ORIGINAL ARTICLE

Effectiveness of Motivational Interviewing (MI) to Improve Paraclinical Indicators and Cardiorespiratory Fitness among Overweight and Obese Women: A Randomized Clinical Trial

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Abstract

Background: Obesity has dramatically formed a public health problem across the world. The current survey explored the effects of motivational interviewing (MI) on paraclinical parameters and cardiorespiratory fitness among women with overweight and obesity who referred to the nutrition clinics.

Methods: We conducted a single blind randomized clinical trial study on 136 women with overweight and obesity who were randomly assigned to MI (n=68) or control (n=68) groups during September 2014 to October 2015 year in Gorgan city of Golestan province. The Rockport Walk Test was used to evaluate the maximal oxygen consumption (VO_2 max), low-density lipoprotein (LDL-C), high-density lipoprotein (HDL-C) and total cholesterol which were also tested in participants trained to fast for 12 hours and avoid alcohol consumption in 24 hours before the blood test. The total cholesterol, LDL-C, HDL-C and cardio-respiratory fitness were investigated at baseline and at 12 months' follow-up. Descriptive analysis was run to describe the mean and standard deviation of the demographic characteristics. Independent t-test, paired t-test, and chi-square test were applied. A P value<0.05 was considered as significant.

Results: The mean age of the MI and control group was 51.6±5.2 and 53.8±5.8 years, respectively. MI significantly reduced the total cholesterol (P=0.032), HDL-C (P=0.041) and LDL-C (P=0.011), while it increased VO_2 max compared to the control group.

Conclusion: MI may remarkably affect the participant's paraclinical outcomes including lipid profiles and cardiorespiratory fitness levels. More surveys seem helpful to confirm the effectiveness of MI on long-time changes among people with overweight and obesity.

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Introduction

Obesity leads to numerous chronic diseases, such as cardiovascular diseases (CVD), diabetes mellitus type 2, certain types of cancer, osteoarthritis, and sleep apnea.[1] One of the indicators of obesity is dyslipidemia that consists of high levels of triglycerides (TG) in very-low-density lipoproteins (VLDL) and low levels of high-density lipoprotein cholesterol (HDL-C).[2] Dyslipidemia is known as a more precious predictor of

the CVD compared to other characteristics of obesity.[3] It is well-documented that low plasma HDL-C levels are inversely associated with the CVD and other risk factors.[1, 4] Moreover, HDL can be modified to produce dysfunctional HDL that is presented as a more serious risk factor for CVD.[5]

Cardiovascular disease (CVD) is a major cause of mortality, morbidity, and disability in Iran. It approximately occurs in 50% of all deaths per year.[6] Healthy lifestyle recommendations are strongly supported by scientific evidence than the pharmacological treatment.[7] Some successful interventions have been done regarding alcohol, smoking cessation, and healthy habits promotion.[8] However, the effects of these interventions ranged from low to moderate; moreover, Computer-tailored interventions (PC interventions) strongly support the change in health behaviors.[9] Physical activity and a high fat diet result in development of CVD, and also ranks as the first priority to prevent hyperlipidemia.[10] Physical activity is low in Iranian population.[11, 12] The present survey hypothesized that the MI intervention leads to greater changes in fasting serum lipid and cardiorespiratory fitness levels than the control group.

Identifying the most applicable approach to help patients to change behaviors related to cardiovascular diseases appeared to be beneficial. As to development of theories, many efforts have been made to describe adherence or changes to explore health behavior. Many of theories have led to prevention of behaviors in line with counseling and brief advice.[13] Motivational interviewing (MI) is a client-based technique that results in increased intrinsic motivation, and as to change, it uses processes including detection, identification, and resolution of doubts and ambivalence.[14] MI is significantly increasing all around the world. As to its importance, over three years, the number of its publication has doubled. This technique has been utilized in the field of health systems, health promotion, mental disorders, and recently areas of training and rehabilitation.[15] MI has been applied in chronic diseases, recently.[16] It has been confirmed to be more useful than other approaches as the traditional technique; also, it is more effective than some of pharmacological treatments.[17, 18] In a study conducted by Perula et al., MI effects have been proven in lipid level in patients with dyslipidemia.[7] Moreover, in Shaghaghi et al.'s study, lipid profile was significantly improved after MI.[19] Since obesity and overweight increase the burden of diseases such as diabetes and hypertension, controlling it by implementing innovative interventions can be beneficial. Therefore, the current survey sought to explore the effects of MI on paraclinical parameters and cardiorespiratory fitness among women with overweight and obesity who referred to nutrition clinics.

