of BED rather than those who have merely BED (193).

2.9. Weight Regain

Weight gain is explained by energy imbalance between energy intake and total energy expenditure (TEE) (194, 195). As it is mentioned that obesity appears as a result of overconsumption of food as well as flawed food intake behaviour. In addition to this, it can be rectified by means of caloric restriction and decreased sedentary lifestyle (196). Although weight loss achievement is common, the vast majority of people regain their weight after lose (197).

According to Wing and Hill, almost a quarter of overweight people report successfully maintaining weight loss which means purposely losing over 10% of initial weight and protect this weight at least one year (198).

On the other hand, dietary disinhibition, which is known as a loss of control overeating, plays a key role in the high intake of food and the increase in obesity (199, 200).

To be more precise, disinhibition has been displayed to be heavily related to weight gain over time in adult life (201). It seems that dietary disinhibition resembles to impulsivity which is highly associated with addiction such as substance use or smoking (202). Furthermore, it can reveal in a wide range of circumstances like when a person is presented

with a variety of palatable foods or under emotional distress. Therefore, weight regain is closely linked with addictive behaviour such as food addiction, with contributions from impulsivity and disinhibition (203).

3. MATERIALS AND METHODS

3.1. Sample Selection and Research Place

This thesis is planned as a cross-sectional descriptive study. The sample of the study consisted of 121 people applying for a private consulting centre in Esenyurt, Istanbul between July 2021 and September 2021. It was conducted with volunteer men and women between the ages of 18 and 65 at Nevin Türk Sağlıklı Beslenme ve Diyet Merkezi.

Inclusion criteria of the participants.

1. Applying to the specified nutrition counselling centre
2. Being 18 years and over, 65 years and under
3. Not being pregnant
4. Volunteering for participation in the study

The exclusion criteria of the participants.

1. Being under 18 years and 65 years older
2. Being pregnant
3. Not being volunteered for participation in the study

3.2. Data Collection Tools

Primarily, the participants agreed to participate in the study by reading and signing the voluntary consent form given in appendix 1. In addition to this, a data collection form prepared in accordance with the literature was used to gather the data from study participants. The data collection form included five different sections which is given in appendix 2. Firstly, socio-demographic characteristics, eating habits, and anthropometric measurements of the individuals were questioned. The 'Morningness Eveningness Questionnaire' was used to determine the levels of individuals' chronotypes. Lastly, the 'Yale Food Addiction Scale' was also used to specify addiction criteria and whether have a food addiction. All data were collected by interviewing face-to-face as well as online consulting via online questionnaire

form. The questionnaire link obtained on Google Forms was delivered to the participants after the nutrition counselling appointment.

3.2.1. General Information

As the first section of the questionnaire form is general information, including 12 questions. In this part, socio-demographic characteristics and other lifestyle factors like smoking and alcohol use conditions, chronic disease, and physical activity were evaluated. Besides this, the number of applying for a dietitian was also calculated.

3.2.2. Eating Habits

The second part of the questionnaire includes a few questions related to eating habits. The number of meals consumed, the type of meal, eating status before and during sleep were questioned.

3.2.3. Anthropometric Measurements

Weight, height, body mass index (BMI) waist circumference were recorded. For face-to-face interviewing people, body weight, height, and waist circumference were measured with **c**alibrated bioelectrical impedance device known In Body 270 brand was used by the researcher for precise prediction of a participants' weight. Following this step, participants' height was recorded by using a stadiometer for accuracy. It is known that the measurement of height can be influenced by footwear, feet, and posture. Thus, it was double-checked to make sure the floor level and other criteria were appropriate for measurement.

Participants' waist circumference was measured with a tape measure in the horizontal plane for using common of the measurements. For waist circumference, it was calculated 2.5 cm above the umbilicus with measuring tape. As stated by International Diabetes Federation, waist circumference for central obesity in Europe is considered ≥ 94 cm for men and ≥ 80 cm for women who are non-pregnant. According to WHO, the existence of central obesity is considered when the waist circumference is 102 cm and above for men and 88 cm and above for women (204).

BMI is a tool used for the determination of the nutritional status of individuals aged 18+ years. It is calculated by an individual's weight in kilograms divided by the square of height in meters (kg/m^2). BMI was evaluated amongst four groups in accordance with WHO classification: underweight people belong BMI of less than 18,5 kg/m^2, normal weight between 18,5 kg/m^2 and 24,9 kg/m^2, overweight between 25 kg/m^2 and 29.9 kg/m^2, and obese over than 30 kg/m^2. As well as that, obesity is subdivided into three different categories. These are known obesity class I (30.0-34.9 kg/m^2), obesity class II (35.0-39.9 kg/m^2), and obesity class III (above 40 kg/m^2) (205).

3.3.4. Yale Food Addiction Scale (YFAS)

Gearhardt et al. at Yale University in 2009 created a scale based on the substance addiction criteria in the DSM-IV-TR that evaluates the consumption of high-fat and sugar-based foods for clinical evaluation and measuring food addiction. Yale Food Addiction Scale (YFAS) measures two different values. Primarily, it evaluates the description of food addiction in line with substance addiction in DSM-IV-TR, and it also measures the qualitative features of this addiction. In our country, the validity and reliability study was conducted by Bayraktar et al. in 2011 (206). Moreover, it is a 27-item in order to determine addiction-like behavior in the previous twelve months. The first 25 questions are Likert-type; the 26th question has multiple options considering an individual's eating habits. It has eight different subsets as well. They are as follows:

1. Outrageous intake of substance over a longer period of time than envisaged
(following questions are; 1.2. and 3.)
2. Constant desire or frequent failures to stop
(following questions are; 4., 22., 24., and 25.)
3. Spending too much time and perform acts to obtain, use and recover
(following questions are; 5., 6. and 7.)
4. Crucial social, business or leisure activities decreased or stopped
(following questions are; 8., 9., 10. and 11.)
5. Continue to consume in spite of knowing to have harmful consequences

(following question is 19.)

6. Developing a tolerance (demolition of effect amount)

(following questions are; 20. and 21.)

7. Characteristic feeling of deprivation occurring after cutting out certain foods

(following questions are; 12., 13. and 14.)

8. Significant clinical impairment of use

(following questions are; 15. and 16.)

The cut-off score was calculated over the sum of the questions under each substance addiction criterion (such as tolerance, withdrawal, clinical significance). If the criterion score is 1 and more than 1, the criterion is met, if the criterion score is 0, the criterion is not met (206).

- 19., 20., 21. and 22. questions are scored as follows: 0 = (0) 1 = (1)

- 24. question is scored as follows: 0 = (1) 1 = (0)

- 8., 10. and 11. questions are scored as follows: 0 = (0 to 1) 1 = (2 to 4)

- 3., 5., 7., 9., 12., 13., 14., 15. and 16. questions are scored as follows: 0 = (0 to 2) 1 = (3 and 4)

- 1., 2., 4., 6. and 25. questions are scored as follows: 0 = (0 to 3) 1 = (4)

- 17., 18. and 23. questions are not scored however, they are precursor for other questions.

After calculation following deduction score, the number of symptoms varies from 0 to 7 apart from clinical sensitivity. Likewise, to substance addiction diagnosis, if food addiction criteria are met, clinical significance must be 1 and besides this, the number of symptoms must be equal to at least 3 or more than 3. In this study, participants were measured in accordance with both scoring options.

3.3.5. Morningness-Eveningness Questionnaire (MEQ)

The last part of the questionnaire is Morningness- Eveningness Questionnaire (MEQ). Horne and Östberg firstly developed this questionnaire in 1976. After that Pündük et al. adapted into Turkish in 2005. Furthermore, MEQ includes 19 multiple–choice questions; these have four or five different response choices in order to determine the preference of the circadian cycle. Any answers are evaluated in different scores from 0 to 6. A total score was found by summing up every question's score. MEQ aims to reveal individuals' sleep patterns or circadian rhythms. There are five different categories of chronotype in accordance with the results. These are;

- definitely morning type a score between 70 and 86
- moderately morning type a score between 59 and 69
- intermediate type, a score between 42 and 58
- moderately evening type, a score between 31 and 41
- definitely evening type, a score between 16 and 30

3.4. Statistical Analysis

Statistical analyses were performed using SPSS Statistics for Windows, version 23.0 (IBM Corp, Armonk, NY). Numerical variables are presented as mean and standard deviation (SD). Categorical variables are presented as frequencies and percentages. Kolmogorov-Smirnov tests for normality were used to determine distribution. According to distribution, the Mann-Whitney U test or independent sample t-test was used to compare differences between two independent groups, and the Kruskal-Wallis test was used to compare more than two groups. The Pearson chi-square test was used to analyse categorical variables. A p-value of ≤ 0.05 was considered statistically significant. Pearson's and Spearman's correlation coefficients were used to investigating the correlations between the parameters. Correlation between scales was interpreted as follows: r = 0–0.19 a very weak correlation, r = 0.20–0.39

weak correlation, r =0.40–0.59 moderate correlation, r = 0.60–0.79 strong correlation and r = 0.80–1 very strong correlation.

