ORIGINAL ARTICLE

Effect of a Wellness Programme on Aerobic Physical Exercise Adherence and Blood Lipid Profile Changes among Office Workers

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ABSTRACT

Introduction. Lack of physical activity is a risk factor for dyslipidemia. Office work is a job associated with low physical activity. Wellness programmes in the workplace might increase physical activity and cardiorespiratory fitness.

Objective. This study aimed to determine the effect of a wellness programme on aerobic physical exercise adherence and blood lipid profile changes among government employees.

Methods. This study used a randomized controlled trial design, with the intervention (wellness programme) conducted for six weeks. Thirty participants who were office workers in a government institution were allocated into two groups. The intervention group (n = 15) received health education, aerobic physical exercise (30 minutes on a treadmill, three times/week for six weeks), reminders, and a logbook. The control group (n = 15) received education only. The outcomes were adherence to the exercise programme and lipid profile levels.

Result. The intervention group showed more adherence to aerobic exercise than the control group (OR 42.2, 95% CI 5.1, 346.9). The mean (SD) total cholesterol level in the intervention group was decreased by 9.9 (21.1) mg/dl, while in the control group, it was increased by −16.0 (14.5) mg/dl at the end of the study (p = 0.010). The mean (SD) of low-density lipoprotein (LDL) cholesterol in the intervention group was also decreased by 0.9 (17.2) mg/dl while in the control group, it was increased by -14.8 (11.6) mg/dl (p = 0.007). No significant mean differences were observed for high-density lipoprotein (HDL) cholesterol and triglyceride.

Conclusion. A workplace wellness programmes can enhance employees' adherence to physical exercise and decrease their total blood cholesterol and LDL level.

Keywords: adherence, physical exercise, lipid profile, randomized controlled trial (RCT), wellness programme

INTRODUCTION

Cardiovascular disease is a non-communicable disease that is increasingly common in modern society. Dyslipidemia is one of the risk factors for cardiovascular disease. Data from the Indonesian Basic Health Research (Riskesdas) in 2018 showed that 28.8% of Indonesia's population aged ≥ 15 years had total cholesterol levels > 200 mg/dL; 72.8% had LDL levels > 100 mg/dL; 24.4% had HDL levels less than 40 mg/dL; and 27.9% had triglyceride levels above

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150 mg/dL.[1,2] The incidence of dyslipidemia in workers is also high, with a prevalence of 85% in male office workers in an Indonesian company.[3] There is a significant association between physical fitness levels and dyslipidemia,[3] with limited physical activity being a risk factor for dyslipidemia. Office workers are engaged in work that involves low physical activity levels. Most such work is performed in a sitting position and does not meet the need for high physical activity.[4–7]

The workplace has a crucial role in providing the ideal environment for implementing occupational health programmes, including wellness programmes. Workplace-based wellness programmes can enhance physical activity and cardiorespiratory fitness. Physical exercise is a key aspect of wellness programmes that can be implemented in the workplace to increase physical activity.[8] In particular, aerobic exercise is known to reduce the incidence of cardiovascular disease.[9]

A successful wellness programme requires a physical training schedule in which all workers can participate, and that maximizes workers' adherence to the programme. Provision of health education, reminders, and use of logbooks are known to increase motivation to participate in physical training and adherence to programmes.[10–12] This study aimed to determine the effect of a wellness programme on adherence to aerobic physical exercise and blood lipid profile changes among government employees.

MATERIALS AND METHODS

Study Design and Participant Selection

This study was an open-label randomized controlled trial where the intervention group received an intensive wellness programme, and the control group received only health education. The intensive wellness programme was composed of health education, aerobic physical exercise (30 minutes on a treadmill, three times per week for six weeks), reminders and a logbook. The aerobic physical exercise used in this study was a treadmill workout with an intensity of 65%–70% at 30 minutes per session, three times per week over six weeks. Health education consisted of introduction to the wellness programmes (including the elements of wellness programmes, benefits, and the type of physical exercise), healthy nutrition, and dyslipidemia (from etiology to prevention). Education for the intervention group was conducted throughout the study, whereas the control group only received education at the beginning of the study. A reminder was given to the participants directly or via an instant messaging application one day before scheduled physical exercise. Short messaging services (via instant messaging applications) were sent privately and through a dedicated group discussion forum.

