

Effectiveness of Yoga, Fast of Dawood, Green Tea and Apple Juice as Suppressors of PPAR- γ , C/EBP- α , and SREBP-c for Management of Obesity on Adolescents

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Article Info:

Submitted:

10-10-2021

Revised:

05-12-2021

Accepted:

21-12-2021

DOI:

<https://doi.org/10.53713/nhs.v1i3.79>



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ABSTRACT

Obesity is a condition that can increase the risk of some diseases such as reduced brain capacity, dyspnea, skin irritation, hypertension, and diabetes. Proper treatment is needed to overcome the problems of obesity. The objective of this study was to investigate the effectiveness of Yoga, fast of Dawood, Green Tea, and Apple juice to manage obesity in adolescents. The method used in this study was a literature review from journal publications through the database ScienceDirect, PUBMED, and google scholar, and the criteria were Indonesian and English with a range of publication years 2014-2021. Ten main articles were used as references in this study. These articles proved that yoga therapy could maintain the balance and health of the physical, emotional, and spiritual dimensions, and Fast of Dawood can limit the amount of calorie intake at a particular time. Moreover, consuming green tea as a source of polyphenol derivatives and apples with high of flavanol, anthocyanidin, dihydrochalcones, and hydroxycinnamic acid could decrease adolescents' body weight. Yoga and Fast of Dawood exercise can reduce adipogenesis and induce reverse cholesterol transport, cellular cholesterol released, reduced pro-inflammatory cytokines and decreased the incidence of obesity.

Keywords: apple juice; fast of dawood; green tea; obesity; yoga

INTRODUCTION

Obesity is a condition caused by fat accumulation in adipose tissue, the complication of obesity was low brain capacity, dyspnea, skin rash, hypertension and diabetes mellitus. The prevalence of obesity in girls is 10% higher in 10 countries. In 2015, 19,5% of the adolescent population was obese across the OECD countries, including Indonesia (Hamann et al., 2017). In Indonesia, the prevalence of obesity in adolescents aged 13-15 was 8.0%. Prevalence of obesity in senior high school (16-18) in Aceh found 2,7% had. The number of obese girls is higher (3,2%) than Indonesian boys (2,2%) (Prameswari, S, P, I., S, Aisah, 2013).

The general problem of obesity is related to energy balance and influenced by internal factors and external factors. Those are the type of lifestyle and low physical activity. The critical factor of obesity in adolescents is a low physical activity which is reported in previous researches such as: watching TV and playing games on a computer for a long time, consumption of junk food, economic status of the family, and history of obesity in the family (Mistry et al., 2014).

Management of obesity consists of two main treatments: diet treatment and exercise treatment. Diet treatment for obesity in adolescents includes modifying dietary intake, especially for the quantity and the quality of food intake (Tyson & Frank, 2018). Fast of Dawood is a well-known type of fasting that can arrange the quantity of food intake regularly and consistently. The quality of food intake can be arranged with the lower dose of sugar, fewer low nutrient foods, and more high nutrient foods (fruits and vegetables). Green tea and apple juice were known as optional nutrients to lose weight. Thus, both things can be optional treatments for adolescents with obesity. Exercises treatment for obesity includes increasing physical activity and reducing sedentary activity. Yoga treatment was an exercise to provide a balanced, healthy physical dimension, mental, emotional, and spiritual. (Bernstein et al, 2014; Dhananjay et al, 2013).

Based on the above phenomenon, the authors are interested in conducting a literature review that aims to determine the effectiveness of Yoga, fast of Dawood, green tea, and apple juice as obesity management for adolescents to prevent complications and maintain their weight.

METHOD

The method in writing this article used a literature review, a method of critical and systematic thinking based on various research articles and other articles using the author's method of logic and argument. The guidelines in writing this literature review use the PRISMA diagram approach (Preferred Reporting Items for Systematic Reviews and Meta-analyses). To assess the feasibility of articles to be included in this study, the authors use the Critical Appraisal Skills Program (CASP). The literature used is articles obtained from electronic media obtained from Google Scholar, Science Direct, Scopus, NCBI, and ProQuest through Apple juice, Fast of Dawood, Green Tea, Obesity, Yoga. The criteria used in the search are in Indonesian and English, with a range of publication years from 2014 to 2021.