3.5. Ethical Dimension

Ethics approval was acquired by Yeditepe University Non-Invasive Clinical Research Ethics Committee before starting the data gathering process of the study. In the structure of the investigation, applicants have been informed, and their permission has been received. The principles and aims of this research were clarified in written as well as spoken, and participants were kept informed that these answers would not be used for another reason, but these would be used for merely academic intentions. As 202105034 numbered 02.09.2021 dated “Ethical Council Approval” form is given in the appendix 3.

4. RESULTS

The demographic variables of the participants in the study were given in Table 4.1.

Table 4.1. Distribution of Adults Participating in the Study According to Demographic Characteristics

Variables	**(n=121)**	**(%)**
Age (years) $\bar{x} \pm s$	31.7± 9.0	-
Sex		
Female	103	85.1%
Male	18	14.9%
Marital Status		
Married	55	45.5%
Single	66	54.5%
Education		
Below Primary School	2	1.7%
Primary School	3	2.5%
Middle School	5	4.1%
High School	19	15.7%
University	76	62.8%
Master/Doctorate	16	13.2%
Occupation		
Unemployed	21	17.4%
Employed	88	72.8%
Retired	3	2.5%
Student	9	7.4%

It is found that adults' age mean is 31.7± 9.0. As it is seen, 85.1% of participants are women while 14.9% are men. According to marital status, it is shown that 45.5% of the participant are married, 54.5% are single. Moreover, it can be noted that 62.8% of participants graduated from a university which is the highest rate compared to any education level.

The distribution of participants' clinical characteristics is shown in Table 4.2. According to the clinical characteristic of participants, it is found that 24% of participants have chronic disease while 76% have not.

When smoking use condition is examined, it is noted that 20.7% of participants use a cigarette. However, according to alcohol use conditions, it is also noted that 17.4% of participants use alcohol. Furthermore, when physical activity status is reported, it is revealed that 35.5% of participants regularly do physical activity.

Anthropometric characteristics of individuals are given in Table 4.3. It was found that the mean of participants' weight is 72.9 ± 17.6 and the mean of height is 166.2 ± 8.0. As well as that mean of BMI, measured is 26.2 ± 5.5. When weight circumference is measured, it is found that mean of waist circumfrence is 82.5 ± 15.9.

The chronotype distribution of individuals by sex is presented in Table 4.4. In both sex, participants with intermediate type chronotype constitute the majority. A statistically significant difference was found between both sex in terms of intermediate type and moderately evening type (p=0.001). Moderately evening type was seen more frequent among women than men.

Table 4.2. Distribution of Adults Participating in the Study According to Clinical Characteristics

Variables	(n=121)	(%)
Chronic Disease Status		
Yes	29	24%
No	92	76%
Smoking Use		
Yes	25	20.7%
No	96	79.3%
Alcohol Use		
Yes	21	17.4%
No	100	82.6%
Physical Activity		
Yes	43	35.5%
No	78	64.5%

Table 4.3. Anthropometric Measurement Characteristics of Individuals

Variables	Mean±SD	Min-Max
Weight (kg)	72.9 ± 17.6	45.0 - 140.0
Height (cm)	166.2 ± 8.0	150.0 - 194.0
BMI (kg/cm^2)	26.2 ± 5.5	14.7 - 47.9
Waist Circumfrence (cm)	82.5 ± 15.9	58.0 - 153.0

SD=standart deviation

Table 4.4. Distribution of Chronotype by Sex

	Number of Case – Percentage (n-%)				p value X^2
Variables	**Moderately Morning Type**	**Intermediate Type**	**Moderately Evening Type**	**Total**	
Women	11 - 11%	75 - 75%	14 - 14%	100	0.071
Men	4 - 22.2%	13 - 72.2%	1 - 5.6%	18	**0.001***
Total	15 - 12.7%	88 - 74.6%	15 - 12.7%	118	**0.001***

*statistically significant at $p \leq 0.05$, X^2: Chi-square Test

Table 4.5. demonstrates the evaluation of alcohol and smoking consumption status considering participants' chronotype. It is reported that the highest rate of smoking status is seen in moderately morning type. On the contrary, the highest rate of alcohol consumption is seen among participants who are moderately evening type.

Table 4.5. Distribution of Alcohol Consumption and Smoking by Chronotype

	Number of Case - Percentage		
Variables	**Moderately Morning Type**	**Intermediate Type**	**Moderately Evening Type**
Alcohol Consumption	2 - 13.3%	14 - 15.9%	3 - 20%
Smoking	4 - 26.7%	18 - 20.5%	2 - 13.3%

The percentage of food addiction according to sex is shown in Table 4.6. A statistically significant difference was found between men and women regarding food addiction diagnosis ($p = 0.005$).

According to table 4.6, it is observed that 15% of participants are diagnosed with food addiction. Food addiction is more frequent in women compared to men.

Smoking, alcohol use, and physical activity characteristics of individuals with food addiction are presented in Table 4.7. It is found that those who do not do regular physical activity more tend to be diagnosed with food addiction (61.1%). Although 5.6% of people with food addiction use alcohol, 94.4% of them do not use it.

Table 4.6. Food Addiction According to Sex

		Number of Case (n)	**- Percentage (%)**		**p value X^2**
Variables		**Food Addict**	**Not Food Addict**	**Total**	
Sex	**Women**	15 - 83.3%	87 - 85.3%	102	**0.005***
	Men	3 - 16.7%	15 - 14.7%	18	**0.001***
	Total	18 - 15%	102 - 85%	120	

*Statistically significant at $p \leq 0.05$, X^2: Chi-square Test

Table 4.7. Distribution of Habits and Physical Activity Status in People Having Food Addiction

Variables	Food Addict (n)	(%)
Doing Regularly Physical Activity		
Yes	7	38.9%
No	11	61.1%
Alcohol Use		
Yes	1	5.6%
No	17	94.4%
Smoking		
Yes	6	33.3%
No	12	66.7%

According to some attitudes examined, the prevalence of food addiction and chronotype is presented in Table 4.8. While 20% of participants with moderately evening chronotype had a food addiction, food addiction was observed in 7.1% of individuals with moderately morning chronotype. It is clear that food addiction is more frequent in moderately evening type rather than moderately morning type. Additionally, there are not definitely evening and definitely morning type people among the whole participants.

When smoking status and alcohol consumption are investigated, it is seen that people smoking (24%) are more food addicted than people (4.8%) who use alcohol. Moreover, it is recorded that 14.1% of participants doing regular physical activity are food addicted.

When eating before sleep and during sleep status are investigated, it is seen that people (18.8%) who eat before sleep are more addicted than people who eat during sleep (10%).

Table 4.8. Prevalence of Food Addiction According to Some Attitudes and Chronotype

Variables	Food Addict – Percentage (n - %)
Doing Regularly Physical Activity (n=78)	11- 14.1%
Acohol Use (n=21)	1- 4.8%
Smoking (n=25)	6- 24%
Eating Before Sleep (n=33)	6- 18.8%
Eating During Sleep (n=10)	1- 10%
Definitely Morning Type (n=0)	-
Moderately Morning Type (n=15)	1- 7.1%
Intermediate Type (n=88)	14- 15.9%
Moderately Evening Type (n=15)	3- 20%
Definitely Evening Type (n=0)	-

n: number of case %: percentage

When eating before sleep and during sleep status are investigated, it is seen that people (18.8%) who eat before sleep are more addicted than people who eat during sleep (10%).

