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**THE EFFECT OF NUTRITION EDUCATION ON
MEDITERRANEAN DIET QUALITY INDEX
(KIDMED) AMONG ADOLESCENTS**

MASTER THESIS

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İstanbul-2020

APPROVAL PAGE

Institute : Yeditepe University Institute of Health Sciences

Programme : Nutrition and Dietetics

Title of the Thesis : THE EFFECT OF NUTRITION EDUCATION ON
MEDITERRANEAN DIET QUALITY INDEX (KIDMED) AMONG
ADOLESCENTS

Owner of the Thesis : CEM ZEYBEK

Examination Date : 28.09.2020

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DECLARATION

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

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DEDICATION

I dedicate my thesis to Hayati IRVANA, my decedent grandfather.



ACKNOWLEDGEMENTS

I would first like to thank my thesis supervisor Assistant Prof. Dr. Binnur OKAN BAKIR for her guidance, enthusiasm and motivation. I could not have imagined having a better mentor for my Master study.

I am also thankful to Handan KAPLAN, former school principal of Pelitk y Halit Sel uk Middle school for her collaborative attitude towards the study.

Finally I would like to thank my family, my beloved ones, who have supported me throughout the entire process by all means. I will be grateful forever for your love.



TABLE OF CONTENTS

APPROVAL PAGE	ii
DECLARATION	iii
DEDICATION	iv
ACKNOWLEDGEMENTS	v
TABLE OF CONTENTS	vi
LIST OF TABLES	viii
LIST OF SYMBOLS AND ABBREVIATIONS.....	ix
ABSTRACT.....	x
ÖZET	xi
1.INTRODUCTION AND PURPOSE	1
2.LITERATURE REVIEW.....	3
2.1.Mediterranean Diet;	3
2.2.Mediterranean Diet & Health;.....	3
2.2.1.Mediterranean Diet and Cognitive Health	3
2.2.2.Mediterranean Diet and CVD	5
2.2.3.Mediterranean Diet and Cancer	6
2.2.4.Mediterranean Diet and Obesity, Type-2 Diabetes, Metabolic Syndrome	6
2.2.5.Mediterranean Diet and Musculoskeletal Health	7
2.3.Mediterranean Diet & Academic Performance;.....	8
2.4.Evaluation of Mediterranean Diet Adherence;.....	9
2.5.Nutrition Education’s Effect on Nutrition Knowledge & Eating Behavior;	11
3.MATERIALS AND METHODS.....	13
3.1.Participants;.....	13
3.2.Data Collection;	13
3.2.1.KIDMED Scoring;	14
3.2.2.Sedentary Behavior & Physical Activity Evaluation;	15
3.3.Nutrition Education Intervention;	16
3.4.Statistical Analysis;.....	16
4.RESULTS	18
5.DISCUSSION AND CONCLUSION.....	26
5.1.Limitations & Weaknesses.....	30

6. REFERENCES.....	31
7. APPENDICES	39
7.1. Ethical Approval	39
7.2. Institutional Approval and Questionnaire	40
8. CURRICULUM VITAE.....	43



LIST OF TABLES

Table 4.1. Demographic characteristics.....	16
Table 4.2. Descriptive characteristics of study sample for continuous variables.....	17
Table 4.3. Descriptive statistics of KIDMED score according to physical activity.....	18
Table 4.4. Descriptive statistics of KIDMED score according to body weight status....	18
Table 4.5. Relationship between participant's KIDMED score and school success after controlling for age, BMI and screen time.....	19
Table 4.6. Answers given to KIDMED index before & after the intervention.....	20
Table 4.7. Change in breakfast habits before & after intervention.....	22
Table 4.8. Paired samples correlations for KIDMED score before & after the intervention.....	22
Table 4.9. Result of paired samples test for KIDMED score before & after the intervention.....	22
Table 4.10. Stages of Mediterranean Diet adherence before & after intervention.....	23

LIST OF SYMBOLS AND ABBREVIATIONS

BMI	Body Mass Index
CVD	Cardiovascular Disease
CEHQ-FFQ	Children's Eating Habits Questionnaire
fMDS	Food Frequency based Mediterranean Diet Score
GPA	Grade Point Average
IQ	Intelligence Quotient
MeD	The Mediterranean diet
MDS (adapted versions)	Mediterranean Diet Score
KIDMED	Mediterranean Diet Quality Index
RCTs	Randomized Controlled Trials

ABSTRACT

Zeybek, C. (2020). The Effect of Nutrition Education on Mediterranean Diet Quality Index (KIDMED) Among Adolescents. Yeditepe University, Institute of Health Science, Department of Nutrition and Dietetics, MSc thesis, İstanbul.

This study was conducted to evaluate affects of theory based nutrition education on adolescent's (mean age: 12.5±1.1 years, boy/girl=19/21) Mediterranean diet adherence in Pelitköy Halit Selçuk Ortaokulu Balıkesir. Study was conducted with 40 volunteered adolescents between 19th of February 2020 and 22nd of May 2020. Self-administered Mediterranean Diet Quality Index (KIDMED) used in this study to asses adolescent's Mediterranean diet adherence. Nutrition education program prepared based on Türkiye Beslenme Rehberi 2015 and presented ones during the study. Duration of the education was approximately 60minutes. Social Cognitive Theory was the theoretical framework of the intervention. The intervention has been given via a computer based presentation assistance (Microsoft® PowerPoint®) which was heavily consisted of related images rather than long and elusive sentences. SPSS version 21.0 for Microsoft was used for statistical analysis. No statistically significant difference found in physical activity status and adherence to the Mediterranean diet ($F(2,37) = 2.896, p = 0.068$) as well as body weight status and adherence to the Mediterranean diet ($F(2,37) = 0.925, p = 0.405$). On average, there were 0.93 points increase in KIDMED scores after intervention (95% CI [-1.5, -0,34]) which was statistically significant ($p=0.003$). Intervention achieved to produce significant change towards adolescents breakfast making habits ($p\leq 0.05$). As a conclusion study shown that theory based nutrition education interventions has a potential towards increasing MeD adherence of adolescents'. This potential will may strengthen with repetition (frequency) of the education, family participation to the education process, health professionals involvement during preparation and presentation of the education, an enhanced scope (number of participants) and a complementary approach which will also focus on physical activity.

Key words: KIDMED, Mediterranean Diet, Nutrition education, Adherence to Mediterranean Diet

ÖZET

Zeybek, C. (2020). Adölesanlarda Beslenme Eğitiminin Akdeniz Diyeti Kalite İndeksi (KIDMED) Üzerine Etkisi. Yeditepe Üniversitesi Sağlık Bilimleri Enstitüsü, Beslenme ve Diyetetik Bölümü Master Tezi. İstanbul.

Bu çalışma teori temelli beslenme eğitiminin adölesanların (ortalama yaş 12.5 ± 1.1 , erkek/kadın=19/21) Akdeniz diyetine olan uyumlarını nasıl etkilediğini incelemek amacıyla Pelitköy Halit Selçuk Ortaokulu Balıkesir’de gerçekleştirilmiştir. Çalışmaya 40 adölesan gönüllü olarak katılmıştır. Çalışma 19 Şubat 2020 ile 22 Mayıs 2020 tarihleri arasında gerçekleştirilmiştir. Katılımcıların Akdeniz diyetine olan uyumlarını değerlendirmede katılımcılar tarafından doldurulan Akdeniz Diyeti Kalite İndeksi (KIDMED) kullanılmıştır. Beslenme eğitimi Türkiye Beslenme Rehberi 2015 esas alınarak hazırlanmıştır ve katılımcılara sunulmuştur. Beslenme eğitiminin süresi yaklaşık bir saattir. Kullanılan müdahalenin temelinde sosyal bilişsel kuram yer almaktadır. Eğitim bilgisayar üzerinden sunum şeklinde verilmiş (Microsoft® PowerPoint®) ve uzun ve anlaşılması zor metinler yerine görseller kullanılmıştır. SPSS 21.0 Microsoft versiyonu ile istatistiksel analizler yapılmıştır. Katılımcıların fiziksel aktivite durumu ve Akdeniz diyetine olan uyumları arasında istatistiksel anlamlı bir sonuç elde edilememiştir ($F(2,37) = 2.896, p = 0.068$). Benzer şekilde katılımcıların kütle oranları ve Akdeniz diyetine olan uyumları arasında istatistiksel anlamlı bir sonuç elde edilememiştir ($F(2,37) = 0.925, p = 0.405$). Müdahale sonrasında katılımcıların KIDMED skorlarında ortalama 0.925 puanlık artış gözlenmiştir (95% CI [-1.5, -0.34])ve bu artış istatistiksel olarak anlamlıdır ($p=0.003$). Müdahale katılımcıların kahvaltı yapma alışkanlığı üzerinde anlamlı değişiklik sağlamayı başarmıştır ($p \leq 0.05$). Sonuç olarak çalışma teori temelli beslenme eğitimi müdahalesinin adölesan katılımcıların Akdeniz Diyetine olan uyumlarını arttırmada olumlu yönde bir potansiyeli olduğunu ortaya koymuştur. Bu potansiyelin müdahalenin sıklığının artırılması, sürece sağlık çalışanlarının ve katılımcı ebeveynlerinin dahil edilmesi ve çalışma kapsamının genişletilmesi ile daha güçlü hale gelebileceği düşünülmektedir. Netice olarak ailelerin de dahil edilmesi ve/veya uygulamalı yaklaşımlar içerme gibi birden fazla strateji barındıran, daha detaylı beslenme eğitimlerinin planlanması ve sıklık ile uzun süreli uygulanması ile daha iyi sonuçlar elde edilebileceği düşünülmektedir.