Participants in this study were office workers in a government institution aged 20–45 years who were actively working when the research was conducted and willing to participate and provide signed informed consent. We excluded employees who were sick (hospitalized), on any drugs that affected blood cholesterol levels, and those who had joint disorders in the lower limbs, diabetes mellitus, hypertension, history of heart disease, or asthma. Dropout criteria were quitting the programme before the study ended or not performing any scheduled exercise sessions in a week. Selection of inclusion and exclusion criteria and randomization was conducted to control confounding factors.

Sample Size

The sample size required for the control and intervention groups in this study was 15 people in each group, calculated using the sample size formula for paired samples in experimental studies (95% confidence level and 80% power). Recruitment of participants was performed using a convenience sampling technique. Randomization was performed by the researcher using computerized block randomization provided by a random number block generator (www.randomization.com), with an allocation ratio of 1:1 and randomly selected block sizes of 2 and 4.

Data Collection

We collected data on participants' demographic characteristics, disease history, attendance of aerobic exercise, body mass index (BMI), nutritional intake, blood pressure, and blood lipid profile levels: total cholesterol, high-density lipoprotein (HDL), low-density lipoprotein (LDL) and triglyceride. Participants' identity, characteristics, and disease history were evaluated in an interview using a questionnaire. The interview was conducted by the first author. BMI was measured by a medical doctor using the weight and height scale (Tanita BC-541). Nutritional intake was assessed using a food recall form and converted into calories by the first author. Aerobic physical exercise attendance was measured directly through observation by the first author. Fasting blood samples for lipid profile examination was taken by laboratory personnel and checked at an accredited private laboratory. Lipid profiles were examined twice, first pre-intervention (baseline data) and again at one-day post-intervention.

Clinical Assessment

Data for participants' baseline characteristics were evaluated and compared. These data included age, sex, smoking (no/yes), occupation (non-administrative/administrative), length of work (1–10 years, >10 years), physical activity (sedentary, less active, active enough), and nutritional intake (kcal). BMI, nutritional status (obese, overweight, normal; based on Asia Pacific BMI classification), and systolic and diastolic blood pressure were also compared. Aerobic physical exercise adherence was assessed based on participants' adherence to the scheduled aerobic physical exercise, with a minimum of 30 minutes per session, three times per week for six weeks. Participants who performed aerobic exercise fewer than three times/week were considered non-adherent. Laboratory tests of fasting lipid profiles included total cholesterol, HDL, LDL, and triglyceride at pre- and post-intervention.

Statistical Analysis

Data were analyzed with SPSS version 20.0 (IBM Corp., Armonk, NY, USA), using intention-to-treat analysis. Participants were included in the analysis according to their initial group allocation. Control group participants were still analyzed as the control group despite performing aerobic exercises. Those in the intervention group that had lower adherence levels were included and analyzed in the intervention group.

Data were reported as mean ± standard deviation, median (interquartile range; 25%–75%), or percentages. Differences in categorical variables between the groups were analyzed with cross-tabulation and chi-square or Fisher's exact tests as appropriate. Normally distributed continuous scale variables were analyzed with independent t-tests or paired t-tests as appropriate. Differences in lipid profile levels between the intervention and control groups were tested by linear regression, if eligible. Analysis of covariance was performed to reduce the variance error by eliminating the effects of non-categorical variables (metrics or intervals) that were believed to bias the analysis. The analysis used a 95% confidence interval (CI) with $\alpha = 0.05$.

Ethics approval

The study protocol was approved by the Ethics Committee of the Faculty of Medicine, Universitas Indonesia (No.0458/UN2.F1/ETIK/2018).