When the participants were compared in terms of their waist circumference, BMI, and chronotype scale total score parameters, there was a statistically significant difference between the groups with and without food addiction only in terms of BMI as shown in Table 4.9. There is a significant difference in BMI scores between food addicts and non-food addict people ($p \leq 0.05$). Individuals with food addiction have a higher BMI than without food addiction.

It is clear that among food addict people, their mean total chronotype score is (49.8±7.8) lower than non-addict's (51.8±7.1). In addition to this, when waist circumference is considered, it was found that the mean waist circumference is 89.7±20.1 among food addict individuals while the mean is 81.2±14.8 among non-addict individuals.

Table 4.9. Comparison of People Who are Food Addictive and Not Addictive According to Their Waist Circumference, BMI and Chronotype Score

	Food Addict (n=18)	**Non-Food Addict (n=102)**	**p value***
Variables	**Mean±SD (Min-Max)**	**Mean±SD (Min-Max)**	***U***
Waist Circumfrence (cm)	89.7±20.1 (65.0-153.0)	81.2±14.8 (58.0-128.0)	0.058
BMI	29.5±6.82 (23.0-47.9)	25.6±5.1 (14.7-45.2)	**0.023***
Total Chronotype Score	49.8±7.8 (36.0-61.0)	51.8±7.1 (32.0-68.0)	0.347

SD: standard deviation. *statistically significant at $p \leq 0.05$. *U:* Mann Whitney U Test

Prevalence of food addiction according to the category of waist circumference in both sex is given in Table 4.10. Among women, it is seen that 50% of addictive women are measured their waist circumference as 88 cm above. Meanwhile, 54.4% of non-addictive women is measured their waist circumference as 80 cm below. It is revealed that addictive women have a more tendency to be central obese than non-addict ones.

The relationship between individuals chronotype and the number of applying for a dietitian is given in Table 4.11. Among moderately morning type individuals, 15.4% of them

applied for a dietitian for 1 time, 46.2% for 2 times, 23.1% for 3 times, and 15.4% for 4 or more times.

Among intermediate type individuals, 46.6% of them applied for a dietitian for 1 time, 21.9% for 2 times, 13.7% for 3 times, 17.8% for 4 times, and more. Additionally, among moderately evening type individuals, 45.5% of them applied for a dietitian for 1 time, 9.1% for 2 times, 45.5% for 4 times or more, and there is no one who apply for a dietitian for 3 times as moderately evening type. It is clear that people who were moderately evening type more tend to apply for a dietitian in 4 times or more.

Table 4.10. Prevalence of Food Addiction According to Waist Circumference

	Number of Case – Percentage (n - %)			
	Food Addict		**Non-Food Addict**	
Waist Circumfrence Total	**Women**	**Men**	**Women**	**Men**
Low Risk (<80 cm)	5- 35.7%	-	43- 54.4%	-
Risk (80-88 cm)	2- 14.3%	-	19- 24.1%	-
High Risk (>88 cm)	7- 50.0%	-	17- 21.5%	-
Low Risk (<94 cm)	-	2- 66.7%		9- 75%
Risk (94-102 cm)	-	0 – 0%		0 -0%
High Risk (>102 cm)	-	1- 33.3%		3- 25%

Table 4.11 Distribution of People According to Their Chronotype and The Number of Applying for A Dietitian

Variables	**Number of Case – Percentage (n - %)**		
	Moderately Morning Type	**Intermediate Type**	**Moderately Evening Type**
Number of Application			
1 time	6- 46.1%	34- 46.6%	5- 45.5%
2 times	3- 23.1%	16- 21.9%	1- 9.0%
3 times	2- 15.4%	10- 13.7%	-
4 times and more	2- 15.4%	13- 17.8%	5- 45.5%

The relationship between food addict people and non-addict considering the number of applications for a dietitian is given in Table 4.12. 16.7% of food addict people applied for a dietitian for 1 time, 27.8% of them for 2 times, 11.1% for 3 times, and 44.4% for 4 times. It is clear that the highest application for a dietitian is seen among food addict participants.

The relationship between clinical parameters is given in Table 4.13 by using Spearman's Rho correlation method. Among the parameters examined, only a very strong correlation was found between BMI and waist circumference. Eating attitudes before and during sleep were weakly correlated with BMI. There is no statistically correlation between

the number of applications for a dietitian and total chronotype scores. In addition to this, there is no correlation between chronotype and diagnosis of food addiction.

Table 4.12. Distribution of People with Food Addiction According to The Number of Application for Dietitian

Variables	Number of Case (n)	Percentage (%)
1 time		
Food Addict	3	16.7%
Non-Food Addict	42	41.2%
2 times		
Food Addict	5	27.8%
Non-Food Addict	17	16.7%
3 times		
Food Addict	2	11.1%
Non-Food Addict	10	9.8%
4 times and more		
Food Addict	8	44.4%
Non-Food Addict	13	12.7%

The distribution of nutritional problems in specific foods among individuals considering food addiction is given in Table 4.14. Beyond food addict people, ice cream, chocolate, fried potatoes, and hamburgers are the most problematic foods. Despite this, no one has a problem with apple, lettuce, strawberry, and banana among food addicted people.

Table 4.13 Relationship Between Clinical Parameters

Variables		Waist Circumference	Smoking	Alcohol use	Total Chronotype Score	Attitudes of eating during sleep	Attitudes of eating before sleep
Food Addiction	**r_s**		-0.147	0.121	-0.088	0.042	
	p		0.108	0.188	0.347	0.647	
BMI	**r_s**	**0.811***				-0.337	-0.334
	p	**0.001**				0.001	0.001
The number of applications for dietitian	**r_s**				-0.161		
	p				0.113		

r: Spearman's Rho correlation coefficient, *r = 0.80–1 very strong correlation.

When it is examined with non-food addict people, it is observed that chocolate is the most problematic food. It is also revealed that the minority of people without food addiction, have problems with strawberry, apple, and lettuce.

Table 4.15 shows the comparison of participants according to the distribution of food addiction criteria in food addict and non-food addict people. A statistically significant relationship was observed between 'Outrageous intake of substance over a longer period of time than envisaged', 'Spending too much time and perform acts to obtain, use and recover', 'Continue to consume in spite of knowing to have harmful consequences', 'Developing a tolerance (demolition of effect amount)', 'Characteristic feeling of deprivation occurring

after cutting out certain foods', 'Significant clinical impairment of use' and diagnosis of food addiction.

Table 4. 14. Nutritional Problems Among People with and without Food Addiction

	Number of Case – Percentage (n - %)	
Foods	**Food Addict (n=18)**	**Non-Food Addict (n=102)**
Ice cream	14- 77.8%	21- 20.6%
Chocolate	12- 66.7%	51- 50.0%
Apple	0- 0%	1- 1.0%
Donat/Sweet Donut	6- 33.3%	31- 30.4%
Broccoli	3- 16.7%	4- 3.9%
Cookies/biscuits	11- 61.1%	19- 18.6%
Cake	9- 50%	45- 44.1%
Candy/confectionery	7- 38.9%	30- 29.4%
Pizza	5- 27.8%	30- 29.4%
Bread	6- 33.3%	28- 27.5%
Pastry	7- 38.9%	33- 32.4%
Lettuce	0- 0%	1- 1.0%
Pasta	6- 33.3%	35- 34.3%
Strawberry/Cherry/Grape	0- 0%	1- 1%
Rice	4- 22.2%	23- 22.5%
Cracker	2- 11.1%	14- 13.7%
Chips	5- 27.8%	36- 35.3%
Soda Water/Soft drinks	2- 11.1%	16- 15.7%
Bagel	4- 22.2%	15- 14.7%
Fried potatoes	11- 61.1%	35- 34.3%
Carrot	0- 0%	3- 2.9%
Steak	1- 5.6%	2- 2.0%
Banana	0- 0%	2- 2.0%
Dried meat	1- 5.6%	6- 5.9%
Hamburger	10- 55.6%	32- 31.4%
Cheseeburger	2- 11.1%	16- 15.7%

Table 4.15. Comparision of People with and without Food Addiction According to Food Addiction Criteria