Anahtar kelimeler: KIDMED, Akdeniz diyeti, Beslenme eğitimi, Akdeniz diyetine uyum

1. INTRODUCTION AND PURPOSE

The Mediterranean diet (MeD) can be defined as increased consumption of plant originated foods(e.g., nuts, vegetables, unrefined natural cereals and fruits), moderate-to-high intake of seafood and fish, minimized consumption of red meat and high-fat dairy products and plenty of olive oil consumption as main source of daily fat (1).

It is believed that impairment in MeD adherence, in parallel to adopting a Western dietary pattern in the Mediterranean Countries, might be responsible for the increasing incidence of chronic diseases since childhood (2).

Higher adherence to MeD has numerous beneficial effects on cognitive health (3-5), Cardiovascular diseases (CVD)(6-8), various cancers (9-11), obesity (12-14) and musculoskeletal health (15-17). Gaining healthy eating habits at earl age has significant positive potency on healthy growth & development and those habits tends to be transferred to later life (18,19).

Mediterranean Diet Quality Index (KIDMED) comprises the main principles of the MeD and accepted as a rapid and valid tool in terms of MeD adherence evaluation (20). Although there are other evaluation tools existing, KIDMED index is widely used in studies conducted with young participants (21-24).

A case study from Turkey showed that there is an significant association between participants nutritional knowledge and their adherence to the MeD (25). Nutrition education programs used for altering nutrition knowledge and changing dietary behavior of children's and adolescents' before (26-29).

Theory based education programs had been used on adolescents before. A study from Ireland conducted with 428 adolescents. Aim of that study was to evaluate theory based education on concussions. Program had a statistically significant positive effect on adolescents' knowledge, their perceived control over concussion and their reporting intentions (30). Douglas Kirby and B. A. Laris's review points out that many of the theory based school education programs on sex and STD (sexually transmitted diseases)

used socio-psychological theories like social cognitive theory and the theory of planned behavior. Review summarizes the findings and states that theory based school education programs are strongly effective on increasing adolescents' knowledge, self-efficacy and risk awareness (31).

Abundance of studies exist in literature which inspected the association of academic success and individual food groups like vegetables, fruits, nuts or fish which they are also a part of the MeD (32-35). However it is broadly recommended that MeD should be studied as a whole due to the synergistic effects of each single food group (36).

In accordance with this information, main purpose of this study is to evaluate effects of theory based nutrition education on adolescent's MeD adherence and to test whether a theory based nutrition education intervention which is prepared specifically from national guidelines can promote participants' MeD adherence scores or not. Investigation of relationship between school success and MeD adherence planned as a secondary purpose for this study.

2. LITERATURE REVIEW

2.1. Mediterranean Diet;

According to a literature review published at 2015 a dietary pattern can be defined according to general descriptions and pyramids. Collective descriptions for MeD are parallel among publications, highlighting the same key points. Definitions contain guidelines for high intake of vegetables, olive oil (extra virgin-cold press), cereals, fruits, nuts and legumes/pulses, moderate intake of dairy products, fish and other meat types and red wine, and low intake of eggs and sweets. Although many of the descriptions give an indication that how frequent these foods should be consumed most of them lack the information about serving size or they use subjective terms like high, some and vast to represent the amount of food which should be consumed. Diet pyramids which are considered an effective way to demonstrate general principles of a diet, has a similar placement of key food groups while showing a MeD pattern (37).

Using quantities of food groups in grams is another way to define a dietary pattern. A diet that contains between three to nine servings of vegetables, half to two servings of fruits one point five to eight servings of olive oil and one to thirteen servings of cereals daily can defined as MeD. A diet contains approximately 9316kilojoules per day and provides close to 43% energy from carbohydrate, 15% from protein and 37% energy from fat (9% from Saturated fatty acids, 19% from Monounsaturated fatty acids and 5% from Polyunsaturated fatty acids) can be also defined as MeD (37).

2.2. Mediterranean Diet & Health;

2.2.1. Mediterranean Diet and Cognitive Health

Dementia is a condition which leads progressive decline of a person's cognitive function. Around 50 million people living with dementia worldwide. With 10 million new cases arise every year, total number of people suffers from dementia is expected to reach 82 million in 2030 (38).

According to a systematic review published in 2017 which has conducted 31 different articles, cognitive function is mostly related with knowledge and acquiring information and it has four subgroups as memory, attention, visuo-spatial skills and executive function. Adherence to MeD plays a major role for both 4 of those subgroups and risk

of developing Alzheimer's disease or dementia. Research mentions 3 possible mechanism about how the MeD could has a protective effect against cognitive decline. First possible mechanism originates from high antioxidant and other bioactive compounds content of the MeD (3). A traditional MeD's flavones and flavonols content can be twice as high compared to U.S. population (39). Second possible mechanism comes from high fish oil and olive oil consumption from a MeD which has an anti-inflammatory effect. Cardiovascular diseases are known to be a risk factor for dementia and because the MeD has been shown to have a positive effect on degreasing cardiovascular disease's risk factors it can be considered as the third possible mechanism (34). Likewise to this systematic review, Alzheimer's Society also recommends adherence to the MeD to improve cognitive function (41).

Results of The Health Professional's Follow-up Study which had 27,842 men participants, shown that following a Mediterranean Diet pattern for a long term is strongly related with better subjective cognitive function (4). In Alexandra et al.'s study which used data from ATTICA and MEDIS population based, cross sectional studies, also found higher mini-mental state examination scores (used in cognitive function assessment) for participants who has high or moderate adherence to the MeD compared to participants who has low adherence (5).

Preliminary evidence from observational studies reveals that adherence to MeD may contribute cognition preservation with aging (42-45). Findings supports that adherence to MeD may delay or prevent cognitive decline⁴. A study published in 2020 also points out that higher MeD adherence scores have a protective effect on common mental disorders but food components (sweetened foods and beverages, sausages, refined carbohydrates and full-fat milk) which are not belongs to Mediterranean dietary pattern limits this effect (46).

Recent findings from a cross-sectional analysis revealed that for patients who suffers from type 2 diabetes mellitus over 5 years, closer MeD adherence is associated with better verbal memory even dough same effect did not shown for patients with type 1 diabetes mellitus (47).

It should be noted that there are other studies which did not find statistically significant correlation between MeD adherence score and cognitive disorders' incidence risk, exist. Lei Wu et al.'s updated systematic review and meta-analysis for example revealed a

linear relationship between adherence scores and risk of cognitive disorders' incidence in dose-response analysis however association was not statistically significant (48).

2.2.2. Mediterranean Diet and CVD

The American Heart Association and the National Cholesterol Education Program consider that a dietary therapy should be the primary approach in treatment and prevention of hypertension and hyperlipidemia (49).

According to Demosthenes B. Panagiotakos et al.'s study which conducted with 1528 healthy women and 1514 healthy men participants, randomly selected from Athens (the ATTICA Study) (50) after controlling variables like age, sex, energy intake, smoking habits, physical activity and education level a significant association can be found between MeD score and systolic blood pressure, C-reactive protein levels, fibrinogen levels, total antioxidant capacity and total serum cholesterol level. Results also show that 11/55-unit raise in the MeD score is associated with a 37% decrease in chance of having an acute coronary event (6).

