



## EFFECTS OF AEROBIC EXERCISE WITH NATURAL SUPPLEMENTATION ON LIPID PROFILES AND BODY COMPOSITION IN DESKBOUND

WOMAN  
Dr.D.Natarajan<sup>1</sup>

### AFFILIATIONS:

<sup>1</sup> Assistant Director of Physical Education, Tamil Nadu Dr.J.Jayalalithaa Fisheries University, Nagapattinam – 611 002, Tamil Nadu, India.

### ABSTRACT

**Aim:** This study was conducted to determine the effect of aerobic exercise with natural supplementation on lipid profiles and body composition in deskbound women. **Materials and methods:** Hence 30 obese women (BMI $\geq$ 30, age 30-34) were included in two groups. Aerobic exercise with natural supplementation (AENS; n=15); control group (G<sub>CON</sub>: n=15). The experimental group underwent their aerobic exercise with natural supplementation (raw onion, Tomatoes, Fenugreek seeds, ginger and garlic). These are in the form of chutney, was given daily as 75 to 100 gm per day for period of 10 weeks for all days. To identify total cholesterol, HDL, LDL and triglycerides levels (computerized Robotic semi auto analyzer), venous blood samples were obtained before and 48 to 72 h after last session of protocol. BMI was calculated the (body weight [kg]/height [m<sup>2</sup>]) and body fat percent was then calculated by using the Siri equation. **Results:** In observation, a significant decrease for total cholesterol, LDL, triglycerides, BMI and body fat percentage (P<0.05) and significant increase for HDL (P>0.05) in the G<sub>CON</sub> after the 10 weeks period was unchanged. **Conclusion:** The study revealed a suggested aerobic exercise with natural supplementation training had been an effective beneficial plan for changes in lipid profiles and body composition in obese women.

**Key words:** Aerobic exercise, natural supplementation, lipid profiles, body composition

## 1. INTRODUCTION

The present way of life, characterized by abundance of energy-enriched foods coupled with deskbound lifestyles is linked with increased obesity.<sup>1</sup> Age is correlated with a raise in adiposity, reduce in muscle mass, and decline in fitness.<sup>2</sup> These age-related changes in body composition and strength given to the improved occurrence of dyslipidemia, glucose intolerance, hypertension, and coronary artery disease (CAD) in the aged.<sup>3</sup> Physical exercise during aging to raise long life and decrease risk for age-related diseases, specific to women based on present study.<sup>4</sup> Therefore, instituting weight loss or work out interventions to decrease obesity and its associated metabolic abnormalities might be an important health benefit to deskbound women.<sup>5</sup> The aerobic exercises with natural supplementation interventions to reduce obesity and increase fitness were widely advocated<sup>6</sup> but there was conflicting evidence in which of these interventions would improve CAD older, obese individuals.<sup>7</sup> The standard of living interventions, such as natural supplementation weight loss and rising physical activity (PA), are advocated for the management of obesity and prevention of future chronic diseases.<sup>8</sup> Few well controlled clinical trials had examined whether weight loss alone or vigorous aerobic exercise training alone was sufficient to improve CAD risk factors in older, sedentary individuals.<sup>9</sup> The studies have shown that growing person levels of aerobic exercise involvement is successful for reducing insulin resistance and adiposity; especially among populations with stationary lifestyle and fatness.<sup>10</sup>

Obesity is the most prevalent dietary disorder in which there is extreme storage of energy in the form of fat as per height, weight, race and gender WHO 2005.<sup>11</sup> Obesity is common among all age groups and is on the rise among adults particularly the women in general urbanized and developing countries.<sup>12</sup> Obesity is absolutely linked with increased risk for lots of health issues like type 2 diabetes, cardiovascular disease, and psychosocial problems.<sup>13</sup> The sensible and scientific definition of obesity is based on the Body Mass Index (BMI; weight (kg)/height (m<sup>2</sup>). It is usually decided that a BMI of greater than 30 is indicative of obesity, while a BMI of 25.0-29.9 is suggestive of overweight in an individual. BMI between 18.5-24.99 indicates normal BMI.<sup>14</sup> Natural supplementations are nature's way of as long as hold up for in general health & well-being. A variety of natural plants (e.g., herbs, fruits, and vegetables), fight the battle against obesity have been widely explored.<sup>15</sup>