Food Addiction Criteria	**Met the Criteria**	**Food Addict**		**Non-Food Addict**		X^2
		n	**%**	**n**	**%**	
1.Outrageous intake of substance over a longer period of time than envisaged	Yes	12	66.7	15	14.7	**0.001***
	No	6	33.3	87	85.3	
2. Constant desire or frequent failures to stop	Yes	18	100	97	95.1	0.599
	No	0	0	5	4.9	
3.Spending too much time and perform acts to obtain, use, and recover	Yes	16	88.9	16	15.7	**0.001***
	No	2	11.1	86	84.3	
4.Crucial social, business or leisure activities decreased or stopped	Yes	10	55.6	43	42.2	0.291
	No	8	44.4	59	57.8	
5.Continue to consume in spite of knowing to have harmful consequences	Yes	15	83.3	53	52.0	**0.013***
	No	3	16.7	49	48.0	
6.Developing a tolerance (demolition of effect amount)	Yes	18	100	79	77.5	**0.045***
	No	0	0	23	22.5	
7.Characteristic feeling of deprivation occurring after cutting out certain food	Yes	10	56.6	8	7.8	**0.001***
	No	8	44.4	94	92.2	
8.Significant clinical impairment of use	Yes	18	100	1	1	**0.001***
	No	0	0	101	99	

*Statistically significant at $p \leq 0.05$, X^2: Chi-Square Test

5. DISCUSSION

In the present study, the association between food addiction and the number of applications for a dietitian according to the participants' chronotype were investigated. Either there is a relationship among food addict people, and their chronotype with other results were evaluated.

When the food addiction prevalence is measured in this study, it is recorded that 15% of participants were food addicts. According to a study conducted with middle-aged, and old women, the prevalence of food addiction is 9 % (207). In another study, food addiction was recorded as 8.8% in a sample of primarily normal-weight individuals (208). In a study, US and Australian sample, food addiction was found 12% of participants, which was consistent beyond a few of studies (209). As a result of that, the present study was carried out with moderately overweight and obese people, the prevalence of food addiction is higher in the present study than these studies performed in the general population. According to a study conducted with bariatric surgery, including obese people, the prevalence of food addiction was found as 16.5% resembling our findings of the present study (210).

In this study, when it is taken into account sex, there was no homogeneous distribution. The vast majority of participants were women (85.1%) compared to men (14.9%). There was a significant difference in both sex considering food addiction. It is found that food addiction is more common in women, which may be result because of a high amount of women population. The result of sex differences in food addiction is consistent with previous studies. According to a study evaluating sex differences in an eating disorder, females addressed nearly more than two-time food addiction rates compared with men (211). It is thought that this may stem from differences in enhanced frequency and cravings in relation to food and enhanced reactivity to food cues underwent with obesity compared with males (212, 213).

According to the result of chronotype spread in the present sample, the majority of participants belonged to the intermediate chronotype. In addition to this, there was not observed any extreme chronotype. Contrary to the finding of the present study, a previous

study showed that 40% of people had two extreme chronotypes. Following this, the majority of participants belong to the intermediate type, which is consistent in our sample (214).

The result of chronotype in terms of sex does not always show a consistent rate. In the present study, there was a significant difference between both sex, and women more likely to be moderately evening type comparing to men. While one study conducted with teenagers found higher morningness in boys, another study in the same age group found higher morningness in girls. (215, 216). Differently, many research can demonstrate that women have more tendency to be morning type compared to men (217, 218). It is reported that these differences between sex might result from the differences in sexual hormones, which can affect the suprachiasmatic nucleus, known as an important location in circadian rhythm (219).

It was reported that BMI and waist circumferences of the people who were food addict were higher than those who were not. Previous studies were found the same finding in terms of waist circumference and BMI. According to a study conducted with 652 people, the mean waist circumference was 105.5 ± 15.3 in food addict people while it was 94.4± 14.6 in non-food addict people (220). In another study, like the present study, BMI level was significantly higher in food addict people than non-food addict ones ($p<0.001$). In addition to this, the mean waist circumference was 107.53 ± 10.15 in non-food addict people; however, the mean BMI was 111.8 ± 11.02 in food addict people (221). On the contrary of these results, a study conducted with consecutive obese patients in 2016 found that there is no significant relationship between BMI and food addiction (222).

It is known that people who are obese show greater activity of rewards, especially in the basal ganglia, compared to normal-weight people. A previous study reported that food addiction was more common in obese patients due to this alteration. But in our study, the absence of significant results may be due to low prevalence of food addiction diagnosis in the sample (14)**.**

In this current study, there was no significant relationship between YFAS and MEQ score, although the mean of MEQ score was lower in food addict people than non-food addict

ones. Contrarily, a study investigating the prevalence of food addiction according to chronotype in university students found a negative significant relationship between YFAS score and MEQ ($p = 0.001$) (223). Kervran et al. indicated that being evening type was more related to poly-problematic addiction by researching with 333 volunteer people. (224) Based on overall literature, evening type can be associated with evening chronotype. Similarly, the present study can support this result. In case, the higher percentage of food addict people had evening type. This result can be explained by the fact that eveningness is also closely associated with impulsivity, leading to unhealthy behaviors (225).

Smoking is known to be able to trigger food addiction. Correspondingly, in a study, smokers had a higher level of YFAS than non-smokers. However, in the present study, smoking was most commonly seen in the non-food addict group. This may be because of the small sample size (223).

As mentioned earlier, food addiction is more common in obese people than non-obese. In our study, food addiction is more common in the highest number of applications for a dietitian. Therefore, it can be concluded that people who apply more for a dietitian have a tendency to be a food addicted. Although there is no study investigating the number of applications for a dietitian or the number of consultations, some studies may indicate the same result. To a study conducted by people who experienced dietary intervention before, it was found to be more successful in losing weight in non-food addict people than food addict ones. Additionally, food addict people tend to regain weight after losing weight than non-food addict people (226). In another study performed with 448 obese and overweight people, it was observed that BMI level significantly increased after losing weight with calorie-restricted Mediterranean diet in food addict people compared to non-food addict ones (227). However, in this study, the lack of significant results concerning the relationship between food addiction and frequency of application may be due to the low prevalence of food addiction cases.

In our study, people who were the evening type apply more often for a dietitian than morning type people. Although evening type people have more tendency to apply for a

dietitian, there was not found a significant correlation between chronotype score and frequency of application for a dietitian.

Likewise, in a previous study investigating the relationship between chronotype and weight loss maintenance, it can be resulted that those who can maintain their weight loss for a year are more likely to be morning people compared to people trying to manage their weight (228). Thomson et al. reported that better sleep quality could lead to the success of weight loss by 33% (229). In another study researching the relationship between light exposure and BMI change in kindergarten students, it was observed that enhanced outdoor light exposure was linked with less weight gain ($p= 0.015$) (230). This result was consistent with other previous studies that showed that late sleep was associated with a greater rise in BMI (231 - 233). To our knowledge, the present study can confirm the previous results by measuring the frequency of application for a dietitian which can show the difficulties of weight management.

In the present study, although each food addiction symptoms were more seen in food addict people, it was found had a significant relationship between a few of food addiction criteria which are 'Outrageous intake of substance over a longer period of time than envisaged,' 'Spending too much time and perform acts to obtain, use and recover', 'Continue to consume in spite of knowing to have harmful consequences', 'Developing a tolerance (demolition of effect amount)', 'Characteristic feeling of deprivation occurring after cutting out certain foods', 'Significant clinical impairment of use' and being a food addict. Another study researched the prevalence of food addiction in the German population using YFAS 2.0 scale. The results indicated that each food addiction criteria were more seen in food addict people than non-addict ones (234). According to a study investigating food addiction prevalence and its association with depression risk in women. The result showed that, in addition to our result, there was also found a significant relationship between 'constant desire or frequent failures to stop', 'crucial social, business or leisure activities to have harmful consequences and food addiction (235).

Our study reported that ‘constant desire or frequent failures to stop’ and ‘developing a tolerance (demolition of effect amount)’ were found most common criteria among food addict people except the essential criteria of food addiction diagnosis, which is ‘significant clinical impairment of use.’ Similarly, previous studies indicated that ‘constant desire or frequent failures to stop’ the most commonly seen criteria of food addiction compared to others (236 - 238).