Another population based, prospective study from Greece with 22,043 participants has shown that there is an inverse association between the MeD score and total mortality rate irrespectively with sex, smoking status, Body Mass Index (BMI), level of education, physical activity level and waist to hip ratio. Data collected for 3.7 years (median) points out that 2/9-point increase in MeD score is associated with 25% decrease in total mortality rate. Although mortality caused by cancer reduced with better adherence to MeD, the association found slightly stronger for mortality reduction caused by coronary heart disease (7).

Martinez-Gonzalez et al. (51) evaluated the association between adherence to the MeD and the risk of having myocardial infraction in their research. Results shown that participants who has an adherence score between 7-9 has 82% less risk of having myocardial infraction than participants who has an adherence score between 1-2.

Data is available in literature for dietary pattern's association with cardiovascular risk factors in younger population as well. In Hannah et al.'s research cardiovascular risk biomarkers analyzed with approximately ten years of interval (12-15 years old to 20-25 years old). After necessary adjustments are made, a healthier dietary pattern

(Mediterranean Diet) found to be inversely associated with pulse wave velocity and circulating homocysteine levels (8).

2.2.3. Mediterranean Diet and Cancer

Relationship between MeD adherence and risk of cancer is a well studied subject. At Sofi et al.'s meta-analysis 4% reduction in neoplastic disease's mortality and/or incidence has been detected for two point increase in MeD adherence (9). Another meta-analysis from literature also shown that higher scores of MeD adherence is related with significantly reduced risks for both cancer mortality and incidence (11). MeD is shown to be highly beneficial in colorectal and post-menopause breast cancer prevention as well (10).

2.2.4. Mediterranean Diet and Obesity, Type-2 Diabetes, Metabolic Syndrome

A shift in dietary patterns noticed among Mediterranean countries, especially in younger generation, that traditional nutritional pattern has been replaced with a diet which is high in energy and saturated fat (52). This shift believed to be responsible for increased obesity incidence especially among adolescents in Mediterranean Countries (2). A systematic review published in 2017 which investigated findings from 17 studies, reported an adverse association between MeD adherence and participants' BMI (12). A recent cross-sectional study conducted with 239 adolescents, has also found statistically significant advanced MeD adherence scores (KIDMED) for normal body weighted participants compared to obese and overweight participants (13). In another study, data from INMA cohort study has been analyzed and results of longitudinal analyses shown that there is a significant association between low MeD adherence scores at age four and incidence of abdominal obesity, obesity and overweight at age of eight (14).

It should be also noted that opposite findings are available in literature. A recent study from Italy found no association between adolescents' body weight status and MeD adherence (53). Likewise in G. Tognon et al.'s study which used data from IDEFICS Study, statistically significant association only found between Hungarian participants' MeD adherence scores and body weight status although study was conducted with eight different European countries (54).

Following a Mediterranean dietary pattern is associated with lower incidence of diabetes in numerous studies conducted in Mediterranean and/or European populations (55-57). A study aimed to clarify same association for U.S. population, used data from Atherosclerosis Risk In Communities study and findings from 22 years of follow-up shown that MeD adherence scores were significantly associated with reduced diabetes incidence (58).

Reduced metabolic syndrome incidence can be evaluated as an additional beneficial effect of increased MeD adherence (45).

2.2.5. Mediterranean Diet and Musculoskeletal Health

A systematic review and meta-analysis from 2018 shown that Mediterranean dietary pattern has a protective effect on bone mineral density and bone fracture risk (15). Data derived from Randomized Controlled Trials (RCTs) and prospective cohort studies also supports that MeD has protective effects on musculoskeletal health (16,17). Antioxidants' and polyphenols' osteoclast suppressing action and their role in osteoblast differentiation is a one pathway that used in the explanation of Mediterranean dietary pattern's effect on musculoskeletal health (59). Moreover saturated fatty acids, (primarily palmitic acid and stearic acid), considered to be harmful to human osteoblast-like cells by inducing apoptosis through Caspase 3/7 ligand. Exposure to Arachidonic acid shown to increase the mRNA expression of the pro-inflammatory cytokines (IL-1a, IL-1b, TNF-a, M-CSF, and IL-16) while consumption of Alpha-linolenic acid and Eicosapentaenoic acid shown to have an opposite effect on pro-inflammatory cytokines (60).

Although vitamin D considered being most important nutritional factor about bone health, MeD is not one of those diets which are high in vitamin D. A study conducted based upon this statement and found that there is a positive significant correlation between MeD adherence and circulating vitamin D levels (61).

Another study conducted in 2020 with 25,453 participants compared fracture incidence and bone density with MeD adherence score which was obtained with two different methods. In first method dairy product consumption scored negatively and in second method dairy intake did not evaluated. For both methods higher adherence scores was associated with higher bone density and reduced fracture risk (62).

Mechanisms behind the MeD's health benefits are not fully known. Valeria et al. summarized possible mechanisms based on accumulating evidences. According to research there are five leading mechanisms which exert beneficial effects of the MeD. First mechanism originates from MeD's lipid lowering effect. Research emphasizes the differences between sources of lipids in Mediterranean Diet (highly consists of olive oil, nuts and germ of whole grains) and Western dietary pattern (animal originated saturated fat) and its effect on serum LDL-levels. Second mechanism comprises MeD's protective effect on platelet aggregation, oxidative stress and inflammation which thought to be the result of abundance of antioxidant vitamins, phytochemicals, natural folate and selenium in MeD. Modification of growth factors and hormones which involved cancer pathogenesis is explained as the third mechanism. Forth mechanism arises from difference between total protein consumption percentage and sources of protein between MeD and Western dietary pattern. Finally metabolites produced by gut microbiota while following a MeD considered to be relevant with health benefits (63).

2.3. Mediterranean Diet & Academic Performance;

Effect of single macro/micro nutrients on cognitive function is well studied subject in literature. A systematic review and meta-analysis published in 2010 found that iron supplementation has beneficial effect on both Intelligence Quotient (IQ), attention and concentration (64). n-3 polyunsaturated fatty acids supplementation's effect has been studied in another systematic review and meta-analysis of RCTs and revealed that supplementation can significantly improve cognitive performance during infancy (especially Docosahexaenoicacid), but same impact has not be seen in children, elderly and adults (65). Carol et al.'s study investigated dietary lipids' effect on hippocampal-memory (associative memory). Result shown negative association between saturated fatty acid consumption and both item memory and relation memory (66). But is should be considered that investigating a whole dietary pattern, rather than single nutrient, is more appealing because in this way both synergetic effects and antagonist effect would be also involved (67).

As previously mentioned MeD has positive influence on cognitive function. To test this influence on children and adolescent's academic performance Irene at al. conducted a research (The UP&DOWN Study) on 1371 young participants (mean age; 12). After necessary adjustment are made results shown significant association between KIDMED

scores and all indicators of academic performance (math score, language score, combined math and language score and grade point average) (21). A study conducted on 520 Greek adolescents also shown that KIDMED score is a significant factor to predict academic performance (22). In Ramón et al.'s cross-sectional study data was collected from 1059 Spanish adolescents. Results present significant association between higher KIDMED scores and different dimensions learning and motivation strategies (elaboration strategies, organizational strategies, critical thinking, self-regulation and intrinsically oriented goals) (23). Last but not least, in Earo et al.'s study, although it was conducted with primary school children, find positive association between MeD adherence and reading comprehension (68).

2.4. Evaluation of Mediterranean Diet Adherence;

Numerous different methods are available in literature which measures MeD adherence. In one of those methods 11 food groups which includes fruits, vegetables, unrefined cereals, potatoes, legumes, fish, red meat and products, poultry, dairy, olive oil (in cooking) and alcohol can be individually ranked from 0 to 5 (based on their position in the Mediterranean diet pyramid) according to their consumption frequency. With this method each participant could get a score ranges between 0-55. Higher scores represents greater adherence to MeD (6). In Trichopoulou et al.'s study each participant received 1 point for each so called beneficial food group in MeD (fruits, nuts, vegetables, cereal, fish and legumes) if they consume above the sex specific median value and participants received 1 point for each detrimental food group (meat, poultry and dairy) if they consume below the sex specified median value. After considering alcohol consumption and the ratio of monounsaturated fatty acids to saturated fatty acids each participant get a total Mediterranean diet adherence score ranged from 0 to 9 (7). Same method used in other studies as well (4). A study aimed to form a short questionnaire that can be used to measure the level of adherence to MeD used only nine items and their consumption frequency. Different from questionnaires used in other studies an additional question added to evaluate the consumption of both fruits and vegetables at the same day and the question which to evaluates dairy consumption removed. Participants categorized according to their MeD adherence scores which ranges between 0 to 9 (51). More detailed information about different components used

to assess MeD adherence score from different cohort studies can be seen in a 2008 meta-analysis (69).