**Onion:** Onion (*Allium cepa*) is wealthy in phenolic compounds. In adding together, these are a main source of quercetin, a flavonol used as a dietary supplement for its anti-inflammatory and antioxidant properties.<sup>16</sup> Onion has the ability to control lipid metabolism and suppress hyperglycemia and diabetes.<sup>17</sup> **Tomatoes:** Tomatoes (*Solanum lycopersicum*) support suggests that tomato-based products could condense the danger of cardiovascular diseases. One of the major cardiovascular risk factors is low levels of high-density lipoprotein cholesterol (HDL-C).<sup>18</sup> **Garlic:** (*Allium sativum*) Garlic is a herb with multifaceted action. Daily intake of garlic is helpful in fat metabolism and lowering of blood cholesterol levels. Garlic increases high-density lipoprotein (HDL), which protects heart and blood vessels, and lowers low-density lipoprotein (LDL) beside with triglycerides.<sup>19</sup> **Ginger:** Ginger (*Zingiber officinale* Roscoe, Zingiberaceae) is one of the for the most part commonly used spices around the globe, especially in the Southern-Eastern Asian countries.<sup>20</sup> It has long been old in traditional medicine as a cure for glucose and anticancer activities.<sup>21</sup> In adding, ginger reduction low density lipoprotein-cholesterol (LDL-cholesterol), very low density lipoprotein cholesterol (VLDL-cholesterol) and triglycerides levels in apolipoprotein-E deficient mice.<sup>22</sup> **Fenugreek seeds:** Fenugreek (*Trigonella foenumgrae-cum*) is one of the oldest therapeutic plants<sup>23</sup> which has valuable effects in pancreatic and other tissues and improves glucose absorption, hyperlipidaemic state as well as reduce insulin resistance.<sup>24</sup> Insulin resistance is

regularly connected with increased triglycerides (TG)<sup>25</sup> and decreased high density lipoprotein (HDL-C) concentrations and increased small LDL particles.<sup>26</sup> Human investigations recommend that fenugreek could be valuable as an addition in controlling high blood glucose and lipid levels in people with diabetes and obesity.<sup>27</sup> However, there have been no direct comparisons of the effects of aerobic exercise with natural supplementation in deskbound women. Thus, hypothesized that aerobic exercise with natural supplementation would improve the levels of lipid profiles and body composition in obese subjects.

## **2. METHODOLOGY**

### **2.1 Subjects**

30 sedentary women (BMI $\geq$ 30, age: 30-34) were selected as the volunteered for participation in this study after receiving a detailed explanation of the study. All participants had to meet the following criteria before enrolment in the study. i. No current chronic health trouble. ii. No cardiovascular, metabolic or respiratory disease and iii. No consumption of any antilipidemic supplements or drugs within the past 6 months.

### **2.2 Reserach design**

In this study, interventions were made a 10 week period and subjects were evaluated at baseline and at the end of the study. The 30 participating obese women (age: 30 $\pm$ 34) were assigned to two equal groups: aerobic exercise with natural supplementation (AENS; n=15); control group (G<sub>CON</sub>; n=15). Thus, 15 obese women (AENS: raw onion, tomatoes, fenugreek seeds, ginger and garlic). These are in the form of chutney was given daily as 75 to 100 gm per day for period of 10 weeks for all days and participants in followed aerobic training for 10 weeks. Subjects were instructed not to change their physical activity routines or dietetic patterns during the course of the experimental.