The result of the study adds to the literature demonstrating that some foods are more problematic in food addict people. Ice cream and chocolate were found to be the most problematic food amongst people diagnosed with food addiction. Likewise, in another study conducted with 91 people who apply for obesity counselling unit in the local health centre, it was revealed that cake and chocolate were the most problematic foods amongst food addict people (239). In addition, these results are consistent with another study researching the relationship between food addiction and depression. The study indicated that people who are food addicts had difficulties with some foods: chocolate and cake as found in our studies. These foods, fried potatoes, cookies, bread, pastry, and pizza were also found the most problematic foods (5). According to a study carried out with children, the finding of problematic foods was consistent with our result, but more additional foods were problematic. These were coke, fried potatoes, bread, rice, candy/confectionery, chips, and pasta (240). Moreover, strawberry, apple, and lettuce were found to be the least problematic food among all participants. This may be due to the absence of high sugar and fat ingredients, which can lead to addictive behavior in humans (241, 32).

Our study has several limitations. First, the study sample consists of people who apply for a dietitian in a health care centre. Thus, providing dietary counselling while the study was conducting, may promote weight loss and influence the subjects’ score of the food addiction scale. Second, a relatively low percentage of people met the diagnosis for food addiction and belong to morningness or eveningness chronotype. Although this is a forecasted result, the sample size was too small to examine the significant relationship between chronotype and food addiction. Therefore, it will be consequential to recur the findings of the study in a large number of participants belonging to morningness and eveningness type and having food

addiction diagnosis. Finally, the present study sample was not homogeneous in terms of sex. Therefore, the study's findings might not be able to generalize to male participants due to lack of male population in our sample.

Although there are a few studies indicating the management and success of lose weight in terms of individuals' chronotype or having food addiction, there is no study investigating the frequency of application for a dietitian related to food addiction and chronotype. The present study is the first to reveal a relationship between the high volume of application for a dietitian counselling and food addiction or being evening chronotype.

6. CONCLUSION

It has been reported that people who have addictive behavior are more tendency to have an evening chronotype. Therefore, having food addiction diagnosis and evening type both might complicate to maintain lose weight.

In this study, food addiction prevalence was found to be 15%. There was a significant difference between food addict people and non-food addict ones in BMI. It seemed that people diagnosed with food addiction had more overweight than the non-food addict. As people have difficulties stopping consuming some food, they may start to gain weight, which can explain why food addict people have more BMI. In addition to this, food addiction diagnosis was the most seen in the evening type. As we forecasted, addiction behavior is more commonly seen in evening-type people.

Although there was no significant relationship between chronotype score and the number of applications for a dietitian, it was found that the most frequent application was seen in evening type and food addict people. A high number of applications can reflect the regain of loss weight, which might be due to an increase in impulsivity, which is closely associated with addictive behavior.

The results of this study contribute to the body of literature investigating the relationship between food addiction and chronotype. Taking into account the number of applications for a dietitian, it is helpful to understand those whose food addict people desires and requirements in the clinical area. In conclusion, further study can reveal the significant result, particularly when conducted in a high volume of food addiction diagnosis and evening chronotypes.

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8. APPENDICES

Appendix 1. Consent Form

Bireylerin Kronotiplerine Göre Diyetisyene Başvurma Sayıları ve Yeme Bağımlılıklarının Değerlendirilmesi

ANKET NO:..... TARİH: …../…../…..

Sayın Katılımcı;

Bu çalışma bir araştırmadır ve Bireylerin Kronotiplerine Göre Diyetisyene Başvurma Sayıları ve Yeme Bağımlılıklarının Değerlendirilmesi amacıyla, Yeditepe Üniversitesi Sağlık Bilimleri Fakültesi Beslenme ve Diyetetik Bölümü Yüksek Lisans Öğrencisi Begüm SEVGİ tarafından yapılacaktır.

Bu çalışmaya katılması beklenen tahmini gönüllü sayısı 120 kişi olarak planlanmıştır.

Çalışmaya katılımda tamamen gönüllülük esastır. Ankette sizden kimlik belirleyici hiçbir bilgi istenmemektedir. Cevaplarınız tamamen gizli tutulacak ve sadece araştırmacı tarafından değerlendirilecektir. Araştırma bir anket çalışması olup, hiçbir tehlikeli yanı bulunmamaktadır.

Elde edilecek olan bilgiler, Etik Kurul, kurum ve diğer sağlık otoritelerinin orijinal tıbbi kayıtlarına doğrudan erişimleri olacaktır. Fakat, bu gönüllü onam formunun imzalanmasıyla bu bilgiler gizli tutulacaktır. Bu çalışmaya katılmayı reddedebilirsiniz. Çalışmanın herhangi aşamasında da katılım onayınızdan vazgeçebilirsiniz.

Araştırmaya katılımınız için sizden herhangi bir ücret istenmeyecek ve katılımınız karşılığında size herhangi bir ücret ödenmeyecektir. Sizden beklenen, bilgilendirilmiş onam formunu doldurup, bu araştırmaya katkı sağlamayı kabul ettikten sonra, doldurmanızı talep edilecek olan anketlerin doldurulmasıdır.

Bu çalışmaya katılabilmeniz için;

- 18 yaşından büyük olmanız
- Hamile olmamanız
- Diyetisyen Nevin Türk Sağlıklı Beslenme ve Diyet Merkezi'ne başvurmuş olmanız gerekmektedir.

Araştırmacı: Dyt. Zahide Begüm SEVGİ
Yeditepe Üniversitesi Sağlık Bilimleri Enstitüsü Beslenme ve Diyetetik Yüksek Lisans Programı öğrencisi
Sorumlu Araştırmacı **:** Yrd. Doç. Dr. İrem KAYA CEBİOĞLU
Yeditepe Üniversitesi Sağlık Bilimleri Enstitüsü Beslenme ve Diyetetik Bölümü Öğretim Üyesi

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

Gönüllü;	Araştırmacı;	Tanık;
Ad,Soyad:	Ad, Soyad:	Ad, Soyad:
Tarih:	Tarih:	Tarih:
İmza:	İmza	İmza

Appendix 2. Survey Form

A. GENEL BİLGİ FORMU

1. Yaşınız (yıl):.....(Doğum Yılı:.....)

2. Cinsiyet

☐ Kadın ☐ Erkek

3. Medeni durumunuz?

☐ Evli ☐ Bekar

4. Eğitim Durumunuz:

☐ Okur-yazar değil ☐ Okur-yazar ☐ İlkokul mezunu
☐ Ortaokul mezunu ☐ Lise mezunu ☐ Üniversite mezunu ☐ Lisansüstü

5. Mesleğiniz:

☐ Ev hanım ☐ Memur ☐ Serbest meslek ☐ Emekli
☐ Diğer:……

6. Doktor teşhisiyle konmuş herhangi bir kronik hastalığınız var mı?

☐ Evet (.....) ☐ Hayır

7. Düzenli olarak fiziksel aktivite yapıyor musunuz?

☐ Evet ☐ Hayır

8. Cevabınız evet ise, türünü, sıklığını ve süresini belirtiniz.

.....dakika .....gün/haftada

9. Daha önce diyetisyene başvurdunuz mu ?

☐ Evet ☐ Hayır

10.Başvurduysanız kaç kez başvurdunuz ?