The methods that studies in literature used in evaluation of the adherence to MeD in children and adolescents can be grouped into 3; a) food frequency based Mediterranean Diet Score (fMDS), b) KIDMED score and c) Mediterranean Diet Score (MDS)(adapted versions) (12).

G. Tongon et al. used fMDS method in their study which is conducted with 14,972 children aged between 2 to 9 years old from 8 different European countries. Consumption frequency for 43 foods assessed by self-administered Children's Eating Habits Questionnaire (CEHQ-FFQ). Daily frequencies from food groups (6 in total including; dairy products, meat products, vegetables, fruits and nuts, cereals and fish) were divided by total daily frequency of all food items in the CEHQ-FFQ to obtain relative frequencies for each food group. Then values were categorized according to sex-age specific medians. Final fMDS ranged 0 to 6 and participants who received $fMDS > 3$ considered to have high adherence to Mediterranean-like dietary pattern (54). To modify the original MDS (70), for children and adolescents, the alcohol consumption part is changed with dairy products consumption (8,71-73). Most widely used scoring system in literature for children and adolescents is the KIDMED index (12). Same scoring method also used in this paper. Extended information about KIDMED index can be found in methodology chapter.

In P.laccarino et al.'s systematic review (12), which investigates adolescent's and children's adherence to Mediterranean diet, 53 studies has been examined. Between 53 studies 33 of them analyzed sex differences on MeD adherence, 7 studies revealed statistically significant difference between sex. Among 24 studies contained data on age and Mediterranean diet adherence 11 studies have found an opposite trend in adherence scores with age. 20 studies among 53 analyzed association between socio economic statue and MeD adherence. 15 studies have shown a positive correlation between MeD adherence and socio economic status. Particularly 7 of them associated high adherence scores with high maternal education. Among 17 studies which physical activity level was assessed 14 of them have shown statistically significant + correlation between MeD adherence and physical activity level. The relationship between adherence to MeD and sedentary behavior which was evaluated as time spending in front of a screen was

evaluated by 11 studies. 10 of those studies have shown positive association between MeD adherence and fewer time spending on sedentary behavior (12).

2.5. Nutrition Education's Effect on Nutrition Knowledge & Eating Behavior;

Nutritional knowledge of an individual is directly related with his/her nutritional choices (26). Providing right nutritional knowledge and introducing decent nutritional habits to children while they are young are quite important for their future nutritional preferences (74). A study conducted in Ohio, USA with 594 adolescents shown that nutrition knowledge is positively correlated with healthy eating behavior for 7th and 8th grade participants (75). Studies also supports that eating patterns and habits developed during adolescence and childhood tends to track into adulthood (76,77).

In HealtyKick Study which is a three year healthy lifestyle intervention study conducted on primary school children, theory based nutrition education intervention's impact on nutrition knowledge has been investigated. Nutrition education intervention constituted according to country specific food-based dietary guidelines. Education included; macronutrients and their role in human health, advantages of having a diet with variety of foods in both childhood and adulthood in disease prevention, creation of a daily meal plan which contains all food groups in dietary guidelines, food groups and their macronutrient proprieties (78,79). Participant's nutritional knowledge was evaluated three times with a questionnaire. Results showed a significant improvement in participant's nutrition knowledge compared to control group within first year and this improvement sustained for further two years (78). Likewise in Alicia et al.'s study a nutrition education intervention (based on Social Cognitive Theory) applied to the treatment group. Results represented significantly greater progression in both dietary behaviors and nutrition knowledge in treatment group compared to the control group. Progression on nutrition knowledge included; better understanding regarding to Food Guide Pyramid, better nutrient-food association and better nutrient-function association (26).

It is possible to find other school based nutritional education interventions in literature which improved children's nutrition knowledge or behavior (27-29.80,81).

Dean et al.'s meta-analysis from 2015 which compiled data from 49 studies (38001 children in total from 13 different countries) about school based healthy eating intervention, shown that enhanced curriculum approaches (Exclusive nutrition education applications beyond existing curriculum delivered by teachers.) are more dominantly used in this particular matter. According to this meta-analysis, enhanced curriculum strategies has minimal influence on total energy and sugar consumption reduction but results emphasize that enhanced curriculum intervention strategies are capable of improving children's nutritional knowledge and fruits and vegetable consumption preferences (82).



3. MATERIALS AND METHODS

Information of the school where study would be carried out, objective and the method of the study and confidentiality for participants submitted to the Ministry of National Education and study started after necessary permission is obtained. Students and their parents informed about the study and only the voluntary students included for the study after a written informed consent provided by their parents.

3.1. Participants;

Study carried out in Pelitköy Halit Selçuk Middle school located in Balıkesir. Selection of the school was primarily based on the willingness which that school had. Out of 46 students 40 of them volunteered to attend the study. None of the volunteers had a medicinal condition which requires specialized nutrition program. None of the participants were lost during follow-up. Data collection comprised dates between 18th of February 2020 and 22nd of May 2020.

3.2. Data Collection;

As mentioned previously maternal education, sex, physical activity, age and sedentary behavior are factors which have an association with MeD adherence (12). Regarding to assess those factors a self-administered questionnaire used.

Academic performance is evaluated based on participant's grade point average (GPA). Recent school records were provided by school management. Same evaluation criteria can be seen in both Ioannis et al.'s and Alice et al.'s researches which also aim to reveal the association between adherence to MeD and academic success in adolescents (22,53). It should be not forgotten that other methods to assess academic performance is also available. For example In UP&DOWN study language, math, an average of math and language subjects, and GPA used as four indicator of academic performance while analyzing MeD adherence and association of academic success (21).

Participant's body weight was measured with portable, 0.1kg sensible scale which is provided by researcher. Height measured with a non-flexible measuring tape while

participants lean against the wall, their feet next to each other and their hand in frontal plane. While measuring body weight and height researcher did pay attention that participants have thin clothes and no shoes. Height and body weight measured when participants handed over their surveys.

WHO AnthroPlus© software used to calculate participant's percentiles according to their age and categorize them in accordance with WHO.

Maternal education level and academic performance data obtained from school's archive. To ensure confidentiality of personal information data had given with student's number only, without their names.

At the first visit, voluntary consent forms had given to the school's administration by researcher, after then school did transmit them to the parents. At the second visit, participants with the informed consent form did fill the given survey including socio-demographical form and KIDMED questionnaire, then anthropometric measurements taken from the participants and finally they did attend nutrition education program designed for this study. Third visit designed to be carried out 3 weeks after the second visit but due to isolation protocols (COVID-19), an online survey created by researcher and send to participants via school administration. All information from 1st and 2nd visits obtained with face to face interviews while class hours when both researcher and teachers present at the classroom.

3.2.1. KIDMED Scoring;

Self-administered KIDMED index, which is a fast and valid evaluation method, used in the evaluation of participants' adherence to the Mediterranean Diet. Index has been used multiple times before in both foreign and local studies (12,21-25,83,84). Index was built on the major principles of Mediterranean dietary pattern plus that factors could impair the dietary pattern (20).

The questionnaire has 16 yes/no questions. Most of those questions aim to assess consumption of different food groups and some aims to assess dietary habits like; having a breakfast habit (question 1); using olive oil in food preparation (question 16) (20). For affirmative questions (Q2) dairy product consumption on breakfast, (Q3) Cereals or grains consumption on breakfast, (Q5) fresh fruit or freshly squeezed fruit

juice ones a day, (Q6) consumption of a second fruit daily, (Q7) consumption of 2 glasses of milk/yogurt or 40 grams of cheese, (Q8) fresh or cooked vegetable consumption daily, (Q9) fresh or cooked vegetable consumption more than ones daily, (Q10) consumption of fish at least 2 to 3 times weekly, (Q12) consumption of nuts at least 2 to 3 times weekly, (Q13) legume consumption more than ones a week, (Q14) consumption of rice or pasta ≥ 5 times per week, (Q16) use of olive oil at home, participants gained 1 point (if they answered as yes). For negative questions (Q1) skipping breakfast, Q(4) commercially baked food product consumption for breakfast, (Q11) fast-food consumption more than ones a week and (Q15) consumption of sweets or candies for several times daily participants lost 1 point (if they answered as yes). After summarizing all points an adherence score ranged between 0 to 12 obtained for each participant (20). Scores ≥ 8 points excepted as optimal adherence, 4-7 excepted as average adherence (needed to be improved) and ≤ 3 excepted as very low adherence to the MeD (20,25).