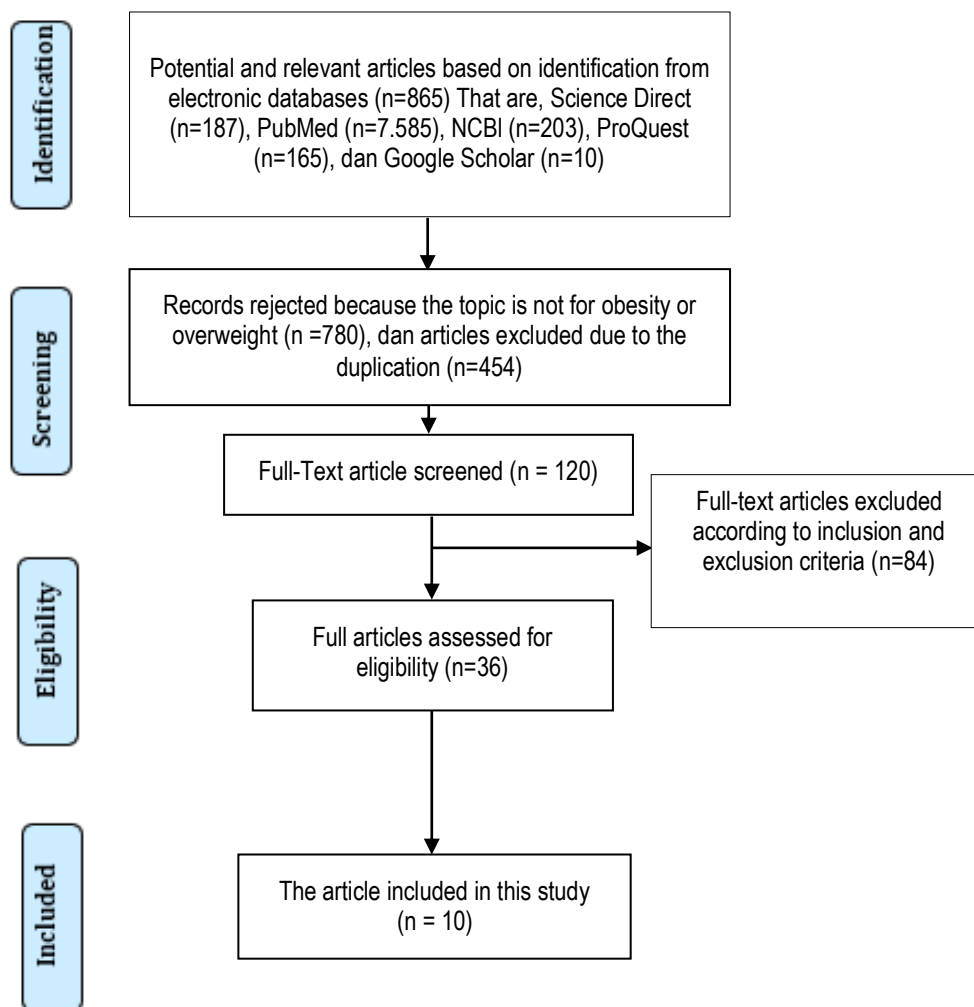


Chart 1. Screening the Articles using a PRISMA Diagram

RESULT

A total of 10 articles were reviewed based on the following articles search results.

