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Effect of Motivational Interviewing on Dietary Intake and Weight Changes Among Preconception Women With Overweight and Obesity: A Randomized Controlled Trial

Samar Azami[1], Roghaiyeh Nourizadeh[2], Esmat Mehrabi[2], Hamid Poursharifi[3], Azizeh Farshbaf- Khalili[4*]

Abstract

Objectives: The present study was conducted to investigate the effect of motivational interviewing (MI) on dietary intake and weight changes among preconception women with obesity and overweight.

Materials and Methods: This randomized controlled trial was conducted on 70 overweight and obese women (body mass index ≥25) within the age range of 18-35 years in the preconception period referred to health centers in Tabriz, Iran. Twenty-four-hour food records were completed by women for 3 days and participants' weights were measured before and 8 weeks after the intervention. Using a random block design and the allocation ratio of 1:1, the participants were divided into MI (6 sessions of training and MI) and control (routine preconception care) groups. The criterion for the primary outcome was the mean macronutrient intake 8 weeks after the intervention. All analyses were done according to intention to treat method.

Results: At the baseline, there was no statistically significant difference in terms of the mean of daily energy intake, carbohydrates, fat, protein, and weight ($P>0.05$). After the intervention, the mean (standard deviation) of daily energy intake was 1841.3 (567.8 kcal) and 2131.0 (568.7 kcal) in intervention and control group, indicating a significant difference between the 2 groups with an adjusted mean difference (AMD) of -334.3 and a 95% confidence interval (CI) of -667.2 to -21.5 ($P=0.03$). However, there was no difference between the 2 groups in terms of macronutrients ($P>0.05$). After the intervention, the mean (SD) of participants' weight was 74.4 (6.94 kg) and 75.7 (7.82 kg) in intervention and control groups, which demonstrated a significant difference between the 2 groups (AMD = -1.30 kg, 95% CI = -2.09 to -0.51, $P=0.002$).

Conclusions: MI is an efficient method of weight loss and the energy intake change can help preconception women with obesity or overweight to safeguard themselves against the adverse consequences of their pregnancy.

Keywords: Motivational interviewing, Preconception, Overweight, Obesity, Dietary intake

Introduction

In the last 2 decades, obesity and overweight with body mass indexes (BMIs) of ≥30 and 25-29.9 have turned to be the most common health problems of all age groups worldwide. Obesity has been doubled among women at reproductive age in the last 25 years (1).

In addition, obesity in pregnancy often enhances the risk of gestational hypertension, preeclampsia, gestational diabetes mellitus, fetal macrosomia, intrauterine fetal death, as well as abortion, prolonged labor, shoulder dystocia, and the need for cesarean (1-5). Further, the risk of childbirth with cardiac abnormalities, neural tube defects, and cleft palate increases due to obesity (1,6). Furthermore, obese women are more prone to bleeding, metritis, and depression after pregnancy (7). Despite all complications, unfortunately, one-fifth of women are obese before pregnancy (1,8).

Losing weight is impossible in pregnancy thus preconception period is the best time to have intervention in order to change dietary intake and lose weight (9). Preconception care is a set of medical, behavioral, and social interventions on women who are at their reproductive ages (15-44 years). These types of interventions aim to improve pregnancy outcomes and mainly emphasize prevention (10).

Conventional training plans seem to be inefficient enough for losing weight (11). However, motivational interviewing (MI) is a kind of client-based counseling method in which the consultant helps the individual to identify her own problem through interviewing and try to change it. The main goal of this approach is to highlight the importance of changing from participants' viewpoints (12-14).

A limited number of interventions is at hand regarding utilizing the approach among obese and overweight women in the preconception period (15). Given the importance of

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[1]Student Research Committee, Department of Midwifery, Faculty of Nursing and Midwifery, Tabriz University of Medical Sciences, Tabriz, Iran. [2]Department of Midwifery, Faculty of Nursing and Midwifery, Tabriz University of Medical Sciences, Tabriz, Iran. [3]Department of Clinical Psychology, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran. [4]Aging Research Institute, Physical Medicine and Rehabilitation Research Centre, Tabriz University of Medical Sciences, Tabriz, Iran.
*Corresponding Author: Azizeh Farshbaf- Khalili, Tel: +989144023216, Email: farshbafa@tbzmed.ac.ir, azizehfarshbafkhalili@yahoo.com

the pre-conception period in adopting preventive actions and interventions, this study was conducted to investigate the effect of MI on dietary intake and weight loss among preconception women with obesity and overweight.

Materials and Methods

Study Design

The present randomized controlled trial was based on the MI approach with 2 parallel arms that were stratified according to obesity and overweight. It was conducted on 70 participants within the age range of 18-35 years, who referred to the health centers of Tabriz, East Azerbaijan province, Iran for their preconception care. The inclusion criteria were being in the age range of 18-35 years when referring to health centers for preconception care, having overweight (BMI = 25-29.9) and obesity grade I (BMI = 30-35), having at least secondary school of education, having a phone number, being able to hear and speak while not taking slimming drugs and not doing physical exercises for weight loss. The exclusion criteria included having any physical (e.g., cardiovascular, thyroid disorders, polycystic ovary syndrome, diabetes, and hypertension) or mental diseases, psychomotor disabilities, as well as a history of participation in previous training and interventional programs, addiction or smoking, and drinking alcohol.