### **2.3. Measures**

#### **2.3.1 Anthropometric measurements**

All anthropometric measurements were performed by the same technical persons on the day that blood specimens were taken. Height, weight were measured while subjects were not putting on shoes. BMI (body weight [kg]/height [m<sup>2</sup>]) and body fat percent was then calculated by using the Siri equation (Siri, 1961).

#### **2.3.2 Lipid profiles measurements**

Blood sampling were collected from each subject at baseline and at 48 to 72 hour after exercise session in an overnight 12-hour fasting state. Both pre test and post test data are means of 2 separate measurements. All the chosen lipid profiles were estimated by using serum in computerized Robotic semi auto analyzer.

#### **2.4 Aerobic exercise with natural supplementation training program**

- Experimental group trained under supervision in the gym centre on a cycle ergometer (Universal Aerobicycle) for 45 minutes both morning and evening.
- 10 minutes warm-up.
- 15 minutes cooling down exercise.
- Raw onion, tomatoes, fenugreek seeds, ginger and garlic. These are in the form of chutney was given daily as 75 to 100 gm per day.

### **2.4 Statistical analysis**

All results are reported as mean  $\pm$  standard deviations. Experimental group interactions were assessed by the two-way analysis of variance (ANOVA). When differences were detected, a Post hoc test was performed to decide pair wise differences. Before statistical comparison, all data sets were tested for normal

distribution by a Kolmogorov-Smirnov test. A p value of <0.05 was used to conclude statistical significance. SPSS 16.0 software was used for all the statistical calculations.

### 3. RESULTS

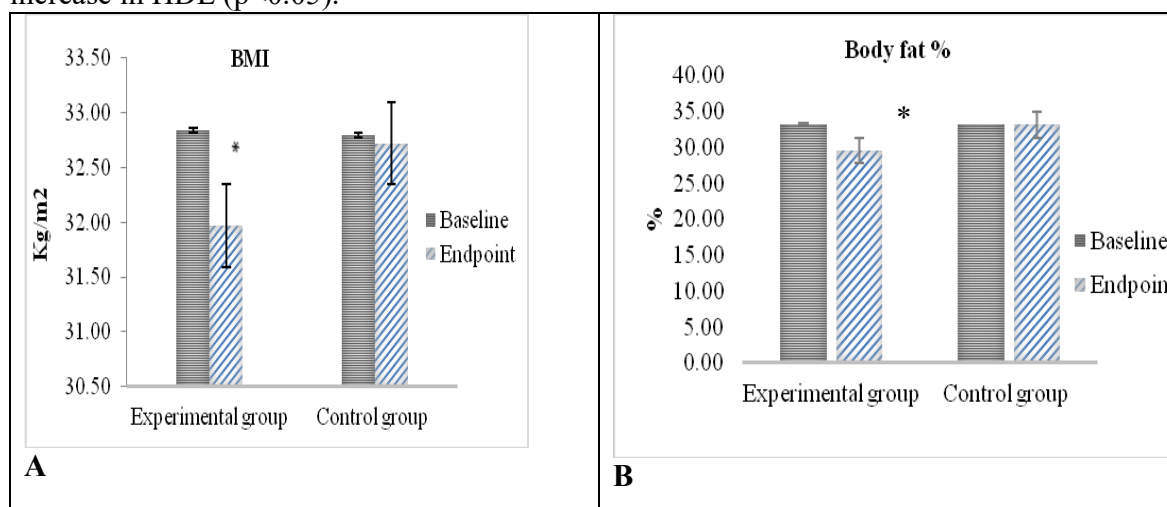
**TABLE 1**  
**BODY COMPOSITION AND LIPID PROFILES PRE-POST AEROBIC EXERCISE WITH NATURAL SUPPLEMENTATION INTERVENTIONS**