Table 1. Literature studies

Author	Years	Title	Method	Result
Bagade, A, H & Bhone, M, S	2018	Role Of Yoga As A Therapeutic Regimen In The Management Of Obesity	Quasi experiment with pretest posttest design	This research found that the respondent who conducted Yoga training among 12 weeks of therapy experienced 18% reductions in body mass index (BMI) and 5% reductions in Waist hip ratio (WHR). Yoga can decrease the amount of weight significantly in participants and control the body weight of people with obesity.
Sameer Mahajan	2017	A Case Report of Obesity and Its Management through Yoga-Asana	Case report	The patients who complained of weight gain, hyperacidity, and headaches significantly reduced after Yoga treatment. 6kg weight reduction was achieved only in 3 months with yoga-asana.
Holger Cramer, Meral S, T, Dennis A, Romi L, Gustav D	2016	Yoga in Women With Abdominal Obesity	Randomized Controlled Trial	This study showed that the abdominal circumference of respondents was significantly reduced in comparison to the participants in the control group, with an intergroup difference of – 3.8 cm. yoga intervention lasting 12 weeks, including women with abdominal obesity, reduced participants' waist circumference, waist-hip ratio, body weight, BMI, and percentage of body fat and increased the percentage of muscle mass.
Syawal, Ichsan Muhammad Nurdin, Naufal Muharam	2021	The Effectiveness of Daud Fasting on Weight Loss and Body Fat Composition in Young Adults	Experimental study	The results showed that the intervention group experienced a decrease in body weight (-1.7 ± 1.3 kg), BMI (-0.6 ± 0.5 kg/m ²), and visceral fat level (-0.6 ± 0.5) significantly after fasting David for four weeks. The percentage of body fat in the intervention group tends to decrease ($-0.1 \pm 0.8\%$)
Izzaturrahmi Akmarina Firda	2017	Effects of Daud Fasting on Body Mass Index and Abdominal Circumference in the Age Group 50 Years in Sleman Regency, Special Region of Yogyakarta	Quasi-experimental with pretest and posttest design	The statistical analysis results showed a significant difference between the body mass index of the fasting group and the non-fasting group, with a value of $p=0.001$ ($p<0.05$).
MC Klempel, Cynthia M Kroeger, Surabhi Bhutani, John F Trepanowski, and Krista A Varady	2012	Intermittent fasting combined with calorie restriction effectively affects weight loss and cardio-protection in obese women.	Randomized control trial	In this study, the combination of Intermittent fasting (IF) and calorie restriction (CR) is an effective means of reducing body weight, fat mass, and visceral fat mass in obese women. This novel regimen also decreased key indicators of CHD risk, such as LDL cholesterol, triglycerides, and the proportion of small LDL particles when liquid meal replacements were incorporated into the IFCR regimen, more significant reductions in body weight.
Chung Shu Yang, Hong Wang, Zachary Paul Sheridan	2018	Studies on prevention of obesity, metabolic syndrome, diabetes, cardiovascular diseases, and cancer by tea	Case study	In the previous study with hyperlipidemic subjects, tea extract (38%) decreased body weight and BMI. Green tea extracts (GTE) supplementation (379 mg daily) to obese patients for three months also decreased body weight.

Table 1. Literature studies (cont.)

Author	Years	Title	Method	Result
I-Ju Chen, Chia-Yu Liu, Jung-Peng Chiu, Chung-Hua Hsu	2016	The therapeutic effect of high-dose green tea extract on weight reduction: A randomized, double-blind, placebo-controlled clinical trial	Randomized, double-blind, placebo-controlled clinical trial	The researcher showed a significant weight loss, from 76.8 ± 11.3 kg to 75.7 ± 11.5 kg ($p = 0.025$), as well as decreases in BMI ($p = 0.018$) and waist circumference ($p = 0.023$) were observed in the treatment group after 12 weeks of high-dose EGCG treatment. This study also demonstrated a consistent trend of decreased total cholesterol, reaching 5.33%, and decreased LDL plasma levels.
Ernawati Hardani, Wiryatun Lestariana, Susetyowati	2014	Effect of Green Tea (<i>Camellia sinensis</i> (L.) O. Kuntze) var Assamica extracts supplementation to body fat total and lipid profile of overweight and obese adult women.	Randomized double-blinded control trial	Green tea extract supplementation could significantly reduce body fat total and insignificantly reduce cholesterol level, triglyceride, and LDL, significantly increasing HDL in overweight and obese women.
Solaleh Sadat Khezria Atoosa Saidpourb, Nima Hosseinzadehc, Zohreh Amirib	2018	Beneficial effects of Apple Cider Vinegar (ACV) on weight management, Visceral Adiposity Index and lipid profile in overweight or obese subjects receiving restricted calorie diet: A randomized clinical trial	Randomized clinical trial	The ACV significantly reduced body weight, BMI, Hip circumference, visceral adiposity index (VAI), and appetite score ($P \leq 0.00$). Furthermore, Plasma triglyceride (TG) and total cholesterol (TC) levels significantly decreased, and high-density lipoprotein cholesterol (HDL-C) concentration significantly increased in the ACV group in comparison to the control group ($P \leq 0.05$).