3.2.2. Sedentary Behavior & Physical Activity Evaluation;

Participants' sedentary behavior and physical activity evaluated based on Türkiye Fiziksel Aktivite Rehberi 2014 (85). According to the guideline; participants who spend more than 2 hours per day in front of a screen (television, telephone or computer/tablet) considered to have overly excessive sedentary behavior, excessive sedentary behavior assigned for participants who spend between 1 to 2 hours in front of a screen daily and spending less than 1 hour in front of a screen considered to be normal. Participants divided in to 4 groups according to their daily physical activity. 1st group assigned for participants who does not perform any kind of physical activity and 2nd group assigned for participants who perform less than 60 minutes moderate to vigorous physical activity. Both 1st and 2nd group considered as inadequate physical activity. Participants who perform 60 minutes moderate to vigorous physical activity has been located into 3rd group and considered to be adequate physical activity. 4th group included participants who perform more than 60 minutes moderate to vigorous physical activity daily and considered to be adequate physical activity which generates additional health benefits(85).

3.3. Nutrition Education Intervention;

Nutrition education intervention design as a theory based program which focuses on the KIDMED index's questions. Definitions of macronutrients, micronutrients and food groups, information about their sources, their effect on individual health, portion sizes and recommended quantities for each food group explained to participants as a part of the nutrition education intervention. Türkiye Beslenme Rehberi 2015 (TÜBER) (86) used as a primary source in constitution of the intervention. As studies points out that nutrition interventions need to use technology as an advantage to reach adolescents (87) the intervention has been given via a computer based presentation assistance (Microsoft® PowerPoint®). Using visuals are effective in nutrition education in a way that they draw attention and encourage individuals to questioning their diet (88) that's why the presentation was heavily consisted of related images rather than long and elusive sentences. That theory based nutrition education applied once during the study and its duration was arround an hour.

3.4. Statistical Analysis;

The descriptive characteristics of the study group are shown as means with standard deviations or percentages. Independent-Samples T Test used in determination of differences between sexes for continuous variables.

Paired Samples t Test used to evaluate the effect of the intervention on MeD adherence score (KIDMED score).

Partial correlations used to analyze the relationship between KIDMED scores and school success after controlling BMI, age and screen time.

The McNemar Test used to assess the effect of the intervention regarding to the answers given to each question before and after the intervention.

One Way ANOVA used to determine the relationship between KIDMED score & physical activity and KIDMED score & body weight status. While calculating the relationship between KIDMED score & physical activity participants who performs 60 minutes moderate to vigorous physical activity daily combined with participants who

performs more than 60 minutes moderate to vigorous physical activity daily to create more evenly distributed groups.

A p-value which is less than 0.05 ($p \leq 0.05$) considered to be statistically significant in this study.



4. RESULTS

Table 4.1. represents demographic characteristics of the study population. Amongst the study population, 52.5% of them were boys and 47.5% of them were girls. 37 (92.5%) of the participants' mother's were primary school graduate. High school and university graduate maternal education status encountered in 1 (2.5%) and 2 (5%) of the participant respectively. 5% of the participants were unsuccessful, 40% of them were successful, 22.5% of them rewarded with certificate of achievement and 32.5% of them rewarded with certificate of higher achievement according to their academic success. 18 participants (45%) stated that they do not perform any moderate to vigorous physical activity. 25% of the study population had inadequate physical activity whereas 10% of them had adequate physical activity and 20% of them had above adequate physical activity. According to time spending in front of a screen only one participant (2.5%) fit the requirements, 15% of the participants had excessive screen time and 82.5% of them had highly excessive screen time. 5 participants (12.5%) were obese, 7 were overweight (17.5%), 23 were at normal body weight (57.5%), 3 were thin (7.5%) and 2 were severely thin (5%).

Table 4.1. Demographic characteristics		
	Frequency	Percentage
Sex		
Male	19	47,5
Female	21	52,5
Total	40	100,0
Maternal Education		
Primary School Graduate	37	92,5
High School Graduate	1	2,5
University Graduate	2	5,0
Total	40	100,0
Academic Success		
Unsuccessful	2	5,0
Successful	16	40,0
Certificate of Achievement	9	22,5
Certificate of High Achievement	13	32,5
Total	40	100,0
Physical Activity		
None	18	45,0
Inadequate	10	25,0

Adequate	4	10,0
Above Adequate	8	20,0
Total	40	100,0
Screen Time		
Normal	1	2,5
Excessive	6	15,0
Highly Excessive	33	82,5
Total	40	100,0
Z-Score		
Obese	5	12,5
Overweight	7	17,5
Normal	23	57,5
Thin	3	7,5
Severe Thin	2	5,0
Total	40	100,0

The descriptive characteristics of the participants for continuous variables are shown in Table 4.2. Although mean values for school success, screen time and BMI was higher for boys than girls, this difference was not statistically significant ($P > 0.05$ for all).

Table 4.2. Descriptive characteristics of study sample for continuous variables					
	Sex	n	Mean	Std. Deviation	P for sex
Age	Girl	19	12,6842	1,00292	0.406
	Boy	21	12,3333	1,19722	
School success	Girl	19	66,4911	15,80495	0.275
	Boy	21	79,2543	12,66064	
Screen time	Girl	19	261,0526	141,43686	0.133
	Boy	21	316,1905	183,26828	
BMI	Girl	19	18,9684	4,78226	0.687
	Boy	21	19,7810	4,75254	
Statically significances ($p < 0.05$)					

Participants in adequate physical activity and above adequate physical activity combined and evaluated as one group to create more evenly distributed analyze (Table 4.3.). No statistically significant difference found between groups as determined by one-way ANOVA ($F(2,37) = 2.896, p = 0.068$).

	n	Mean	Std. Deviation	95% Confidence Interval for Mean		Minimum	Maximum
				Lower Bound	Upper Bound		
None	18	5,1667	2,30728	4,0193	6,3140	1,00	9,00
Inadequate	10	5,6000	1,83787	4,2853	6,9147	4,00	9,00
Adequate&Above Adequate	12	7,0000	1,85864	5,8191	8,1809	3,00	9,00
Total	40	5,8250	2,17076	5,1308	6,5192	1,00	9,00

As can be seen at Table 4.4. Obese & overweight participants and thin & severe thin participants combined and evaluated as one group to create more evenly distributed analyze. No statistically significant difference found between groups as determined by one-way ANOVA ($F(2,37) = 0.925, p = 0.405$).

	n	Mean	Std. Deviation	95% Confidence Interval for Mean		Minimum	Maximum
				Lower Bound	Upper Bound		
Obese & Overweight	12	5,5833	1,92865	4,3579	6,8087	3,00	9,00
Normal	23	6,1739	2,05939	5,2834	7,0645	3,00	9,00
Thin & Severe Thin	5	4,8000	3,19374	,8344	8,7656	1,00	9,00
Total	40	5,8250	2,17076	5,1308	6,5192	1,00	9,00

A partial correlation applied to determine the relationship between participant's KIDMED score and school success after controlling for age, BMI and screen time. As shown at Table 4.5. negative partial correlation between KIDMED score (5.82 ± 2.17) and school success (73.19 ± 15.46) found after controlling for age (12.5 ± 1.1 years), BMI (19.29 ± 4.7 kg/m²) and screen time (290 ± 165 minutes) which was not statistically significant, $r(35) = -.207, N = 40, p = 0.219$.

Table 4.5. Relationship between participant's KIDMED score and school success after controlling for age, BMI and screen time.				
Control Variables			School success	KIDMED score
Age & Screen time & BMI	School success	Correlation	1,000	-,207
		Significance	.	,219
		df	0	35
	KIDMED score	Correlation	-,207	1,000
		Significance	,219	.
		df	35	0

Table 4.6. presents affirmative and negative results for each question before and after the intervention as percentages. Affirmative results represents positive health outcomes for example in question number 11 percentages of avoiding fast food consumption increased from 85% to 92,5%.