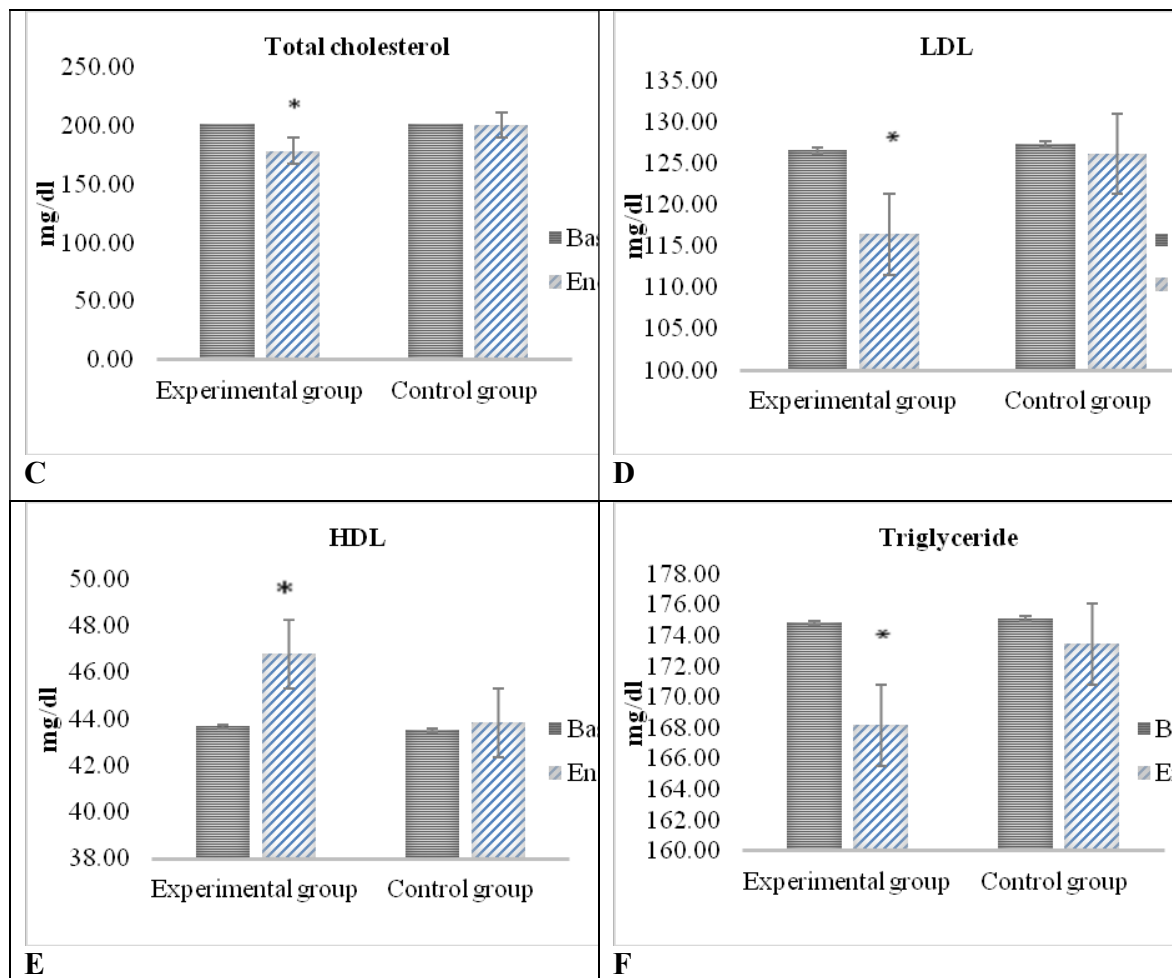
|                           | Aerobic exercise with natural supplementation |              | Control group |             |
|---------------------------|---|--------------|---------------|-------------|
|                           | Pre   | Post         | Pre           | Post        |
| <b>Body composition</b>   |   |              |               |             |
| BMI (Kg/m <sup>2</sup> )  | 32.84±0.35                                    | 31.97±0.50*  | 32.79±0.46    | 32.72±0.43  |
| Body fat (%)              | 33.25±0.95                                    | 29.55±1.32*  | 33.17±1.15    | 33.12±1.11  |
| <b>Lipid profile</b>      |   |              |               |             |
| Total cholesterol (mg/dl) | 201.90±1.23                                   | 178.32±3.89* | 201.87±1.25   | 200.5±2.10  |
| LDL(mg/dl)                | 126.53±2.77                                   | 116.40±6.32* | 127.31±3.53   | 126.11±3.45 |
| HDL(mg/dl)                | 43.67±0.88                                    | 46.77±0.97*  | 43.52±0.73    | 43.80±0.68  |
| TG(mg/dl)                 | 174.81±2.22                                   | 168.19±2.48* | 175.11±1.83   | 173.46±2.16 |