DISCUSSION

Yoga Therapy

Yoga is a type of exercise designed to bring physical balance and physical health dimensions, mental, emotional, and spiritual dimensions. This exercise is related to the impact on the sympathetic nervous system and Hypothalamus-Pituitary Axis (HPA). Yoga consists of eight aspects: Yama, Niyama, Asana, Pranayama, Pratyahara, Dharana, Dhyana, Samadhi (Bernstein, Basr, Ehrman, & Golubic, 2014; Tiwari, Dutt, Kumar, Dhananjai, & Sadashiv, 2013). Yoga has a low intensity that shows cortisol levels, increasing cortisol levels. Yoga, which is a low exercise, responds positively to HPA. Yoga with low epinephrine and norepinephrine levels (Bernstein et al., 2014). Yoga has lower inflammatory interleukin-6 (IL-6) (Kiecolt-Glaser JK, Christian L, Preston H & Al, 2010). The adipocytokines leptin and adiponectin, both secreted by fat cells, may augment or dampen inflammation: leptin stimulates monocyte and T-cell release of IL-6 and TNF- α , activates macrophages, and promotes CRP production; adiponectin enhances the production of anti-inflammatory IL-10 and decreases CRP, IL-6, and TNF- α . Leptin also decreases appetite and increases energy expenditures, and exogenous leptin administration has been shown to stimulate sympathetic nervous system activity (Bernstein et al., 2014). Greater frequency and years of yoga practice have been associated with lower leptin levels and a higher adiponectin-to-leptin ratio, independent of BMI, central adiposity, and mood. Low sympathetic nervous system activity may be a risk factor for weight gain (Bernstein et al., 2014).

The patients who complained of weight gain, hyperacidity, and headaches significantly reduced after Yoga treatment. 6kg weight reduction was achieved only in 3 months with yoga-asana (Sameer S. Mahajan, 2017). Bagade, A, H & Megha S (2018) found that the respondent who conducted Yoga training among 12 weeks of therapy experienced 18% reductions in body mass index (BMI) and 5% reductions in Waist hip ratio (WHR). Yoga can decrease the amount of weight significantly in participants and control the body weight of people with obesity. The BMI of the subjects was 33.28 ± 2.68 before the Yoga training program. BMI decreased to 27.83 ± 2.35 after 12 weeks of Yoga training which is statistically significant ($Z = 11.84$, $P < 0.001$). Yogasanas include various postures and stretching exercises that help strengthen the muscles and improve the body's flexibility. They involve gentle movements of body parts and isometric contraction of various muscles and muscle groups. These asanas and pranayamas entail a

considerable expenditure of energy and burning calories, which may be responsible for the decrease in weight (Bagade, A, H & Megha S, 2018).

Cramer et al. (2016) showed that the abdominal circumference of respondents who participated in their study was significantly reduced compared to the participants in the control group. Yoga intervention lasted 12 weeks, including women with abdominal obesity, reduced participants' waist circumference, waist-hip ratio, body weight, BMI, percentage of body fat, and increased muscle mass. Yoga improved participants' mental and physical wellbeing and self-esteem and reduced perceived stress (Cramer et al., 2016). The effects of Yoga on anthropometric measures can be increased by a greater frequency, a longer duration, and the use of complex yoga interventions with multiple components and in combination with dietary (especially of a vegetarian diet with calorie reduction) (Rioux JG, 2013). Hagins et al. (2007) identified anthropometric effects of the intervention are due exclusively to the increase in physical activity: the reduction in the proportion in body fat that was achieved in the yoga group corresponds to a reduction of 1.3 kg of pure fat, or 12.000 (Hagins M, 2007).

Fast of Dawood

fasting is a limitation on the number of calories in a vulnerable time. Fast of Dawood was one of the fasting relatively heavy because it is done on continuously with a one-day pause, in which they abstained from eating, drinking, or having sexual intercourse from the break of dawn to dusk with the expressed intent to fast every other day (Fidianingsih et al., 2018). Most studies showed that the fast of Dawood is described as intermittent fasting (IF). Intermittent fasting, whose proposed benefits include improving lipid profile and body weight loss, has gained considerable scientific and popular percussion (Santos & Macedo, 2018). Low calories diets can enhance lipid (Fothergill et al., 2016). According to Izzaturrahmi et al. (2017), in addition to weight loss, fat mass, concentrations of triacylglycerol and leptin also showed a significant decrease in the fasting group. Based on this research, it can be seen that alternate-day fasting can lose weight and can be a preventive measure for heart disease (Izzaturrahmi et al., 2017)