As Table 4.6. shows that for 11 questions in total frequencies of affirmative answers increased after the intervention. Those questions were aimed to investigate different eating habits such as having a breakfast (question1), to avoid consumption of commercially baked products at breakfast (question 4), consuming 2 glasses of milk/yogurt or 40grams of cheese daily (question7), consumption of second fruit daily(question 8), consumption of cooked or fresh vegetables more than ones daily (question 9), regular consumption of fish (question 10), to avoid the consumption of fast-food more than ones a week (question 11), consumption of legumes and pulses more than ones weekly(question 13), regular consumption of rice or pasta (question 14), to avoid consumption of sweets and desserts more than ones daily (question 15) and olive oil consumption at home (question 16). As can be seen from Table 4.6. intervention did not affect the frequency of grains & cereal products consumption at breakfast (question 3) and consumption of fruits or freshly squeezed fruit juices daily (question 5). Frequencies for affirmative responds to remaining 3 questions decreased after intervention. Those questions were (question 2) milk and milk product consumption at breakfast, (question 6) consumption of cooked or fresh vegetables ones a day and (question 12) regular consumption of nuts.

Table 4.6. Answers given to KIDMED index before & after the intervention.			
Question Number		Frequency	Percentage
1	affirmative	23	57,5
	negative	17	42,5
1*	affirmative	32	80,0
	negative	8	20,0
2	affirmative	32	80,0
	negative	8	20,0
2*	affirmative	30	75,0
	negative	10	25,0
3	affirmative	36	90,0
	negative	4	10,0
3*	affirmative	36	90,0
	negative	4	10,0
4	affirmative	9	22,5
	negative	31	77,5
4*	affirmative	14	35,0
	negative	26	65,0
5	affirmative	36	90,0
	negative	4	10,0
5*	affirmative	36	90,0
	negative	4	10,0
6	affirmative	32	80,0
	negative	8	20,0
6*	affirmative	30	75,0
	negative	10	25,0
7	affirmative	24	60,0
	negative	16	40,0
7*	affirmative	28	70,0
	negative	12	30,0
8	affirmative	23	57,5
	negative	17	42,5
8*	affirmative	28	70,0
	negative	12	30,0
9	affirmative	16	40,0
	negative	24	60,0
9*	affirmative	17	42,5
	negative	23	57,5
10	affirmative	15	37,5
	negative	25	62,5

10*	affirmative	17	42,5
	negative	23	57,5
11	affirmative	34	85,0
	negative	6	15,0
11*	affirmative	37	92,5
	negative	3	7,5
12	affirmative	24	60,0
	negative	16	40,0
12*	affirmative	22	55,0
	negative	18	45,0
13	affirmative	28	70,0
	negative	12	30,0
13*	affirmative	30	75,0
	negative	10	25,0
14	affirmative	16	40,0
	negative	24	60,0
14*	affirmative	22	55,0
	negative	18	45,0
15	affirmative	6	15,0
	negative	34	85,0
15*	affirmative	9	22,5
	negative	31	77,5
16	affirmative	39	97,5
	negative	1	2,5
16*	affirmative	40	100
	negative	0	0
* represents results from questions after the intervention			

As shown in Table 4.7. 11 participants changed their breakfast habit towards having a breakfast from skipping breakfast after the intervention. Although frequencies for affirmative responses increased after the intervention for 11 questions, according to the McNemar test that proportional chance was statistically significant for only question 1 ($p=0.022$).

Before the Intervention	After the Intervention		n	Q1 & Q1new
	Skipping breakfast	Having breakfast		
Skipping breakfast	6	11	40	,022*
Having breakfast	2	21		
Statically significances (p < 0,05)				

KIDMED scores before and after the intervention were positively correlated ($r = 0.708, p < 0.001$) (Table 4.8.). On average, there were 0.93 points of increase in KIDMED scores after intervention (95% CI [-1.5, -0,34]). The average difference between KIDMED scores was statistically significant ($t_{39} = -3.195, p < 0.05$) (Table 4.9.).

	Mean	n	Std. Deviation	Std. Error Mean	Correlation	Sig.
KIDMED score before the intervention	5,8250	40	2,17076	,34323	,708	,000
KIDMED score after the intervention	6,7500	40	2,53943	,40152		
Statically significances (p < 0.05)						

	Paired Differences				t	df	Sig.
	Mean	Std. Deviation	95% Confidence Interval of the Difference				
			Lower	Upper			
KIDMED score before the intervention KIDMED score after the intervention	-,92500	1,83118	-1,51064	-,33936	-3,195	39	,003
Statically significances (p < 0.05)							

Table 4.10. summarizes the MeD adherence levels of the study population before and after of the intervention. 15% of the participants remained showing poor adherence towards Mediterranean dietary pattern. While percentage of the participants with good adherence increased 40% from 27.5%, average adherence decreased from 57.5% to 45%.

Table 4.10. Stages of Mediterranean Diet adherence before & after intervention		
	Frequency	Percentage
Adherence to the Mediterranean Diet		
Poor Adherence	6	15,0
Average Adherence	23	57,5
Good Adherence	11	27,5
Total	40	100,0
Adherence to the Mediterranean Diet*		
Poor Adherence	6	15,0
Average Adherence	18	45,0
Good Adherence	16	40,0
Total	40	100,0
* represents results after the intervention.		

5. DISCUSSION AND CONCLUSION

Although results from this study shown that giving a theory based nutrition education achieved statistically significantly behavior change towards adolescents' breakfast habits, while interpreting this finding it should be considered that students were on a distance education program instead of their regular school program. With a new education approach which begins later at the morning compared to the old one and does not caused time loss during transportation to school might gave more time to students for having breakfast. Also because of the study design it is not possible to predict whether that effect will remain for longer period of time or not.

As can be seen in Table 4.10. percentage of the adolescents with good MeD adherence increased from 27.5 to 40 but percentages of the adolescents with poor adherence did not changed. It can be sad that theory based nutritional education has more effective on improving adolescents adherence from average to good than improving their adherence from poor to average. While considering that participants with poor adherence to MeD have higher chances to be overweight or obese (14) and higher chances to developing CVDs (6) in future, upgrading this theory based education program to cover that imperilment group (participants with poor adherence) should be the main focus for further studies.

As expected, intervention achieved to increase affirmative answers given to the 15th question which investigates sugar and sugary product consumption (by 7.5% in total). To obtain a statistically significant improvement on reducing sugar and sugary product consumption on the other hand a systematic review and meta-analyzes suggest that greater investments are required beyond theory based nutrition education programs (82). In one of such intervention which used both parental involvement and school curriculum based nutrition education techniques and acquired significantly reduced unhealthy food (sweets, cookies and ice-cream) consumption compared to control group (28).

Alicia et al.'s study revealed significantly increased dairy consumption compared to the control group after their Social Cognitive Theory based nutrition education intervention (26). Likewise in this study percentage of affirmative answers for 7th question (investigating dairy consumption) increased 10% after the intervention.

Although Dean et al.'s meta-analyze on teaching approaches to promote healthy eating shows 60% of the interventions with curriculum based approaches achieved significant increase on vegetable and fruit consumption (82), in this study intervention achieved increased fruit and vegetable consumption (question 8, 9 and 10) which was not statistically significant.

Using olive oil at home (in food preparation) has the highest affirmative answer rate in both before and after intervention. Such high ratio of olive oil usage is believed to be an effect of the region which study conducted.

Data regarding to evaluate sedentary behavior (screen time) and physical activity are taken for only investigation of their relationship with adherence to MeD purpose. Even though they do not have any representative meaning towards whole adolescent population because of sampling and size factors, it still is a dramatic outcome that only 1 participant (2.5%) spend normal time in front of a screen and 28 participants (70%) had below adequate physical activity according to Türkiye Fiziksel Aktivite Rehberi 2014(85).

Data is available in literature shows that better adherence to Mediterranean dietary pattern is related with favorable sleeping habits in terms of sleep duration and quality (53,89,90). A study published in 2019 which was conducted with 269 adolescents further investigated this subject. After controlling sex, BMI and physical activity academic performance (GPA) found to be associated with Mediterranean diet adherence. But that association disappeared when further controlling sleeping habits (sleep duration and quality) (91). In present study no significant association found between school success and MeD adherence but in the direction of those new findings it can be sad that further studies should be questioning sleeping habits as well while investigating the association.