Methods

Study Design and Participant

A single blind randomized clinical trial study was done from baseline (pre-intervention) to post-intervention (12 months) in the intervention and control groups during September 2014 to October 2015 year in Gorgan city of Golestan province. The study protocol was approved by Ethics Committee of Golestan University of Medical Science (No. IR.GOUMS.REC.1395.211) and also registered in Iranian Registry of Clinical Trials with the code of IRCT2016062217736N8. Participants were selected from two private nutrition clinics in Gorgan city in the study (North of Iran), who referred to the two nutrition clinics for the first time using the records in the clinic through convenient sampling technique. To control selection bias, we used random block allocation (each block comprising 4 persons). The selection of the numbers for the blocks was conducted randomly using the SPSS software (version 16). Therefore, the samples were randomly allocated to the two groups of control (n=68) and MI (n=68). As to blinding, a single blind study was performed such that the participants were not aware of the their allocation to the groups (Figure 1).

Inclusion criteria were: 1) hyperlipidemia diagnosed by a fasting LDL-C (130 mg/dl or higher), 2) ability to read, 3) access to a telephone, 4) no history of nutritional intervention such as MI, 5) no history of drug use (drugs for controlling cholesterol, LDL and HDL), 6) body mass index (BMI) ranging from 25 to 29.9 (overweight) and 30 to 35 (obese),[20] and 7) no history of cardiovascular diseases. The participants with absence in more than two sessions (control or MI) were excluded. To prevent transmission of information between the two groups, we selected the participants from two different nutrition clinics. In addition, during the research process, the university ethical principles were considered in accordance with the principles of the Helsinki Declaration, including obtaining informed consent to participate in the research.

Sample Size Formula

According to a related study with a mean and standard deviation of VO2 max as 35.2±11.9 and 31±3.4 in the MI group and in the control group, respectively, 12 months after the intervention, and also considering the test power of 80% and error of 5%, 68 samples were finally considered in each group.[21]

$$n = \frac{(s_1^2 + s_2^2)\ (z_{1-\frac{\alpha}{2}} + z_{1-\beta})^2}{(\overline{x}_1 - \overline{x}_2)^2}$$

Group of Motivational Interviewing

Firstly, MI arm was educated using written materials including pamphlet and brochure in dealing with (a) behaviors that may decrease cholesterol, (b)