Klempel et al. (2013) studied obese women who were intervened with intermittent fasting (IF) for two weeks. As a result, bodyweight decreased 3.9 ± 1.4 kg; lipids decreased 2.8 ± 1.2 kg; low-density lipoprotein cholesterol (LDLC) decreased $19 \pm 10\%$. The effect of fasting on obesity could be characterized by the level of IL-6, CRP, and homocysteine. Fast of Dawood can induce cellular cholesterol and reverse cholesterol transport. This makes the cholesterol ester HDLC induce maturity and activate the gene Apolipoprotein-1 (ApoA1). ApoA1 will make LDL in the body attached to the LDL receptor (LDLR) divided and excreted by valeric vesical. Reverse cholesterol transport also improves the circulation of microRNA-33 for the ATP-binding cassette inhibit transporter 1 (ABCA1). Indirectly ABCA1 would undermine the atherosclerotic plaque in blood vessels composed of LDLC (Klempel et al., 2013). Meanwhile, a study conducted by Syawal & Nurdin (2021) showed that the intervention group experienced a decrease in body weight (-1.7 ± 1.3 kg), BMI (-0.6 ± 0.5 kg/m²), and visceral fat level (-0.6 ± 0.5) significantly after fasting David for four weeks. The percentage of body fat in the intervention group tends to decrease ($-0.1 \pm 0.8\%$) (Syawal & Nurdin, 2021).

Tea Treatment

Teas are the most popular beverages consumed in the world. Several kinds of tea are commonly consumed, such as green tea, black tea, and oolong. Green Tea (*Camellia synesis*) has a significant effect on controlling diseases. Green tea consists of Anti-allergic, anti-cancer, antiobesity, anti-mutagenic, anti-apoptotic, neuroprotective, anti-hyperglycemic, antioxidant, anti-microbial, and anti-inflammatory effects. Green Tea (*Camellia synesis*) also has many antioxidant polyphenols (Azevedo et al., 2018). The characteristic of polyphenolic compounds in green tea is known as catechins, which include: (-) epigallocatechin-3- gallate (EGCG), (-) epigallocatechin (EGC), (-) epicatechin- 3-gallate (ECG), and (-) epicatechin (EC) (Yang et al., 2017). The primary catechin (40% higher of the total catechin content) is Epigallocatechin-3-gallate (EGCG), found on green Tea (Zagury, Kazir, & Livney, 2019). Most studies showed that EGCG significantly reduces body weight and adipose tissue weight (Yang et al., 2017). In research showed intervenes EGCG on obese mice for eight weeks made some genes PPAR- γ , C/EBP- α , and SREBP-close their expressions. They explained before that PPAR- γ and C/EBP- α become regulatory genes that play a role in adipogenesis (Kim, H.S., Quon, M.J. and Kim, J.A., 2014). If these two genes are muted or lose expression, the lipid profile will also decrease. Generally, the expression of PPAR- γ and C / EBP- α stimulates deep adipogenesis NIH 3T3 fibroblasts show an essential role of deep transcription factors regulating adipogenesis. PPAR- γ and C / EBP- α are found almost exclusively in adipose tissue and associated with adipocyte differentiation. The combination of PPAR- γ and C / EBP- α has a synergistic effect in promoting the conversion of fat cells to myoblasts, and this showed that this gene is essential for adipocyte fat accumulation. These transcription factors coordinate gene expression in maintaining adipocyte phenotypes, including AP2. AP2 kind of intracellular lipid-binding proteins showed the protein is involved in the formation of atherosclerosis mainly through direct modification of cholesterol and inflammatory macrophages. EGCG in adipogenesis induces a

reduction in PPAR- γ protein in cells 3T3-L1, accompanied by attenuation of C / EBP- α expression (Moon, H.S., Lee, H.G., Choi, Y.J., Kim, T.G. and Cho, 2007; Wang et al., 2014).