RESULTS

This intervention was implemented for six weeks; in the last two weeks, all participants in both groups underwent Ramadan fasting. No participants dropped out of this study. In total, 30 participants were selected and randomly allocated to the intervention group (n = 15) or the control group (n = 15). The distribution of age, sex, smoking habits, blood pressure, BMI, nutritional status, nutrition, physical activity, occupation, and length of work did not significantly differ ($p > 0.05$) between the intervention and control groups (Table 1).

Table 1. Participants' baseline characteristics

Characteristic	Intervention group	Control group	p-value*
***Age**, years (mean±SD)*	31.1±5.1	30.9±5.1	0.887
Sex			
Male	5 (33.3%)	5 (33.3%)	1.000
Female	10 (66.7%)	10 (66.7%)	
Smoking			
No	15 (100%)	14 (93.3%)	1.000
Yes	0 (0%)	1 (6.7%)	
***Blood pressure** (median; min-max)†*			
Systolic	120 (110–120)	120 (110–120)	0.717
Diastolic	70 (70–80)	70 (70–80)	0.717
BMI (mean±SD)	27.2±4.5	28.0±5.4	0.661
BMI category (nutritional status)			
Obese	9 (60%)	9 (60%)	
Overweight	2 (13.3%)	3 (20%)	0.887
Normal	4 (26.7%)	3 (20%)	
Nutritional intake	1381.9±419.5	1283.8±398.9	0.517
Physical activity			
Sedentary	5 (33.3%)	3 (20%)	
Less active	7 (46.7%)	8 (53.3%)	0.443
Active enough	3 (20%)	4 (26.7%)	
Occupation type			
Non-administrative	10 (66.7%)	9 (60%)	0.705
Administrative	5 (33.3%)	6 (40%)	
Length of work			
1–10 years	12 (80%)	14 (93.3%)	
>10 years	3 (20%)	1 (6.7%)	0.598

BMI, body mass index.
**Independent t-test. †Numerical data are presented as median (range) because they are not normally distributed*

Thirteen participants (86.7%) in the intervention group and two participants (13.3%) in the control group adhered to aerobic physical exercise. The intervention group had increased odds of adherence to aerobic physical exercise than the control group (OR 42.2, 95% CI 5.1, 346.9, $p < 0.001$). Furthermore, there was a significant difference in the number of aerobic physical exercise sessions performed between the intervention and control groups ($p < 0.001$). The median number of aerobic physical exercise sessions performed in the intervention group was 18 (12–18) and three (0–18) in the control group.

Based on Table 2, mean (SD) total cholesterol levels between pre- and post-intervention in the intervention group decreased by 9.9 (21.1) mg/dl. In comparison, total cholesterol levels in the control group increased by 16.0 (14.5) mg/dl, with significant differences ($p = 0.01$) between the two groups. Moreover, LDL levels in the intervention group pre- and post- intervention also decreased with mean (SD) difference of 0.9 (17.2) mg /dl, while LDL level in the control group increased by 14.8 (11.6) mg/dl at the end of the study ($p = 0.007$). There was a significant mean difference ($p = 0.011$) in the total cholesterol level at pre-intervention between the two groups, but not in HDL ($p = 0.107$), LDL ($p = 0.093$), and triglyceride ($p = 0.551$) levels. There was a significant mean difference in total cholesterol level ($p = 0.011$) at post-intervention between the two groups, but not in HDL ($p = 0.5$), LDL ($p = 0.872$) and triglyceride ($p = 0.236$) levels.

The intervention group showed a significant decrease in their nutrition intake at the end of the study with a total reduction in mean (SD) calorie intake of 151.8 (216.9) calories, while the control group had no signficant decrease in calorie intake at the end of the study (Table 3). Changes in the lipid profile in pre- and post-intervention in both groups are shown in Figure 1.