Additional strategies used in intervention studies accompanied to curriculum focused nutrition education. In HealtyKick Study experiential teaching approaches (establishing vegetable gardens at schools) used and healthy eating environment tried to be created via healthier food options in truck shops and special events in addition to theory based nutrition education (78). Also in the Pathways Study together with enhanced curriculum technique parental involvement technique is used, within three years nine different family events accomplished in schools. Low-fat snack pack samples introduced to

parents, cooking demonstrations and other healthy lifestyle promoting activities done with families (29). A systematic review and meta-analysis published in 2015 points out that in most of the interventions which shown improved fruit and vegetable consumption as a result, used curriculum based approaches coupled with secondary approaches like experiential learning or parental involvement (82). After considering that information it can be sad for further studies that while planning an intervention which is aimed to alter adolescents eating habits, using combined strategies would be more meaningful.

It is known that parents and home environment are important factors for children's eating habits (92,93) and C. D. Summerbell et al.'s systematic review on interventions for obesity prevention in children shown that school based intervention programs' effectiveness can be enhanced by parental involvement (94). Another review also points out that parental involvement is more effective when it is used as a direct approach like group education rather than indirect approach like sending informative brochures to houses (95). In one of those studies motivational interviewing technique used to enhance parental self-efficacy. Parents encouraged to believe that they are able to perform certain actions to change their child's behavior towards diet or physical activity and results shown significantly lower unhealthy foods and drink consumption between intervention and control group (28). Although peers have more influence on adolescents eating pattern than their families (75), future studies should also consider to add parental involvement techniques their intervention programs.

Nutrition education is given to participants only for ones in this study while recurring nutrition education can be seen in other intervention studies like 64 times (45minutes each) within 3 years²⁹ or 10 times (30minutes each) within 6 months.²⁸ Considering that study failed to achieve a significant improvement in adolescents' KIDMED scores, it might be sad that giving a nutrition education for just one time is not effective on generating favorable nutritional behaviors. Duration and frequency of the nutrition education programs seems to be as important as programs' content.

Besides duration and frequency of the nutrition education intervention, timing of it is also an issue. In the present study nutrition education was given to middle school students (5th,6th,7th and 8th grade students). Studies exist in literature which started to give nutrition education at the 1st grade²⁷ or given to 2nd grade and 3rd grade students

(26). Findings emphasizes that nutrition education should be a part of the school curriculum from at the very early stages, for all ages (96). Sadly as mentioned in Semra et al.'s study there are no nutritional programs in Turkish school curriculums (25). Considering that measures and education within specific settings (such as schools, workplaces, and hospitals) are valuable strategies on health promotion and schools provide the most efficient & effective way to reach multiple segments of the population (97), governmental (Ministry of Health & Ministry of Education) regulations and actions for schools should be prioritized on nutrition subject.

Literature points out that nutrition education programs in school curriculums should not be vague and general. They should be evaluated regularly to follow the progress and use results from it to encourage and enhance the strategies (96).

Nutrition education interventions are commonly delivered by class teachers in studies (27-29). In Nyberg et al.'s study teachers are trained by research team two hours before the intervention and they received a continuous support by research team including face to face contact, phone calls and e-mailing throughout the intervention (28) whereas in Caballero et al.'s study teachers trained annually in regional or local meetings. Regular visits also carried out to reinforce concepts and procedures (29). Dissimilarly a nutrition education intervention program from 2005 used specialized nutrition educators. Same nutrition educators also used as role models (26). In this paper a nutritionist gave the nutrition education intervention while class teachers were present in classroom during the intervention.

Apart from the academic studies, as teachers are viewed as a core in the implementation process for nutrition education programs (98) they should not be left alone, according to a research paper published at European Journal of Clinical Nutrition (2003) teachers are often complain about lack of time due to their overloaded schedule, lack of suitable materials and training experience in nutrition subject. Findings suggest that to achieve a successful school based nutritional education both teachers, families and professionals should be involved (96). To provide such comprehensive action governmental regulations seems to be the best and only way.

Following the MeD pattern has other beneficial outputs beyond increased academic performance and prevention of diseases several diseases. Studies found that adherence to the Mediterranean Diet is directly associated with better quality of life. Emily Knox

and Jose Joaquin Muros' study revealed more positive scores in 4 parameters of health related quality of life for adolescents with better MeD adherence (99). Likewise findings obtained from cross sectional analysis of PREDIMED-Plus Trial shown significantly better scores in 8 parameters of health related quality of life in adults with higher MeD adherence (100), which further strengthens that dietary habits of youngsters are highly important issue and requires investments on.

Influence of Mediterranean dietary pattern is not limited with adolescents. Studies conducted in European countries signalize that university student's diet was distancing from traditional MeD(101-103), one study in particular revealed that only 19.4% of the students in the study group followed the Mediterranean dietary pattern, to the contrary 22.2% of them were following a Western type of eating pattern (103). While university students dietary habits move away from MeD, a literature review published in 2020 highlights MeD's potential positive effects of on depression prevention and academic success improvement (104). As providing correct nutritional information to children in early stages of their life is associated with healthy nutritional preferences (74), school based nutrition education programs has potential to influence and change that pattern shift towards Western diet in college students.

As a conclusion it can be sad that theory based nutrition education intervention has a potential towards increasing MeD adherence of adolescents'. This potential will may strengthen with repetition (frequency) of the education, family participation to the education process, health professionals involvement during preparation and presentation of the education, an enhanced scope (number of participants) and a complementary approach which will also focus on physical activity. It cannot be expected from either schools or small health organizations to overcome construction of such elaborated intervention by themselves, governmental support seems to be the key point while creating such nutrition education programs.

5.1. Limitations & Weaknesses

Second part of the data collection (2 weeks after the intervention) was planned to be done in classroom during lecture hours, however schools were switched to distance education program due to health and safety measures (COVID-19). Arise from that situation second part of the data collection is done via e-mail.

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7. APPENDICES

7.1. Ethical Approval



Sayı : 37068608-6100-15- 1770
Konu: Klinik Araştırmalar
Etik kurul Başvurusu hk.

07/11/2019

İlgili Makama (Cem Zeybek)


Yeditepe Üniversitesi Sağlık Bilimleri Fakültesi Beslenme ve Diyetetik Dr. Öğr. Üyesi Binnur Okan Bakır'ın sorumlu araştırmacı olduğu "Adölesanlarda Beslenme Eğitiminin Akdeniz Diyeti Kalite İndeksi (KIDMED) Üzerindeki Etkisi " isimli araştırma projesine ait Klinik Araştırmalar Etik Kurulu (KAEK) Başvuru Dosyası (1756) kayıt Numaralı KAEK Başvuru Dosyası, Yeditepe Üniversitesi Klinik Araştırmalar Etik Kurulu tarafından 06.11.2019 tarihli toplantıda incelenmiştir.

Kurul tarafından yapılan inceleme sonucu, yukarıdaki isimi belirtilen çalışmanın yapılmasının etik ve bilimsel açıdan uygun olduğuna karar verilmiştir (KAEK Karar No: 1115).

Prof. Dr. Turgay ÇELİK

Yeditepe Üniversitesi
Klinik Araştırmalar Etik Kurulu Başkanı

7.2. Institutional Approval and Questionnaire



T.C.
BALIKESİR VALİLİĞİ
İl Millî Eğitim Müdürlüğü

Sayı : 99191664-605.01-E.1425445
Konu : Araştırma İzni

20.01.2020

T.C. YEDİTEPE ÜNİVERSİTESİ REKTÖRLÜĞÜNE
(26 Ağustos Yerleşimi İnönü Mah. Kayışdağı Cad. 34755 Ataşehir/ İSTANBUL)

İlgi : 14/01/2020 tarih ve 478 sayılı yazınız.

Üniversiteniz Sağlık Bilimleri Enstitüsü Beslenme ve Diyetetik Anabilim Dalı yüksek lisans öğrenciniz Dyt. Cem ZEYBEK 'in Müdürlüğümüze bağlı eğitim kurumlarımızda uygulamak istediği anket çalışmasının uygun görüldüğüne ilişkin Valilik Makamının 17/01/2020 tarih ve 13333123 sayılı onayı yazımız ekinde sunulmuştur.