The results of Hardani & Lestariana (2014) showed a significant decrease in the total body fat of overweight and obese women after being given green tea extraction drinks. The decrease in total body fat occurs because green tea has a high inhibitory effect on linoleic acid oxidation (omega 6 fatty acid). This high inhibitory power is due to the presence of catechin compounds in green tea, which are the most potent components and chemically have the most muscular biological activity among other catechin compounds (Hardani & Lestariana, 2014). Catechins (EGCG) have a hypocholesterolemic effect because EGCG can suppress cholesterol absorption in the intestine. Fatty acids are oxidized to acetyl CoA and synthesized from acetic-CoA (Chen et al., 2015).

Chen et al. (2015) showed a significant weight loss, from 76.8 ± 11.3 kg to 75.7 ± 11.5 kg ($p \frac{1}{4} 0.025$), as well as decreases in BMI ($p \frac{1}{4} 0.018$) and waist circumference ($p \frac{1}{4} 0.023$) were observed in the treatment group after 12 weeks of high-dose EGCG treatment (Chen et al., 2015). Several previous studies also stated that when overweight and obese patients were given green tea extract (ETH) containing catechins (EGCG), there would inhibit the catechol-O-methyltransferase enzyme, resulting in increased activity in the sympathetic nervous system. An increase in activity in the sympathetic nervous system will cause an increase in catecholamine hormones, epinephrine, norepinephrine, and glucagon. These four hormones are instrumental in increasing lipolysis (decomposition and digestion of fat). Increased lipolysis will be followed by increased thermogenesis (heat in the body to burn fat and calories) and fatty acid oxidation (Belza et al., 2009). More acetyl-CoA is formed to produce energy with increased fatty acid oxidation. , the less fat stored in adipose tissue. This process of lipolysis and thermogenesis can suppress hunger and increase satiety, which will impact nutritional status, and subsequently, this nutritional status will affect TLT conditions and lipid profiles (Chen et al., 2015).

Apple Treatment

Apples are the most commonly consumed fruit globally and an essential source of phytonutrients. Apples are rich in fibres, vitamins, and polyphenols. Apple phenolics comprise four main polyphenol classes: Cinnamic acid, flavanols, and many antioxidants (Trošt et al., 2018). Polyphenols significantly affect accessible radical interventions, regulate gene expression, and change signal transduction in tissues or target cells. A high intake of polyphenols significantly reduces weight and adipose tissue. Polyphenols decrease of leptin (Lep), perilipin (Plan), and level of mRNA sterol binding transcription factor 1 (Srebf1) but increasing of aquaporin 7 (Aqp7), adipocyte enhancer-binding protein 1 (Aebp1), and mRNA-level peroxisome proliferator-activated receptor-gamma coactivator 1 alpha (PPAR γ C1 α) in adipocytes. The increase of Aebp1 has a higher effect on preventing adipogenesis. Previous studies showed that Polyphenol extract suppresses adipocyte differentiation by Srebf1 downregulation. Supplementation of AP in parallel can reduce leptin expenditure in plasma, and this study revealed a fat mass in epididymal adipocytes attenuated (Zheng et al., 2018; Barth et al., 2012; Thesis, 2013; Hyson, 2011). Khezri et al. (2018) showed that the oral administration of ACV and RCD significantly decreased body weight, BMI, hip circumference, and Visceral Adiposity Index (VAI) compared to the control (Khezri et al., 2018). Moreover, approximately half a kilogram weight loss more than the expected amount for this duration may be related to the thermic effect of ACV. The mechanism of the effect of vinegar consumption on serum triglyceride may be attributed to a reduction in the formation of triglycerides in the liver due to a reduction in body weight (Fushimi et al., 2006).

CONCLUSION

According to 10 articles that authors have reviewed, it can be concluded that yoga treatment can reduce cortisol and leptin in the body and increase adenopectin, which can reduce adipogenesis. Fast of Dawood can induce reverse cholesterol transport and expenditure of cellular cholesterol and reduce some pro-cytokines inflammation so that it has a positive impact in reducing the body lipid. Meanwhile, green tea and apples contain high polyphenols, which play a role in inducing lipolysis. In addition, EGCG is contained in green tea; it is proven to reduce the PPAR-gene, SREBP-c, and C / EBP- α , which is the primary regulator in energy metabolism. Through method combination of these interventions, it is expected that the incidence of obesity, in particular, is expected in adolescents can be minimized.

ACKNOWLEDGEMENT

The authors would like to thank all of the researchers who were included in this study.

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