DISCUSSION

In this study, the intervention group that received an intensive wellness programme had a higher level of adherence to aerobic physical exercise than the control group. This finding was consistent with previous research by Butler et al.,[8] who found that workplace wellness programmes were effective in improving physical activity and cardio-

Table 2. Lipid profile mean differences in the intervention and control groups

Lipid profile	Intervention group	Control group	p-value†
***Total cholesterol** (mg/dl)*			
Pre-intervention	191.3±27.7	167.5±19.3	0.011
Post-intervention	181.4±23.1	183.5±25.3	0.011‡
p-value*	0.091	0.001	
Difference	9.9±21.1	−16.0±14.5	0.001
***HDL** (mg/dl)*			
Pre-intervention	62.8±7.7	57.9±8.5	0.107
Post-intervention	63.0±6.3	60.9±10.2	0.5
p-value*	0.930	0.130	
Difference	−0.2±8.6	−3.0±7.2	0.343
***LDL** (mg/dl)*			
Pre-intervention	124.7±24.8	110.3±20.1	0.093
Post-intervention	123.7±21.5	125.1±25.4	0.872
p-value*	0.837	<0.001	
Difference	0.9±17.2	−14.8±11.6	0.007
***Triglyceride** (mg/dl)*			
Pre-intervention	169.3±38.4	179.2±50.7	0.551
Post-intervention	161.7±31.3	178.2±42.3	0.236
p-value*	0.457	0.937	
Difference	7.5±38.2	1.0±48.31	0.684

HDL, high-density lipoprotein; LDL, low-density lipoprotein.
**paired t-test; †independent t-test; ‡analysis of covariance*

Table 3. Nutrition intake mean differences in the intervention and control groups

Nutrition intake (calories)	Intervention group	Control group	p-value†
Pre-intervention	1381.9±419.5	1283.8±398.9	0.517
Post-intervention	1230.1±450.4	1157.9±297.6	0.609
Difference	151.8±216.9	125.9±306.4	0.792
p-value*	0.017	0.134	

**paired t-test; †independent t-test*

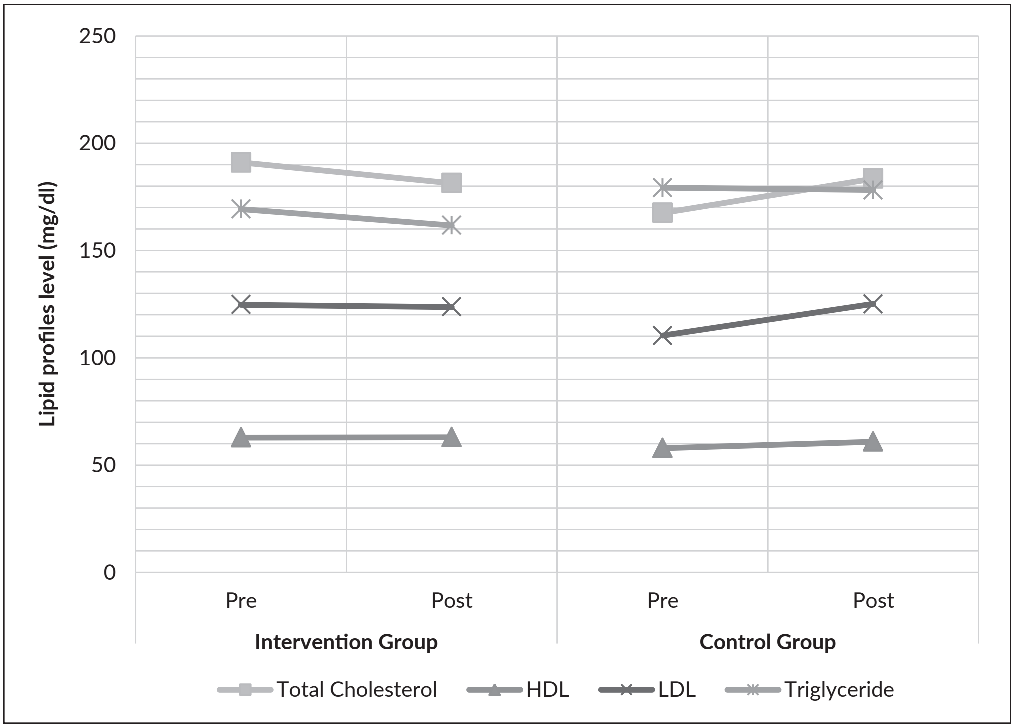

Figure 1. Changes in lipid profile levels at pre- and post-intervention in the intervention and control groups. HDL, high-density lipoprotein; LDL, low-density lipoprotein.