Values are mean ± SD. \*P<0.05 vs. Pre test. BMI=body mass index; LDL= low density lipoprotein; HDL= high density lipoprotein; TG= triglyceride.

There were no significant differences among group at the beginning of the test for age, BMI and body fat % (p>0.05). Body composition and lipid profiles pre – post aerobic exercise with natural supplementation were statistically compared and are shown in Table 1.

In investigational groups, comparison with baseline values, mean BMI, body fat percentage, total cholesterol, LDL, and triglycerides decreased in the aerobic exercise with natural supplementation (p <0.05) independently of 10 weeks. In addition, there was a mean increase in HDL (p<0.05).





**Fig. 1.** Effect of aerobic exercise with natural supplementation on lipid profiles and body composition in deskbound woman. A: Effect on BMI (Body mass index). B: Effect on body fat %. C: Effect on total cholesterol. D: Effect on LDL (Low density lipoprotein). E: Effect on HDL (High density lipoprotein). F: Effect on TG (Triglyceride). Note.  $P < 0.05$  were considered statistically significant (\*).

#### 4. DISCUSSION

The present investigation which confirms the effect of aerobic exercise decreases the body compositions. The reductions in body compositions could be due to the lipolysis activity of the body adipose tissues.<sup>28</sup> The aerobic exercise resulted in the increase density of adrenergic receptors at the cell level of fat tissue and their compassion toward the process of lipolysis, which could describe the reductions in the indicators of abdominal obesity (waist and hip circumference).<sup>29</sup> Moreover after 4 weeks intervention of aerobic training and fenugreek supplemental capsule consumption on cholesterol and triglyceride decline in blood.<sup>30</sup> Current studies on 8 weeks resistance-training with fenugreek seeds supplementation extracts support their success in promoting lean body mass, and lowering cholesterol.<sup>31</sup> According to the Yang et al. showed that 10 female university students who took onion extract for 12 weeks training decreased weight, percentage of body fat, BMI, and waist circumference, which corresponds to the results of this study.<sup>32</sup> In addition, the investigation reported in deceases in 12 weeks of taking the onion peel extract capsules, the overweight and deskbound adults showed significant decreases in weight;

BMI; waist, hip, and thigh circumferences; and skinfold thickness. The DXA measurements of body composition showed significant decreases in the percentage of body fat, particularly in the percentage of fat in the arm.<sup>33</sup> Noted similar significant reduced in 10-week aerobic activity with garlic supplementation reduces the weight, lipid percentage, cholesterol level BMI, and LDL-C in exercise and aerobic workout with supplementation groups were significantly decreases.<sup>34</sup> Several studies have shown decreased in 12 weeks of aged garlic supplementation with usual exercise body composition, lipid profile, and CVD risk factors considerably decreased in postmenopausal women.<sup>35</sup> Furthermore, research on the effects of onion significantly decreased the levels of total cholesterol in obese or overweight women.<sup>36</sup> The 3-month aerobic training with endurance strength training significant decreases in body mass, BMI, total body fat, total body fat mass, and waist and hip circumference amid women with abdominal obesity.<sup>37</sup> According to the present study, figueroa-colon showed a reduction in body weight and body fat after a 10-week of training with every day aerobic exercise jointly with a protein-sparing diet but no change in FFM.<sup>38</sup> Zhonqqu, (2010) investigated result of diet and aerobic exercise is more clear in the early phase of treatment for body weight and waist to hip ratio.<sup>39</sup> In view of the fact that, waist hip ratio is the key for abdominal fatness and there are relations between waist hip ratio changes, body fat percentage and sensitivity to insulin, it can be said that by reducing waist hip ratio, and the rate of body fat after aerobic exercise.<sup>40</sup> Therefore, previous studies concluded that 12 weeks of aerobic exercise, BMI, WHR, fat rate, weight and fat mass and triglyceride had significant reduction and HDL had significant increase. But no significant changes happened in LDL, VLDL, and cholesterol levels.<sup>41</sup>