☐ 1 kez ☐ 2 kez ☐ 3 kez ☐ daha fazla

11. Sigara Kullanıyor musunuz?

☐ Evet ……. adet / gün ☐ Hayır ☐ Bıraktım

12. Alkol kullanıyor musunuz?

☐ Evet ☐ Hayır ☐ Bıraktım

B. BESLENME ALIŞKANLIKLARI

13. Genellikle bir günde kaç öğün yemek tüketirsiniz?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ve üstü

14. Gün içerisinde hangi öğünleri tüketirsiniz ? Birden fazla seçeceği işaretleyebilirsiniz.

☐ Kahvaltı ☐ Kuşluk ☐ Öğle ☐ İkindi ☐ Akşam ☐ Gece

15.Gece yatmadan önce yemek yeme alışkanlığınız var mıdır?
☐ Evet ☐ Hayır

16.Gece uykudan kalkıp yemek yeme alışkanlığınız var mıdır?
☐ Evet ☐ Hayır

C. ANTROPOMETRİK ÖLÇÜMLER

- Vücut ağırlığı .....kg
- Boy uzunluğu .....cm
- BKİ .....kg/m^2
- Bel çevresi .....cm

EK 1: YALE YEME BAĞIMLILIĞI ÖLÇEĞİ (YYBÖ)

Bu ankette yer alan sorular, geçen bir yıla dair yeme alışkanlıklarınızı öğrenmeyi amaçlamaktadır. İnsanlar bazen belirli yiyeceklerin tüketimini kontrol etmekte zorlanırlar:
-Dondurma, çikolata, kurabiye, pasta, şeker gibi tatlılar
-Beyaz ekmek, makarna, pirinç gibi nişastalı gıdalar
-Cips, kraker gibi tuzlu atıştırmalar
-Biftek, hamburger, pizza, patates kızartması gibi yağlı yiyecekler
-Kolalı ve şekerli içecekler
Aşağıdaki sorularda "BELİRLİ YİYECEKLER" ifadesini gördüğünüzde listedeki yiyecekler ya da benzerlerini, ya da geçen bir yıl içinde sorun yaşadığınız bir yiyecek türünü düşünün

	Hiç	Ayda 1 kez	Ayda 2-4 kez	Haftada 2-3 kez	Haftada 4 kezden fazla veya hergün
1. Bazı besinleri tüketmeye başladığımda planladığımdan çok daha fazla yedim.					
2. Daha fazla açlık hissetmiyor olmama rağmen, kendimi bazı besinleri tüketmeye devam ederken buluyorum.					
3. Kendimi fiziksel olarak rahatsız hissedene kadar yemek yerim.					
4. Bazı besin türlerini yememek veya azaltmak konusunda kaygılarım var.					
5. Çoğu zaman fazla yemeye bağlı olarak kendimi uyuşuk ve yorgun hissettim.					
6. Kendimi gün boyunca bazı besinleri sürekli tüketirken buldum.					

7. Bazı besinlere erişemediğimde, o besinleri elde etmek için elimden geleni yaparım. Örneğin, evde başka yiyecek seçenekleri olmasına rağmen, istediğim besini satın almak için markete gittim.					
8. Çalışmak, ailem ve arkadaşlarımla vakit geçirmek, diğer başka önemli aktivitelere veya keyif aldığım eğlenceli faaliyetlere zaman ayırmak yerine vaktimi bazı besinleri çok sık veya fazla miktarlarda tüketerek harcadığım zamanlar oldu.					
9. Çalışmak, ailem ve arkadaşlarımla vakit geçirmek, diğer başka önemli aktivitelere veya keyif aldığım eğlenceli faaliyetlere zaman ayırmak yerine, bazı besinleri sık veya fazla miktarlarda tükettiğim için kendimi kötü hissederek vaktimi tükettiğim oldu.					
10. Fazla yeme korkusuyla bazı besinlerin bulunduğu mesleki veya sosyal ortamlardan uzak durduğum zamanlar oldu.					
11. Orada bulunacak bazı besinleri tüketemeyeceğim için mesleki veya sosyal ortamlardan uzak durduğum zamanlar oldu.					
12. Bazı besinleri tüketmeyi kestiğimde ya da azalttığımda gerginlik, kaygı veya başka fiziksel belirtiler yaşadığım zamanlar oldu. (Gazlı içecekler, kahve, çay, enerji içeceği gibi kafein içeren içeceklerin tüketiminin azaltılmasına veya kesilmesine bağlı olan belirtiler HARİÇ)					
13. Kaygı, gerginlik hissi veya diğer fiziksel belirtileri önlemek için bazı besinleri tükettiğim zamanlar oldu. (Lütfen bu soruyu cevaplandırırken, gazlı içecekler, kahve, çay, enerji içeceği gibi kafein içeren içecekleri düşünmeyiniz)					
14. Bazı besinleri tüketmeyi azalttığımda ya da kestiğimde bu besinleri tüketme isteğim ve dürtülerim arttı.					
15. Besin ve yemeye ilişkin davranışlarım önemli derecede strese neden oldu.					
16. Besinler ve yemek yüzünden bazı sorumluluklarımı (günlük rutin işler, iş/okul, sosyal aktiviteler, aile aktiviteleri, sağlık sorunları gibi) etkin olarak yerine getirmede önemli sorunlar yaşadım					

Geçtiğimiz 12 ayda	Evet	Hayır
17. Besin tüketimim depresyon, kaygı, kendimden nefret etme veya suçluluk duygusu gibi önemli psikolojik sorunlara neden oldu.		
18. Besin tüketimim önemli fiziksel sorunlar yaşamama veya mevcut fiziksel sorunlarımın daha da kötüleşmesine sebep oldu.		
19. Duygusal ve/veya fiziksel sorunlar yaşamama rağmen aynı tür besinleri tüketmeye veya aynı miktarlarda tüketmeye devam ettim.		
20. Zaman içerisinde, olumsuz duygularımı azaltmak veya aldığım keyfi arttırmak için, çok daha fazla yemek yemeye ihtiyaç duydum.		
21. Bir besini eskiden tükettiğim miktarlarda tükettiğimde, olumsuz duygularımın azalmadığı veya besinden aldığım keyfin artmadığının farkındayım.		
22. Bazı besinlerin tüketimini azaltmayı veya bunları hiç tüketmemeyi istiyorum.		
23. Bazı besinlerin tüketimini azaltmayı veya bunları hiç tüketmemeyi denedim.		
24.Bazı besinlerin tüketimini azaltmakta veya bunları hiç tüketmemekte başarılı oldum.		

25. Geçtiğimiz bir yıl içerisinde kaç kez bazı besinlerin tüketimini azaltmayı veya tamamen kesmeyi denediniz?	Hiç	1 kez	2 kez	3 kez	4 kez	5 kez veya daha fazla

26. Lütfen sorun yaşadığınız tüm besinleri daire içine alınız:

Dondurma	Çikolata	Elma	Yağda kızarmış hamur tatlıları	Brokoli	Kurabiye	Kek / Pastalar	Şekerleme	Pizza
Beyaz ekmek	Poğaça	Marul	Makarna	Çilek	Pilav	Krakerler	Cips	Gazoz
Tuzlu simit	Patates kızartması	Havuç	Biftek	Muz	Pastırma	Hamburger	Çizburger	Hiçbiri

27. Listede belirtilenler dışında sorun yaşadığınız başka besinler varsa lütfen belirtiniz:

……..

EKLER 2. Sabahçıl Akşamcıl Anketi
Turkish version of the MEQ

AÇIKLAMALAR
İnsanlar yaşam biçimleri, uyku-uyanıklık düzenleri ve gösterdikleri performansların zamanı bakımından "sabah tipi" ve "akşam tipi" şeklinde sınıflandırılabilirler. Aşağıda bununla ilgili sorular bulunmaktadır. Lütfen her bir soruyu cevaplandırmadan önce dikkatli bir şekilde okuyun. Tüm soruları cevaplandırın. Her bir soru için cevabınız diğerlerinden bağımsız olmalıdır, geri dönmeyin ve cevaplarınız kontrol etmeyin. Her bir soru için bir tek cevap seçin. Bazı sorularda cevap olarak bir cetvel bulunmaktadır. Size doğru gelen seçeneği cetvel üzerinde ya da uygun sayıyı dikkate alarak işaretleyin.

SORULAR
1. Eğer gündüz planlarınızı başkalarından bağımsız olarak tek başınıza yapabilmiş olsaydınız saat kaç civarında yataktan kalkmak sizin için en uygunu olurdu?

- 05:00 - 06:30
- 06:30- 07:45
- 07:45 - 09:45
- 09:45 - 11.00
- 11:00 - 12:00

05:00 06:30 07:45 09:45 11:00 12:00
<---5---> <---4---> <-------3-------> <---2---> <—1—>

2.Eğer akşam planlarınızı başkalarından bağımsız olarak tek başınıza yapabilmiş olsaydınız saat kaç civarında yatmak sizin için en uygunu olurdu?