respiratory fitness, and overcoming cardiovascular disease risk factors among university employees. The wellness programme used in that study involved cardiovascular health assessment, personal health report, walking and pedometer-based tracking for eight weeks, and weekly health sessions.[8]

That study also showed that intensive interventions in the form of proactive and targeted programmes could significantly prevent risks for health problems rather than passive interventions that rely solely on workers' voluntary participation.[8] Active support from the company or organization is important in implementing health promotion programmes in the workplace. The intensive intervention allowed subjects to improve their athletic ability by improving their basic physical fitness and forming mutually supportive bonds between team members through group exercise classes. Therefore, organizations should establish targeted and proactive healthcare programmes rather than only providing healthcare systems dependent on voluntary participation.[13]

The wellness programme provided in this study included health education, reminders, and a logbook. Health education is a way of supporting health programmes that can produce change and increase knowledge quickly. The output from health education is the result of the learning process, which is the ability and behavioral changes of the learner. The methods used when conducting health education also affect the improvement of knowledge. In the process of health education, there are reciprocal effects among various factors, including the learner, teacher, methods/learning techniques, and learning aids and materials.[14]

Reminders to perform health tasks, such as laboratory tests and regular exercise, are essential to support an individual in managing their health. A health reminder is usually designed to trigger health behavior in a timely manner. Based on Fogg's behavioral model, three factors must exist at the same time to influence behavioral change: motivation, ability, and a trigger (e.g., reminder). When a person has the motivation and ability to perform a behavior, a reminder that triggers that behavior at the right time becomes more effective. However, when ability or motivation is lacking, a person can also benefit from the trigger to motivate them to perform the task.[15] A logbook or control book is another health education strategy that can be implemented by the health officer. A logbook or diary of physical activity can be given to participants who are in the contemplation and preparation stages as well as to participants in the action stage that need refinement of their structured training programme.[16]

The results of this study showed there was a decrease in nutritional intake after the intervention in both groups. This may indicate that the intervention may be beneficial in lowering nutritional intake, even though this change was not statistically significant. The changes in nutritional intake after the intervention in both groups might have been related to the health education provided. The provision of health education in the workplace is known to affect dietary behavior positively. Workplace interventions have a positive impact on employees' nutritional knowledge, food choices and healthy nutritional intake, and company profitability, especially in terms of reduced absenteeism.[17]

Although not statistically significant, the group who received intensive wellness programme was able to decrease their total cholesterol, LDL, and triglyceride levels at the end of the intervention. Moreover, the decrease in the total cholesterol and triglyceride levels is clinically significant. These results support the evidence that improving the frequency and duration of physical exercise improved lipid profile. Performing regular aerobic exercise is known to reduce the risk of developing metabolic syndrome and coronary heart disease, as well as dyslipidemia.[1,18,19]

The lipid profile response to a physical exercise programme depends on the type of physical exercise undertaken, intensity and frequency of physical exercise, duration of each session, and time spent on such a programme. Kannan et al. (2014)[20] found significant mean differences in total cholesterol, LDL, HDL, and triglyceride levels before and after a moderate intensity exercise programme. The training protocol for moderate-intensity exercise groups was 40 minutes of exercise per session with an intensity of 50%–74% of the reserve heart rate five times per week.[20] However, the duration of exercise protocols in that study was longer, and the sessions were more frequent than in our programme. Based on Farsani and Rezaeimanesh (2011),[21] intermittent aerobic physical exercise for six weeks caused a decrease in triglyceride and total cholesterol levels and significantly increased HDL cholesterol levels. Therefore, the researchers in this study used six weeks to carry out the aerobic physical exercise programme.