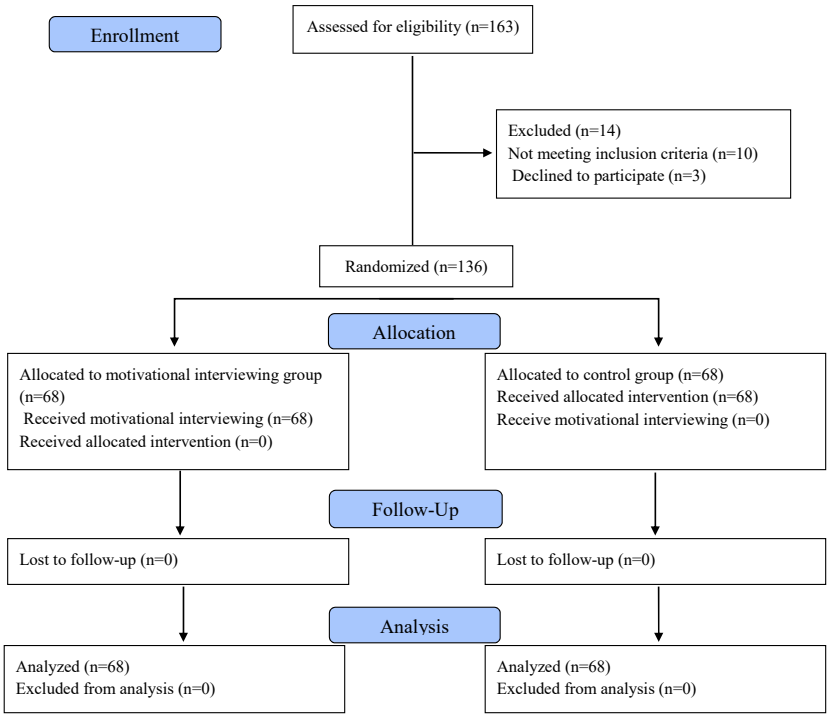

Figure 1: Consort diagram of the study presenting the allocation and follow-up of the two arms

the components of LDL-C and HDL-C, (c) a definition of cholesterol, (d) some usual misconceptions in terms of cholesterol, (e) the principal components of a healthy diet for heart, (f) basic dietary guidelines, (g) the role of physical activity and dietary fats in reducing cholesterol, (h) shopping and food preparation tips, and (i) an exercise plan as defined by both the AHA (2004) and National Cholesterol Education Program (NCEP) (2002).[21]

All participants in the group attended five sessions of MI with a psychologist based on seven key points of MI three weeks after the first intervention (written material). Overall, between 8 and 12 persons participated in each session (each session lasted 30 to 45 minutes). These steps were as follows: (a) people were motivated and persuaded to change, voluntarily (for example, we asked what will happen if you do not change), (b) it is the clients' role to resolve their ambivalence, (c) direct persuasion is not a beneficial technique to resolve ambivalence, (d) the counselor is a directive method to help clients to explore and resolve ambivalence, (e) the counseling style is an eliciting and quiet approach, (f) readiness to change is a fluctuating product of interpersonal interaction, and (g) the therapeutic relation was more similar to a partnership than expert- recipient roles.[21]

Group of Control

Women in this arm received the same education as the MI group by written material. Participants in the control group received five follow-up telephone sessions three weeks after the first intervention (written material). These sessions lasted 30 to 45 minutes and were also delivered by a trained person to adhere to the script provided. It must also be mentioned that the control group just received the usual nutritional education that was routinely provided in the nutrition clinics. Questions were answered in a manner that no behavior or attempts at motivation and resolution of ambivalence were made.

Measures

The Rockport Walk Test (RWT)

The RWT was developed to test the cardiorespiratory fitness by estimating maximal oxygen uptake (VO_2 max) in milliliters of O_2 per kilogram per minute during physical activity in a timed one-mile walk. The RWT was implemented in track equipment that was accessible in the communities and schools. Heart rate and time were estimated by using polar watches and double-checked through a manual pulse and stopwatch. The following equation was used to estimate VO_2max score for women;
VO_2=139.168-(0.388×age)-(0.077×weight in pounds)-(3.265×walk time in minutes)–(0.156×heart rate).[22]

To run RWT test, a specialist in the nutrition and a general physician were supervised on the process in a clinic by considering first aids equipment.

Lipid Value

A fasting lipid profile which consisted of the LDL-C, HDL-C and total cholesterol was investigated at baseline and at 12 month follow-ups. Participants were trained to fast for 12 hours and avoid alcohol consumption in 24 hours before blood test. Participants were asked to do free-of-cost blood test in a health

center (that previously coordinated) at baseline and at 12 month follow-ups.

Data Analysis

Descriptive analysis was utilized to describe the mean and standard deviation of the demographic characteristics. To test the normality of data, we used independent T-test to compare age and BMI of the samples between the two groups. Moreover, Chi-square test was used to explore the normality of job and education variables. Paired t-test was also used to compare the means before and after the interventions in terms of LDL-C, HDL-C, total cholesterol, and VO_{2max}. P value<0.05 was considered significant.