## 5. CONCLUSION

The present study of aerobic exercise with natural supplementation training for 10 weeks resulted in significant body composition and lipid profile in deskbound women. Therefore, the previous study revealed the aerobic exercise with natural supplementation training had been an effective therapeutic plan to favourable changes in body composition and lipid profile and reduction of cardiovascular risk factors in deskbound individual. Further the study with lager number of subjects and different protocols should be performed, identified and the valuable result of natural supplementation and aerobic exercise the suitable programme for the management of obesity and its difficulties.

### Acknowledgments

The author would like to show thanks to participate in the study and for their work the team that provided support throughout the entire project work.

### Competing interests

None of the author declares competing financial interests.

## REFERENCES

1. Petri Wiklund, Markku Alen, Eveliina Munukka, Shu Mei Cheng, Bo Yu, Satu Pekkala, Sulin Cheng. Metabolic response to 6-week aerobic exercise training and dieting in previously sedentary overweight and obese pre-menopausal women: A randomized trial. *J Sport Health Sci* 2014; 3 (3):217-224.
2. Meyers D, Goldberg AP, Coon PJ, Drinkwater DT, Bleecker ER. Relationship of obesity and physical fitness to cardiopulmonary and metabolic function in healthy older men. *J Gerontol* 1991; 46 (2):M57 - 65.
3. Katzell LI, Busby-Whitehead MJ, Goldberg AP. Adverse effects of abdominal obesity on lipoprotein lipids in healthy older men. *Exp Gerontol* 1993; 28(4-5):411-20.
4. Rena Li. Women's health in exercise and aging: What do we know. *J Sport Health Sci* 2014; 2(3):153-154.