Bilgilerinize arz ederim.

Yakup YILDIZ
İl Millî Eğitim Müdürü

20 Ocak 2020
Güvenli Elektronik İmza
Aslı ile Aynıdır.
Zekariya YALIN
Memur

Ek :
-Onay (1 Adet)
-Anket Formu (2 Sayfa)

Kayıtlar Mahalleni Sındığı Caddesi No:1 Merkez/BALIKESİR
Elektronik Ađ: balikesir.meb.gov.tr
e-posta: stratejigelistirme10@meb.gov.tr

Ayrıntılı bilgi için: Hasan KARADEMİR V.H.K.İ.
Tel: (0266) 277 10 49
Faks: (0 266) 277 10 66

Bu onay güvenli elektronik imza ile imzalanmıştır. İmza kontrolü için: <https://www.saglik.gov.tr> adresinden: ee3d-d53b-3655-8f37-5d82 koda ile teyit edilebilir.



T.C.
BALIKESİR VALİLİĞİ
İl Millî Eğitim Müdürlüğü

Sayı : 99191664-605.01-E.1333123
Konu : Araştırma İznî

17.01.2020

VALİLİK MAKAMINA
BALIKESİR

İlgi : a) Millî Eğitim Bakanlığı Yenilik ve Eğitim Teknolojileri Genel Müdürlüğünün 22/08/2017 tarih ve 2017/25 sayılı genelgesi.

b) T.C. Yeditepe Üniversitesi Rektörlüğünün 15/01/2020 tarih ve 478 sayılı yazısı.

Başvuru Sahibinin Adı Soyadı	Dyt. Cem ZEYBEK		
Danışman	Dr. Öğr. Üyesi Binnur OKAN BAKIR		
Kurumu/Üniversite/Görev Yeri	Yeditepe Üniversitesi, Sağlık Bilimleri Enstitüsü, Beslenme ve Diyetetik Anabilim Dalı		
Alan/Bölüm	Beslenme ve Diyetetik		
Tez/Araştırma veya Anketin Konusu	Adölesanlarda Beslenme Eğitiminin Akdeniz Diyeti Kalite İndeksi (KIDMED) Üzerindeki Etkisi		
Başvuru Tarihi	15.01.2020	Başvuru Sayısı	962757
Çalışma Başlama Tarihi	15.01.2020		
Çalışma Bitiş Tarihi	15.06.2020		
Veri Toplama Araçları	Anket		
Araştırma Türü	Tez Araştırması		Araştırma Önerisi
ÇALIŞMA YAPILACAK EĞİTİM KURUMLARININ LİSTESİ			
Burhanive/Peliköy Halit Selçuk Ortaokulu			

15/01/2020 tarihli araştırma izni başvurusu 22.08.2017 tarih ve 2017/25 sayılı araştırma, yarışma ve sosyal etkinlik izinlerine ilişkin genelge kapsamında değerlendirilmiştir. Lisans, lisansüstü, TÜBİTAK çalışmalarına ve seminer ödevlerine veri toplamak amacıyla, araştırma önerisinin ve veri toplama araçlarının içerik ve kapsam yönünden Türk Millî Eğitiminin amaçlarına uygun olduğu, millî ve manevî değerlere aykırı ve kişilik haklarını zedeleyecek herhangi bir unsur taşımadığı görülmüştür.

Bakanlığımıza bağlı okul ve kurumlarda yapılacak Araştırma, Yarışma ve Sosyal Etkinlik izinleri ilçe (a) genelge gereğince yukarıdaki bilgileri belirtilen çalışmanın, eğitim kurumlarında, okul/kurum müdürlüklerinin denetiminde, öğrenci ve velilerin kişisel bilgilerinin alınmaması/verilmemesi kaydı ile yapılması Müdürlüğümüzce uygun görülmektedir.

Makamlarınıza da uygun görüldüğü takdirde olularınıza arz ederim.

Hüseyin AŞIK
Müdür a.
İl Millî Eğitim Müdür Yardımcısı

Ek : Anket Formu (2 Sayfa)

OLUR
17.01.2020
Yakup YILDIZ
Vali a.
İl Millî Eğitim Müdürü

Okul No:

Cinsiyet:

Erkek Kadın

Yaş:

Diyet kısıtlaması gerektirecek bir sağlık sorunuz var mı?

Evet (Diyet kısıtlaması gereken hastalığınızın adı) Hayır

Annenizin eğitim durumu nedir?

İlköğretim Lise Üniversite Yüksek lisans / Doktora

Okul Not Ortalamanız:

Düzenli fiziksel aktivite yapıyor musunuz?

Hayır

Evet Günde 60 dakikadan az, orta şiddetli fiziksel aktivite yaparım.

Evet Günde 60 dakika, orta şiddetli fiziksel aktivite yaparım.

Evet Günde 60 dakikadan fazla, orta şiddetli fiziksel aktivite yaparım.

Günde televizyon, telefon, bilgisayar/tablet karşısında ne kadar vakit geçirirsiniz?

Televizyondk Telefondk Bilgisayar/tabletdk

		EVET	HAYIR
1	Kahvaltı yapmam.		
2	Kahvaltıda süt ve süt ürünleri tüketirim. (süt, yoğurt...)		
3	Kahvaltıda tahıl (ekmek) veya tahıl ürünleri (tahıl gevreği) tüketirim.		
4	Kahvaltıda hazır fırın ürünleri veya hamurçileri tüketirim.		
5	Her gün meyve veya taze sıkılmış meyve suyu tüketirim.		
6	Her gün ikinci bir meyve daha tüketirim.		
7	Günlük olarak iki bardak süt/yoğurt ve veya bir büyük dilim (40gr) peynir tüketirim.		
8	Düzenli olarak günde bir kez taze veya pişmiş sebze tüketirim.		
9	Günde birden fazla taze veya pişmiş sebze tüketirim.		
10	Düzenli olarak balık tüketirim. (haftada en az 2-3 kez)		
11	Fast-food tarzı restoranlara (hamburger) haftada bir kereden fazla giderim.		
12	Düzenli olarak kuruyemiş tüketirim. (haftada en az 2-3 kez)		
13	Baklagilleri severim ve haftada bir kereden fazla tüketirim.		
14	Makarna ve pilavı hemen hemen hergün tüketirim. (haftada 5 veya daha fazla)		



15	Tatlı, şeker ve şekerlemeleri günde birkaç kez tüketirim.		
16	Evide zeytinyağı kullanırım.		

KIDMED (Mediterranean Diet Quality Index)

8. CURRICULUM VITAE

Kişisel Bilgiler

Adı	Cem	Soyadı	ZEYBEK
DoğumYeri	Balıkesir	DoğumTarihi	24.05.1995
Uyruğu	T.C.	TC Kimlik No	15832611546
E-mail	zeybekcem95@gmail.com	Tel	05352330868

Öğrenim Durumu

Derece	Alan	MezunOlduğuKurumunAdı	MezuniyetYılı
Doktora			
YüksekLisans	Beslenme ve Diyetetik	YeditepeÜniversitesi	2020
Lisans	Beslenme ve Diyetetik	YeditepeÜniversitesi	2018
Lise	-	İzmir Atatürk Lisesi	2013

BildiğiYabancıDilleri	YabancıDilSınavNotu (#)
İngilizce	81.25 (YDS-2018)

#Başarılımışbirdenfazlasınavvarsa(KPDS, ÜDS, TOEFL; EELTS vs), tümsonuçlaryazılmalıdır

İş Deneyimi (Sondan geçmişe doğru sıralayın)

Görevi	Kurum	Süre (Yıl - Yıl)
		-
		-

Bilgisayar Bilgisi

Program	Kullanmabecerisi

*Çokiyi, iyi, orta, zayıfolarakdeğerlendirin

BilimselÇalışmaları

SCI, SSCI, AHCI indekslerinegirendergilerdeyayınlananmakaleler

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28.11.2020

[Signature]

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Diğer dergilerde yayımlanan makaleler

Uluslararası bilimsel toplantılarda sunulan ve bildiri kitabında (*Proceedings*) basılan bildiriler

Hakemlik konferans/sempozyumların bildiri kitaplarında yer alan yayınlar

Diğer (Görev Aldığı Projeler/Sertifikaları/Ödülleri)

28.11.2020

Kaya