Results

As reported in Table 1, all demographic characteristics were not different at the baseline regarding variables such as age, education, BMI, and job using independent t-test and chi-square test. The mean age of the samples was 51.8 years with a range of 32 to 61 years. The mean age of the MI and the control group was 51.6±5.2 and 53.8±5.8, respectively. The vast majority of women in the MI and control groups were educated in the high school (25 (36.7 %) and 28 (43.7%), respectively). In addition, in the MI and control groups, 40 (59.4%) and 36 (53.1%) were housewife, accordingly.

As shown in Table 2, the MI arm reported a significant decrease in 12-month follow-up in total cholesterol (P=0.032) and LDL-C (P=0.011). The total cholesterol and LDL-C were also decreased in the control group after 12 months. However, it was not significant (P=0.125), and LDL-C (P=0.102). HDL-C was declined remarkably in the MI group (P=0.041), while no decrease was found in the control group (P=0.621). Moreover, VO_2 max values were improved in both groups of MI (P=0.612) and control (P=0.732); however, the two groups were not statistically different. Moreover, the comparison of the groups revealed that all variables except for VO_2 max were significantly different as follows: LDL-C (P=0.031), HDL-C (P=0.035), and Total serum cholesterol (P=0.042).

Discussion

To the best of our knowledge, this survey was primarily considered as a basis to do more research. The MI group shower a higher decrease in the total cholesterol of 36.3 mg/dl that means approximately 18% decrease. A decline of total cholesterol by 10% led to 8% of reduction in the mortality rate.[21] The mean decrease of total cholesterol in the control group was 20.3 mg/dl, which is a 10% of decrease. Despite the intervention, the total cholesterol of no groups was decreased to <200

Table 1: Means and demographic characteristics of the two groups in the pre-intervention

Variables	Motivation interviewing group (number=68) M (Standard Deviation) N (%)	Control group (number=68) M (Standard Deviation) N (%)	P value
Age (year)	51.6 (5.2)	53.8 (5.8)	0.321*
BMI (kg/m^2)	27.9 (2.41)	28.1 (2.17)	0.437*
Education			
Elementary school	9 (13.2)	10 (15.6)	0.128**
Middle school	11 (16.2)	11 (12.5)	
High school	25 (36.7)	28 (43.7)	
Academic	23 (33.9)	19 (28.2)	
Job			
Housewife	40 (59.4)	36 (53.1)	0.271**
Retired	7 (9.4)	5 (6.2)	
Unemployed	12 (18.7)	14 (21.9)	
Other	9 (12.5)	13 (18.8)	

BMI: Body Mass Index; *Independent t-test; **Chi-square test; Significant level: <0.05

Table 2: Means and standard deviation of paraclinical outcomes at baseline and at 12 months' follow-up

Outcome variables	Group	Baseline M(SD)	12 months M(SD)	% Change	*P value (within)	*P value (between)
LDL-C (mg/dl; optimal, <130 mg/dl)	MI	165.2	136.8	20	0.01	0.031
	Control	155.2	141.9	9	0.10	
HDL-C (mg/dl; optimal, ≥40mg/dl)	MI	51.1 (12.2)	44.1 (8.7)	16	0.04	0.035
	Control	48.5 (12.9)	52.8 (12.9)	8	0.62	
Total serum cholesterol (mg/dl; optimal, <200 mg/dl)	MI	238.7 (18.3)	201.2 (29.7)	18	0.03	0.042
	Control	232.4 (26.1)	212.1 (28.9)	10	0.12	
VO_{2max} (ml O_2/ Kg/min)	MI	30.6 (8.8)	34.7 (10.5)	12	0.62	0.264
	Control	27.9 (5.1)	30.2 (2.9)	11	0.72	

MI: Motivational Interviewing Group; M: Mean; SD: Standard Deviation; LDL: Low-Density Lipoprotein; HDL: High-Density Lipoprotein; M: Mean; SD: Standards Deviation; *Paired t-test; Significant level: <0.05

mg/dl, as recommended by the NCEP (2002) guidelines; however, it was decreased significantly in the MI group. At the present study, the significant difference between the two groups might indicate the probable usefulness of the MI method.