5. King AC, Haskell WL, Taylor B, Kraemer HC, De Busk RF. Group- vs home-based exercise training in healthy older men and women: a community based clinical trial. *JAMA* 1991; 266:1535-1542.
6. Hellenius ML, de Faire U, Berglund B, Hamsten A, Krakau I. Diet and exercise are equally effective in reducing risk for cardiovascular disease: results of a randomized controlled study in men with slightly to moderately raised cardiovascular risk factors. *Atherosclerosis* 1993; 103:81-91.
7. Wood PD, Stefanick ML, Williams PT, Haskell WL. The effects on plasma lipoproteins of a prudent weight-reducing diet, with or without exercise, in overweight men and women. *N Engl J Med* 1991; 325:461-466.
8. Tongjian You, Xuwen Wang, Rongze Yang, Mary F. Lyles, Dawei Gong, Barbara J. Nicklas. Effect of exercise training intensity on adipose tissue hormone sensitive lipase gene expression in obese women under weight loss. *J Sport Health Sci* 2012; 1 (3): 184-190
9. Blumenthal JA, Emery CF, Madden DJ, et al. Effects of exercise training on cardiorespiratory function in men and women >60 years of age. *Am J Cardiol* 1991; 67:633-639.
10. Shenglong Le, Lijuan Mao, Dajiang Lu, Yifan Yang, Xiao Tan, Petri Wiklund, Sulin Cheng. Effect of aerobic exercise on insulin resistance and central adiposity disappeared after the discontinuation of intervention in overweight women. *J Sport Health Sci* 2013; 5 (2): 166-170.
11. World Health Organization 2005. Obesity and Overweight. [Http://www.who.int](http://www.who.int), (Retrieved March 4, 2009).
12. Wang Z, Hoy WE. Waist circumference, body mass index, hip circumference and waist-to-hip ratio as predictors of cardiovascular disease in Aboriginal people. *Eur J Clin Nutr* 2004; 58: 888-893.
13. Jonghoon Par, Kazuko Ishikawa-Takata, Sangjik Lee, Eunkyung Kim, Kiwon Lim, Hyungryul Kim, In-Sook Lee, Shigeho Tanaka. Comparison of daily physical activity parameters using objective methods between overweight and normal-weight children. *J Sport Health Sci* xx (2017) 1–8.
14. Jitendra Gouda and Ranjan Kumar Prusty. Overweight and Obesity among Women by Economic Stratum in Urban India. *J Health Popul Nutr* 2014; 32(1):79-88.
15. Nan-Nong Sun, Tsung-Yen Wu and Chi-Fai Chau. Natural Dietary and Herbal Products in Anti-Obesity Treatment. *Molecules* 2016; 21, 1351.
16. Nuutila. A.M, Puupponen-Pimia. R, Aarni.M and Oksman-Caldentey. K. M. Comparison of Antioxidant Activities of Onion and Garlic Extracts by Inhibition of Lipid Peroxidation and Radical Scavenging Activity. *Food Chemistry*, 2003; 81 (4), 485-493.
17. Corzo-Martinez M, Corzo N, Villamiel M. Biological properties of onions and garlic. *Trends Food Sci Technol* 2007; 18:609–625.
18. Cuevas Ramos D, Almeda Valdes P, Chayez Manzanera E, Meza Arana CE, Brito Cordova G, Mehta R, Perez-Mendez O and Gomez-Perez FJ. Effect of tomato consumption on high-density lipoprotein cholesterol level: a randomized, single-blinded, controlled clinical trial. *Diabetes Metab Syndr Obes* 2013; 6:263-73.
19. Preeti Lachhramka, Sujay Patil. Cholesterol lowering property of garlic (*Allium sativum*) on patients with hypercholesterolemia. *International Journal of Medical Science and Public Health* 2016; 5(11): 2249-2251.