On the other hand, the control group showed a tendency to increase lipid profile parameters. This may be because of the lack of physical activity performed by the control group and the unbalanced nutrient intake. Low physical activity, lack of exercise, and excessive food intake are factors related to fat accumulation leading to high plasma cholesterol levels. Low physical activity will push the balance of energy in a positive direction that leads to energy storage and affects the increase in blood cholesterol levels. Fat intake is also known to affect blood cholesterol levels significantly; for example, trans fatty acids increase LDL cholesterol and lower HDL cholesterol.[18,22,23] Therefore, workers who did not receive the intensive wellness programme were at risk for worse health problems than workers who received the programme.

This study was conducted at the time of Ramadan fasting, so there might have been other factors that could have caused the control group's lipid profile levels to worsen. The effects of Ramadan fasting on blood lipid profiles have been reported to vary in many studies because of changes in diet and reduced activity.[24,25] Changes in lipid profiles that worsened in the control group may be explained by high-carbohydrate diets, especially sugar consumption. Other possible causes are changes in carbohydrate consumption patterns from complex carbohydrates (such as cereals, fruits, vegetables) to simple carbohydrates such as sugary drinks or artificial sweeteners, decreased protein intake, and increased fat intake during Ramadan.[24,25] However, the diet and physical activity in the intervention group were more controlled, which may be attributable to the intensive wellness programme.

Although lipid profile levels in the intervention group did not appear to be statistically significant after the intervention, there was a tendency to improve clinical lipid profile levels in the laboratory results. Therefore, aerobic physical exercise should be continued to improve the lipid profile and reduce the incidence of dyslipidemia among workers.

The limitation of this study was that in the present study, we did not directly intervene the participants' diet but only influenced this through education, meaning their nutritional intake could not be controlled optimally. Furthermore, the food recall method might have introduced recall bias. On the other hand, this study's randomized controlled trial design is the strongest design for studying the effect of an intervention, hence adding the evidence to the effectiveness of a wellness programme targeted to white-collar workers.

CONCLUSION

Workplace wellness programmes can enhance employees' aerobic physical exercise adherence and decrease their total blood cholesterol level. Organisations should establish targeted and proactive healthcare programmes in addition to providing a healthcare system that depends on voluntary participation.

Statement of Authorship

All authors contributed in the conceptualization of work, acquisition and analysis of data, drafting and revising and approved the final version submitted.

Authors Disclosure

All authors declared no conflicts of interest.

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REFERENCES

1. Arsana PM, Rosandi R, Manaf A, Budhiarta A, Permana H, Sucipta KW, et al. Guidelines for the Management of Dyslipidemia in Indonesia. PB Perkeni. 2015; 1–5
2. Ministry of Health of the Republic of Indonesia. Laporan Riskesdas 2018. Lap Nas Riskesdas. 2018; 53: 154–65. http://www.yankes.kemkes.go.id/assets/downloads/PMK No. 57 Tahun 2013 tentang PTRM.pdf