HDL-C level among the participants of the MI group was declined considerably by 7 mg/dl or 16%, which was a significant change. However, HDL-C level in the control group was not decreased significantly (8%). This might be caused by the findings that the LDL-C level and the total cholesterol were declined in the MI group, and then HDL-C levels also decreased. In a study,[23] no statistical changes were found between the MI and control groups in weight-related measurements, blood pressure, glucose metabolism and lipid profile after one year; this is not in the same line with the present survey. Additionally, other studies indicated the inefficiency of MI in the clinical fields of lifestyle interventions for prevention of type 2 diabetes.[24-26] This difference might be caused by the fact that in the present survey MI was carried out on limited variables, while in other investigations, more factors were considered to improve by the MI intervention, and they mostly focused on lifestyle intervention that requires a long-time to be changed.

LDL-C level was decreased in the MI group to 28.4 mg/dl on average that is approximately 20% of reduction. LDL-C level of participants in the control group was decreased by 13.3 mg/dl that is a 9% decline. Neither group showed a standard level of <130 mg/dl. Similar to our survey, in another study, MI session was able to increase the intention of participants to change healthy behavior that targeted lifestyle status.[27] Given the Theory of Planned Behavior,[28] prior to the behavior change, the intention must be modified; therefore, it is usually easier to be improved that can explain the inconsistency with other investigations which have addressed lifestyle change by the MI technique. MI technique was also remarkably different compared to the control arm that shows the efficiency of MI to control the lipid profile that is usually abnormal in patients with diabetes and hypertension who referred to the Health Centers of Golestan Province.

VO_2 max was not significantly different in both groups. The level of physical fitness in the MI arm was augmented by 12% and changed from fair to average, while in the control arm, the level of physical fitness was augmented by 11% and changed from poor to fair, as well. In a study, VO_2 max did not differ significantly between the MI and attention-control groups.[21] A study also revealed the same findings such that levels of physical fitness in the MI arm increased by 13% and changed from fair to average. Similarly, levels of physical fitness in the AC group augmented by 9% and changed from poor to fair.[29] The increase of cardiorespiratory fitness by 10% has also been reported similarly in other surveys with long-time intervention.[21, 22, 30, 31] In association with the current study, a meta-analysis[32] cited no significant effect of MI intervention on cardiorespiratory fitness or functional exercise capacity. This might be justified by the fact that in two surveys,[21, 33] MI was provided by telephone counseling. In the present study, MI was provided by a psychologist. This difference might be caused by the different sample size among the studies. Also, in our study MI was conducted through different ways (presence in an educational class, written materials), while in others MI was run by telephone counseling; however, the same results were found that might be due to different follow-ups.

A meta-analysis reported that MI had a remarkable positive effect on smoking cessation only. Also, it showed improvements in the clients' blood pressures only; however, there was no difference between the MI and usual care.[34] The main causes contributing to this inconsistency may be the variation in the designs of the interventions. The MI is usually delivered in terms of the formats and dosage, differently. On the other hand, the providers of the intervention and the training they received also varied markedly.

In brief, due to the huge burden of hypertension, diabetes, and other chronic conditions, MI technique is likely to be beneficial to control or even promote the condition of patients who refer to the Health System.

Limitation of the Study

The present study tested only female subjects that may limit the generalizability of the findings beyond the current samples. In addition, this survey just focused on adults; it seems to be useful to investigate overweight and obesity in the groups at higher risk such as children and adolescents due to the far-reaching weight-related health concerns worldwide. In addition, nutrition, and cigarette status as well as readiness for physical activity were not explored; it is recommended that it should be considered in the future studies.

Conclusion

In summary, the total cholesterol, LDL-C, and HDL-C values were reduced using MI intervention, while VO_2max was not improved compared to the control group; it is suggested that MI intervention might have a remarkable effect on the participants' para-clinical outcomes including lipid profiles and cardiorespiratory fitness levels. Following the high prevalence of hypertension, diabetes and cardio-respiratory disorders among the Iranian population, using the MI seems helpful to control these diseases.

Conflicts of Interest: None declared.

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