20. Ali B, Blunden G, Tanira M, Nemmar A. Some phytochemical, pharmacological and toxicological properties of ginger (*Zingiber officinales* Rosc); a review of recent research. *Food Chem Toxicol* 2008; 46: 409-420.
21. Nicoll R, Henein M. Ginger (*Zingiber officinales* Roscoe): a hot remedy for cardiovascular disease. *Int J Cardiol* 2009; 131: 408-409.
22. Fuhrman B, Rosenblat M, Hayek T, Coleman R, Aviram M. Ginger extract consumption reduces plasma cholesterol, inhibits LDL oxidation and attenuates development of atherosclerosis in atherosclerotic, apolipoprotein E-deficient mice. *J Nutr* 2000; 130(5):1124-31.
23. Jensen R. Fenugreek, overlooked but not forgotten. *UCLA Lactation Alumni Newsletter* 1992; 1: 2-3.
24. Raghuram TC, Sharma R, Sivakumar D, Sahay BK. Effect of fenugreek seeds on intravenous glucose disposition in Non-insulin dependent patients. *Phytotherapy Res* 1994; 8:83-86.
25. Prassana M. Hypolipidemic effect of fenugreek: a clinical study. *Indian J Pharma* 2000; 32:34-36.
26. Sauvaire Y et al. 4-Hydroxyisoleucine: a novel amino acid potentiator of insulin secretion. *Diabetes* 1998; 47(2):206-210.
27. Singletary, K.W. Fenugreek overview of potential health benefits. *Nutrition Today* 2017; 52(2):93-111.
28. Maughan R, Gleeson M, Greenhaff P. 1st ed. USA: Oxford University Press; 1997. *Biochemistry of exercise and training*. Informa Healthcare.
29. Vinson JA, Dabbagh YA. Effect of green and black tea supplementation on lipids, lipid oxidation and fibrinogen in the hamster: mechanisms for the epidemiological benefits of tea drinking. *FEBS Letters* 1998; 433 (1-2): 44-46.
30. Fatemeh Moeinzadeh Mirhosseini, Ebrahim Khoshnam, Asghar Nikseresht. Aerobic Exercise Effect Along With Fenugreek Supplemental Consumption on Cholesterol And Triglyceride Changes In Blood. *Advances in Environmental Biology*, 2013; 7(6): 1138-1142.
31. Sachin Wankhede, Vishwaraman Mohan, Prasad Thakurdesai. Beneficial effects of fenugreek glycoside supplementation in male subjects during resistance training: A randomized controlled pilot study. *J Sport Health Sci* 2016; 5 (2): 176–182.
32. Yang YK, Kim SP. The effect of onion extract intake for 12 weeks on blood lipid and obesity index in obese university women. *Korean J Sports Sci* 2013; 22:955–962.
33. Ji-Sook Lee, Yong-Jun Cha, Kyung-Hea Lee, and Jung Eun Yim. Onion peel extract reduces the percentage of body fat in overweight and obese subjects: a 12-week, randomized, double-blind, placebo-controlled study. *Nutr Res Pract* 2016; 10(2): 175–181.
34. Soori R., Choopani Z., Falahian N., Choopani S., Ramezankhani A. Effect of Endurance Exercise with Garlic Supplement Consumption on Intracellular and Vascular Adhesion Molecules in Sedentary Women. *Scholarly Quarterly of the Horizon of Medical Sciences* 2017; 23(1): 89-96.
35. Dae Yun Seo, Sung Ryul Lee, Hyoung Kyu Kim, Yeong Ho Baek, Yi Sub Kwak, Tae Hee Ko, Nari Kim, Byoung Doo Rhee, Kyoung Soo Ko, Byung Joo Park, and Jin Han. Independent beneficial effects of aged garlic extract intake with regular exercise on cardiovascular risk in postmenopausal women. *Nutr Res Pract* 2012; 6(3): 226–231.



36. Mehranghiz Ebrahimi-Mamaghani, Maryam Saghafi-Asl, Saeed Pirouzpanah and Mohammad Asghari-Jafarabadi. Effects of raw red onion consumption on metabolic features in overweight or obese women with polycystic ovary syndrome: A randomized controlled clinical trial. *J. Obstet. Gynaecol Res* 2014; 40 (4):1067-76.
37. Damian Skrypnik, Paweł Bogdański, Edyta Mądry, Joanna Karolkiewicz, Marzena Ratajczak, Jakub Kryściak, Danuta Pupek-Musialik, Jarosław Walkowiak. Effects of Endurance and Endurance Strength Training on Body Composition and Physical Capacity in Women with Abdominal Obesity. *Obes Facts* 2015; 8:175–187.
38. Figueroa-Colon R, von Almen TK, Franklin FA, Schuftan C, Suskind RM. Comparison of two hypocaloric diets in obese children. *Am J Dis Child* 1993; 147:160–166.
39. Zhongqu, Z.J. Effect of acupuncture combined with diet adjustment and aerobic exercise on weight and waist. Hip Ratio in Simple obesity patients. Department of acupuncture, college of tan of Hebei medical university, Shijazhvang, China. 2010; 30(7): 555-580.
40. Randeve HS, Lewandowski KC, Drzewoski J, Brooke-Wavell K, O’Callaghan C, Czupryniak L, et al. Exercise Decreases plasma total homocysteine in overweight young women With polycystic ovary syndrome. *J Clin Endocrinol Metab* 2002; 87:4496–501.
41. Elaheh Abazar, Farzaneh Taghian, Farahnaz Mardanian, and Dashti Forozandeh. Effects of aerobic exercise on plasma lipoproteins in overweight and obese women with polycystic ovary syndrome. *Adv Biomed Res* 2015; 4: 68.