3. Sunardjo MH. Dyslipidemia prevalence and distribution of several risk factors for male office workers at PT X. Universitas Indonesia; 2007.
4. Bergman F, Boraxbekk C-J, Wennberg P, Sörlin A, Olsson T. Increasing physical activity in office workers—the Inphact Treadmill study; a study protocol for a 13-month randomized controlled trial of treadmill workstations. BMC Public Health. 2010; 15:632. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4497371/pdf/12889_2015_Article_2017.pdf
5. Biernat E, Milde K. Physical activity of office workers. Biol Sport. 2010;27:289-6.
6. Chintya A, Dewi N, Mahmudiono T. Association between Diet, Physical Activity, Attitudes, and Knowledge about Obesity with the Nutritional Status of Civil Servants at the East Java Provincial Health Office. Media Gizi Indones. 2013; 9:42-8. http://journal.unair.ac.id/filerPDF/mgi512ac5572ffull.pdf
7. Hopkin TJ, Sarkar S. Sedentary behavior of white-collar office workers-review. EC Nutr. 2016; 726-36. https://www.ecronicon.com/ecnu/pdf/ECNU-03-0000102.pdf
8. Butler CE, Clark BR, Burlis TL, Castillo JC, Racette SB. Physical activity for campus employees: A university worksite wellness program. J Phys Act Health. 2015; 12:470-6. http://www.ncbi.nlm.nih.gov/pubmed/24905703
9. Stefanick ML, Mackey S, Sheehan M, Ellsworth N, Haskel WL, Wood PD. Effects of diet and exercise in men and post menopausal women with low levels of HDL cholesterol and high levels of LDL cholesterol. N Engl J Med. 1998; 339:12-20.
10. Hamilton A. Effects of electronic reminders for promoting exercise motivation and adherence in university students [Internet]. Kinesiology Theses. Georgia State University United States; 2014 [cited 2017 Nov 28]. Available from: https://scholarworks.gsu.edu/cgi/viewcontent.cgi?article=1006&context=kin_health_theses
11. Jeffrey BA, Hannan MT, Quinn EK, Zimmerman S, Barton BA, Rubin CT, et al. Self-reported adherence with the use of a device in a clinical trial as validated by electronic monitors: The VIBES study. BMC Med Res Methodol. 2012; 12:171.
12. Rondonuwu RHS. The Effect of Health Education Interventions about Self-Management of Physical Exercise on Self-Efficacy of Coronary Artery Disease Patients at Manado Hospital, North Sulawesi [thesis]. Jakarta: Universitas Indonesia; 2012.
13. Ryu H, Jung J, Cho J, Chin DL. Program development and effectiveness of workplace health promotion program for preventing metabolic syndrome among office workers. Int J Environ Res Public Health [Internet]. 2017 [cited 2017 Dec 5]; 14(8):878.
14. Notoatmodjo S. Health Behavioral Science. Jakarta: Rineka Cipta; 2010.
15. O'Leary K, Liu L, McClure JB, Ralston J, Pratt W. Persuasive reminders for health self-management. Int Conf Nutr. 2013;994-1003.
16. Alexander J, Bambury E, Mendoza A, Reynolds J, Veronneau R, Dean E. Health education strategies used by physical therapists to promote behaviour change in people with lifestyle-related conditions: A systematic review. Hong Kong Physiother J. 2012; 30: 57-75. http://dx.doi.org/10.1016/j.hkpj.2012.07.003
17. Hawkes C. Promoting healthy diets through nutrition education and changes in the food environment: an international review of actions and their effectiveness. Rome: FAO; 2013.
18. Indonesian Association of Cardiovascular Specialists. Dyslipidemia Management Guidelines. 2013 [cited 2017 Nov 5]. Available from: http://www.inaheart.org/upload/file/Pedoman_tatalksana_Dislipidemia.pdf
19. Wang Y, Xu D. Effects of aerobic exercise on lipids and lipoproteins. Lipids Health Dis. 2017; 16:1-8.
20. Kannan U, Vasudevan K, Balasubramaniam K, Yerrabelli D, Shanmugavel K, John NA. Effect of exercise intensity on lipid profile in sedentary obese adults. J Clin Diagnostic Res. 2014; 8:8-10.
21. Farsani PA, Rezaeimanesh D. The effect of six-week aerobic interval training on some blood lipids and VO2 max in female athlete students. Procedia - Soc Behav Sci. 2011; 30:2144-8.
22. Waani OT, Tiho M, Kaligis SHM. Overview of total blood cholesterol levels in office workers. J e-Biomedik [Internet]. 2016 [cited 2017 Nov 5]; 4. Available from: https://media.neliti.com/media/publications/58600-ID-gambaran-kadar-kolesterol-total-darah-pa.pdf
23. Waloya T, Masyarakat DG. Association between food consumption and physical activity with blood cholesterol levels of adult men and women in Bogor. J Gizi dan Pangan. 2013; 8:9-16.
24. Firmansyah MA. Management of Diabetes Mellitus during Ramadan Fasting. CDK-204. 2013; 40:342-7.
25. Sadiya A, Ahmed S, Siddieg HH, Babas IJ, Carlsson M. Effect of Ramadan fasting on metabolic markers, body composition, and dietary intake in Emiratis of Ajman (UAE) with metabolic syndrome. Diabetes Metab Syndr Obes Targets Ther. 2011; 4:409-16.