- 20:00 - 21:00
- 21:00 - 22:15
- 22:15 - 00:30
- 00:30 - 01:45
- 01:45 - 03:00

20:00 21:00 22:15 24:30 01:45 03:00
<---5---> <----4----> <--------3--------> <---2---> <——1----->

3. Sabahları belli bir saatte kalkmak zorunda olduğunuzda saat kurup zil sesiyle uyanmaya ne derecede kendinizi bağımlı hissedersiniz?
- Hiç bağımlı hissetmem
- Çok az bağımlı hissederim
- Oldukça bağımlı hissederim
- Çok bağımlı hissederim

4. Çevresel şartlar tam olarak uygun olsa sabahları yataktan kalkmak size ne denli kolay gelir?
- Asla kolay gelmez
- Çok kolay gelmez
- Oldukça kolay gelir
- Çok kolay gelir

5.Sabahları kalktıktan sonraki ilk bir saat içinde kendinizi ne denli canlı ve uyanık hissedersiniz?
- Asla canlı hissetmem
- Hafif canlı hissederim
- Oldukça canlı hissederim
- Çok canlı hissederim

6. Sabahları kalktıktan sonraki ilk bir saat süresince iştahınız nasıldır?
- Çok kötü
- Oldukça kötü
- Oldukça iyi
- Çok iyi

7. Sabahları kalktıktan sonraki ilk bir saat içinde kendinizi ne denli yorgun hissedersiniz?
- Çok yorgun
- Oldukça yorgun
- Oldukça dinlenmiş
- Çok dinlenmiş

8. Ertesi güne ait bir randevu ya da işiniz olmadığında her zamanki yatma vaktinize göre erken ya da geç mi yatarsınız?
- Asla geç yatmam
- 1 saatten daha az geç yatarım
- 1-2 saat daha geç yatarım
- 2 saatten daha fazla gecikirim

9. Biraz fiziksel egzersiz yapmaya karar verdiniz. Bir arkadaşınız da bunu haftada iki kez ve birer saat yapmanızın uygun olduğunu belirterek bunun için en iyi zamanın sabah 07:00-08:00 Arası olduğunu söyledi. En iyi performansı elde etmeyi hedef alarak bunun ne düzeyde gerçekleşebileceğini düşünürsünüz?
- İyi bir şekilde gerçekleşeceğini düşünürüm
- Orta derecede başarılı olurum
- Güç olacaktır
- Çok güç olacaktır

10. Uyku ihtiyacınızın artmasına bağlı olarak gün içinde saat kaç sularında kendinizi yorulmuş hissedersiniz?
- 08:00 - 09:00
- 09:00 - 10:15
- 10:15 - 12:45
- 12:45 - 14:00
- 14:00 - 15:00

08:00 09:00 10:15 12:45 14:00 15:00
<---5---> <——4----> <---------3---------> <---2---> <—1--->

11. Bir güne ait planlarınızı tam olarak kendinizin ayarladığınızı düşünün. Size, iki saat sürecek ve sonunda zihinsel olarak yorgun düşürecek bir başarı testi uygulanacak olsa en iyi Performansı gösterebilmeniz için bu testin hangi saat diliminde uygulanması sizce uygun olur?
- Sabah 08:00-10:00
- Sabah 11:00-13:00
- Öğleden sonra 15:00-17:00
- Akşam 19:00-21:00

12. Gece saat 23.00'de yattığınızı düşünün. Yatağa yattığınızda kendinizi ne düzeyde yorgun hissedersiniz?
- Hiç yorgun hissetmem
- Çok az yorgun hissederim
- Oldukça yorgun hissederim
- Çok fazla yorgun hissederim

13. Bir takım nedenlerden ötürü her zamankinden 3-4 saat daha geç yattığınızı ancak ertesi sabah belli bir saatte kalkmanız gerekmediğini düşünün. Aşağıdakilerden hangisi yatış ve kalkış zamanınızı en iyi tanımlar?
- Her zamanki vakitte uyanırım ve tekrar uyumam
- Her zamanki vakitte uyanırım ama daha sonra hafifçe uyuklarım
- Her zamanki vakitte uyanırım ama tekrar uykuya dalarım
- Her zamankinden geç uyanırım

14. Sabah 04:00-06:00 arası nöbet tuttuğunuzu ve uyanık durmak zorunda olduğunuzu düşünün. Ertesi güne ait bir randevunuz da yok. Böyle bir durumda aşağıdakilerden hangisini yaparsınız?

- Nöbet bitene kadar yatmam
- Nöbetten önce hafif bir şekerleme yapar ve nöbetten sonra uyurum
- Nöbetten önce uyur nöbetten sonra da biraz kestiririm
- Nöbetten önce iyice uyur ve uykumu almış olurum

15. İki saat süreyle bedensel olarak sıkı bir şekilde çalışmak zorunda olduğunuzu düşünün. Günlük çalışma planınızı ayarlamakta da tamamıyla serbest olsanız aşağıdaki zaman dilimlerinden hangisi sizin için en iyi çalışma zamanıdır?

- Sabah 08:00-10:00
- Sabah 11:00 - öğeden sonra 13:00
- Öğleden sonra 15:00-17:00
- Akşam 19:00-21:00

16. Sıkı bir fiziksel egzersiz yapmaya karar verdiniz. Bir arkadaşınız da bunu haftada iki kez ve birer saat yapmanızın uygun olduğunu belirterek bunun için en iyi zamanın gece 22:00-23:00 arası olduğunu söyledi. En iyi performansı elde etmeyi hedef alarak bunun ne düzeyde gerçekleşebileceğini düşünürsünüz?

- İyi bir şekilde gerçekleşeceğini düşünürüm
- Orta derecede başarılı olurum
- Güç olacaktır
- Çok güç olacaktır

17. Çalışma saatlerinizi kendinizin belirlediğinizi düşünün. Günde 5 saat (yemek arası dahil) Çalıştığınızı, işinizin ilginç bir iş olduğunu, severek çalıştığınızı ve elde ettiğiniz başarıya göre de ücret aldığınızı farz edin. Böyle bir durumda 5 çalışma saati olarak hangi saatleri seçerdiniz?

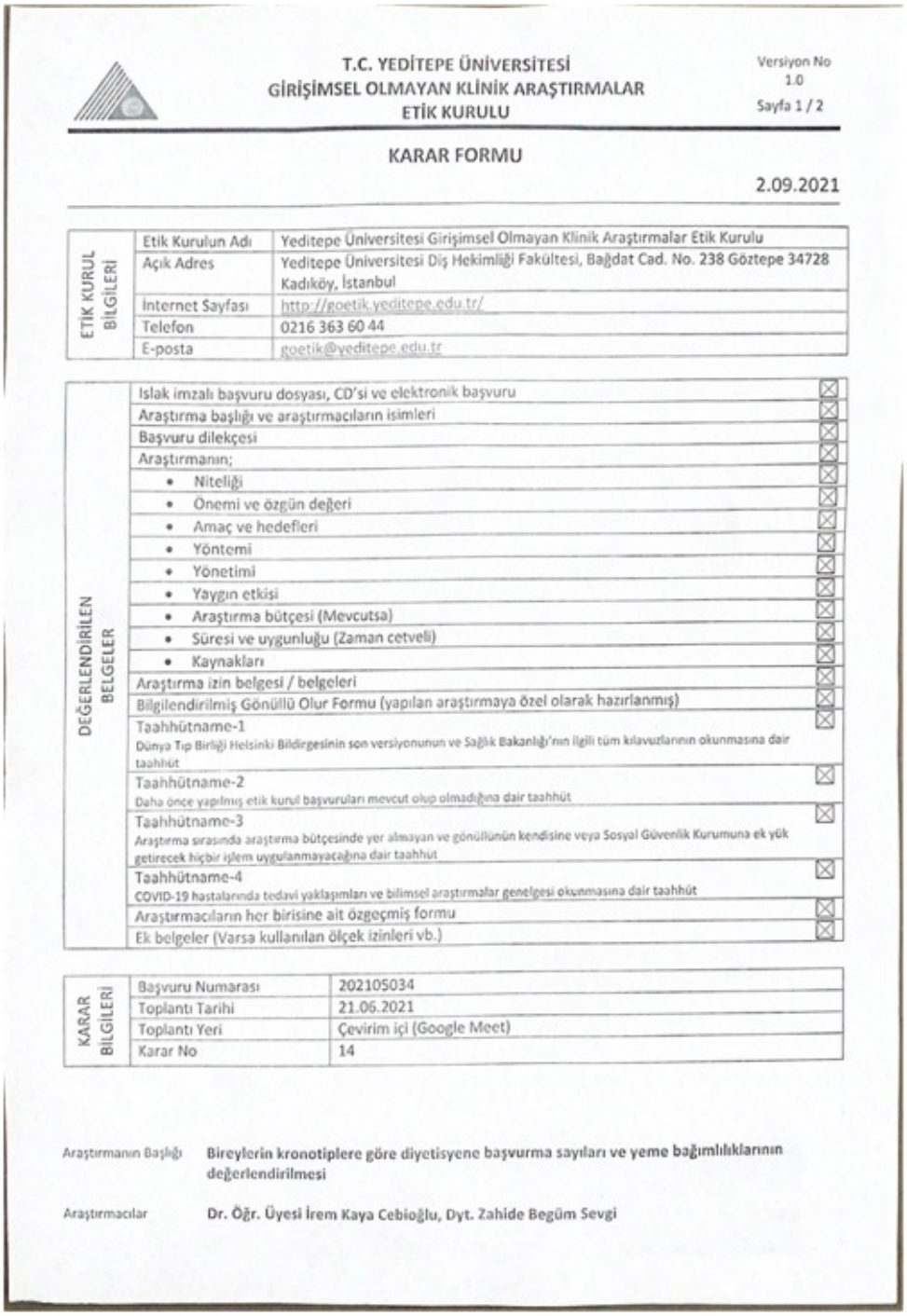
24 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 16 19 20 21 22 23 24
Gece yarısı Öğleden sonra Gecede yarısı
<—— -----><----------><----------><----------><----------><---------->

18. Gün içinde kendinizi en iyi hissettiğiniz zaman dilimi hangisidir?
24 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 16 19 20 21 22 23 24
Gece yarısı Öğleden sonra Gecede yarısı
<—— -----><----------><----------><----------><----------><---------->

19. İnsanlar yaşam biçimleri, uyku-uyanıklık düzenleri ve gösterdikleri performanslar›n Zamanı bakımından “sabah tipi” ve “akşam tipi” şeklinde sınıflandırılabilirler. Aşağıdakilerden hangisi bu bakımdan sizi en iyi şekilde tanımlar?

- Kesinlikle sabah tipi
- Akşam tipinden daha ziyade sabah tipi
- Sabah tipinden daha ziyade akşam tipi
- Kesinlikle akşam tipi

Appendix 3. Ethical Approval



T.C. YEDİTEPE ÜNİVERSİTESİ
GİRİŞİMSEL OLMAYAN KLİNİK ARAŞTIRMALAR
ETİK KURULU

Versiyon No
1.0
Sayfa 1 / 2

KARAR FORMU

2.09.2021

ETİK KURUL BİLGİLERİ	
Etik Kurulun Adı	Yeditepe Üniversitesi Girişimsel Olmayan Klinik Araştırmalar Etik Kurulu
Açık Adres	Yeditepe Üniversitesi Diş Hekimliği Fakültesi, Bağdat Cad. No. 238 Göztepe 34728 Kadıköy, İstanbul
İnternet Sayfası	http://goetik.yeditepe.edu.tr/
Telefon	0216 363 60 44
E-posta	goetik@yeditepe.edu.tr

DEĞERLENDİRİLEN BELGELER	
Islak imzalı başvuru dosyası, CD'si ve elektronik başvuru	☒
Araştırma başlığı ve araştırmacıların isimleri	☒
Başvuru dilekçesi	☒
Araştırmanın;	☒
• Niteliği	☒
• Önemi ve özgün değeri	☒
• Amaç ve hedefleri	☒
• Yöntemi	☒
• Yönetimi	☒
• Yaygın etkisi	☒
• Araştırma bütçesi (Mevcutsa)	☒
• Süresi ve uygunluğu (Zaman cetveli)	☒
• Kaynakları	☒
Araştırma izin belgesi / belgeleri	☒
Bilgilendirilmiş Gönüllü Olur Formu (yapılan araştırmaya özel olarak hazırlanmış)	☒
Taahhütname-1 Dünya Tıp Birliği Helsinki Bildirgesinin son versiyonunun ve Sağlık Bakanlığı'nın ilgili tüm kılavuzlarının okunmasına dair taahhüt	☒
Taahhütname-2 Daha önce yapılmış etik kurul başvuruları mevcut olup olmadığına dair taahhüt	☒
Taahhütname-3 Araştırma sırasında araştırma bütçesinde yer almayan ve gönüllünün kendisine veya Sosyal Güvenlik Kurumuna ek yük getirecek hiçbir işlem uygulanmayacağına dair taahhüt	☒
Taahhütname-4 COVID-19 hastalarında tedavi yaklaşımları ve bilimsel araştırmalar genelgesi okunmasına dair taahhüt	☒
Araştırmacıların her birisine ait özgeçmiş formu	☒
Ek belgeler (Varsa kullanılan ölçek izinleri vb.)	☒

KARAR BİLGİLERİ	
Başvuru Numarası	202105034
Toplantı Tarihi	21.06.2021
Toplantı Yeri	Çevirim içi (Google Meet)
Karar No	14

Araştırmanın Başlığı: **Bireylerin kronotiplere göre diyetisyene başvurma sayıları ve yeme bağımlılıklarının değerlendirilmesi**

Araştırmacılar: **Dr. Öğr. Üyesi İrem Kaya Cebioğlu, Dyt. Zahide Begüm Sevgi**

T.C. YEDİTEPE ÜNİVERSİTESİ
GİRİŞİMSEL OLMAYAN KLİNİK ARAŞTIRMALAR
ETİK KURULU

Versiyon No
1.0
Sayfa 2 / 2

BAŞVURU NUMARASI: 202105034

KARAR

2.09.2021

☒ KABUL	☐ RET ☐ *KAPSAM DIŞI (GİRİŞİMSEL)* ☐ *BİLİMSEL VE/VEYA ETİK KURALLARA AYKIRI* ☐ *BİR SORUMLU ARAŞTIRMACININ (TEZ İSE TEZ DANIŞMANI), BİR TOPLANTIYA **İKİ (2)** **ADETTEN FAZLA ÇALIŞMA BAŞVURUSUNDA** BULUNMASI* ☐ *KURUM İÇİ BAŞVURULARINDA **YEDİTEPE UZANTILI E-POSTA HESABI** İLE GİRİŞ YAPILMAMIŞ OLMASI* ☐ *ŞARTLI KABULDE BELİRTİLEN REVİZYONLARIN ZAMANINDA VE/VEYA İSTENİLDİĞİ ŞEKİLDE YAPILMAMIŞ OLMASI*

T.C. Yeditepe Üniversitesi Girişimsel Olmayan Klinik Araştırmalar Etik Kurulu adına
Prof. Dr. Didem ÖZDEMİR ÖZENEN
Başkan

Araştırmanın Başlığı: **Bireylerin kronotiplere göre diyetisyene başvurma sayıları ve yeme bağımlılıklarının değerlendirilmesi**

Araştırmacılar: **Dr. Öğr. Üyesi İrem Kaya Cebioğlu, Dyt. Zahide Begüm Sevgi**

Appendix 4. Curriculum Vitae

Kişisel Bilgiler

Adı	Zahide Begüm	**Soyadı**	Sevgi

Öğrenim Durumu

Derece	Alan	Mezun Olduğu Kurumun Adı	Mezuniyet Yılı
Doktora	-	-	
Yüksek Lisans	Clinical Nutrition Beslenme ve Diyetetik	London Roehampton University Yeditepe Üniversitesi	2023 2022
Lisans	Beslenme ve Diyetetik	İstanbul Medipol Üniversitesi	2017
Lise	Fen- Matematik	Asfa Arda Asalet Anadolu Lisesi	2013

Bildiği Yabancı Dilleri	Yabancı Dil Sınav Notu (#)

	İngilizce	IELTS ACADEMIC - 6.5

İş Deneyimi (Sondan geçmişe doğru sıralayın)

Görevi	**Kurum**	**Süre (Yıl - Yıl)**
Diyetsiyen	Begüm Sevgi Beslenme Diyet Merkezi	2019-2021
Diyetsiyen	Akmaster Sağlık Ürünleri	2018-2019

Bilgisayar Bilgisi

Program	**Kullanma becerisi**
Microsoft Office Uygulamaları	İyi
SPSS İstatistik	Orta