Sample Size

The sample size was calculated using G-Power software, version 3.1.2. It was computed through the intake calorie variable obtained from the study by Saffari et al (16) and considering m_1=2812, m_2=2470, SD_1=592, SD_2=170, power of 80%, along with α=0.05, a two-tailed test, and a 10% sample drop. The sample size was finally calculated to be 30 and 35 participants were included in each group by considering the sample drop. The macronutrient intake and the mean weight of the participants 8 weeks post-intervention were considered as primary and secondary outcomes, respectively.

Sampling

Then, the convenience sampling technique was conducted in 4 health centers with different socio-economic status in Tabriz. First, a list of obese or overweight women in the preconception period (18-35 years), who was covered by the above healthcare centers, was provided using the integrated health system. The participants were then phoned to participate in our study and scrutinized in terms of inclusion and exclusion criteria. Eligible women were invited to participate in the briefing session held in each health center. In the first session, they were provided with explanations on the objectives and method of the research, followed by obtaining the written consent form. Participants in both groups were evaluated in terms of height and weight and their BMI was calculated as well. The 24-hour food record form was filled for 3 days before the intervention. The women who filled the pre-test questionnaire were randomly divided into MI and control groups by blocked randomization using random allocation software with block sizes of 4 and 6 stratified according to their BMI (BMI=25-29.9 and BMI=30-35) with the allocation ratio of 1:1. The allocation type was written in a paper and put inside non-transparent envelopes which were numbered respectively (allocation concealment). Next, the envelopes were opened from number 1 and continued to the last one with respect to the entrance of each individual into the study. For allocation concealment, allocation randomized sequence generation and envelope preparation were carried out by a person outside the study. For each health center, half of the envelopes were allocated to obese women and the other half were delivered to women with overweight.

Data Collection Tools

A demographic questionnaire was used to study participants' demographic information such as age, education, occupation, income, weight, height, as well as the number of children and pregnancies.

In addition, the food recording form was used to study dietary intake. The form is always applied in out-patient health centers and filled by the client. The type of food, along with its components and amount is recorded using this method and thus, it minimizes the probability of mind errors or carelessness. The consumed foods are recorded by the participants themselves. The data on the food record form for 3 days which contained what the participants ate and drank throughout one holiday and 2 non-holidays were assessed by Nutritionist IV software (17).

Using a centimeter, the height was measured in a standing straight position with no shoes and hat in a way that the back of the head, hips, and heels were tangent to a scaled wall while the individual was looking to the front. Weight, without shoes and the least costumes, was measured by Seca digital scale (Germany) with 100 g of approximation (scale performance was daily checked by a 500 g calibration scale) and then the BMI was calculated using the formula of weight (kg) divided into the square of height (m).

Intervention

In the intervention group (n=35), the counseling sessions of MI were held with 8-12 individuals in each health center. A booklet and the image of a healthy eating plate (Figure 1) were then handed over in a separate paper (18-20). Further, the intervention was designed to be carried out in 6 sessions of 60-90 minutes and twice a week for 3 weeks. The final session took a longer time (100-120 minutes) to reach a conclusion. Initially, 2 training sessions were held using a booklet, followed by holding 4 sessions of motivational group interviewing. The content of the booklet was to explain 5 main food groups, food pyramid, healthy dish, and important reasons for weight

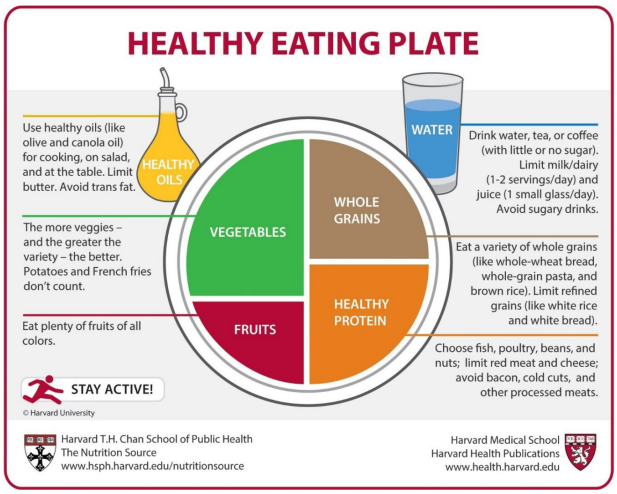

Figure 1. Healthy Eating Plat.

loss, as well as suggestions for controlling overweight and correcting food habits and behaviors. Table 1 provides the arrangement of intervention sessions (21). Routine preconception care was provided for the control group according to the national standard guideline (19).

Eight weeks post-intervention, the participants were phoned and invited to attend their healthcare centres. Eventually, the participants were asked to fill the post-test questionnaire (food record form), followed by measuring their weights and collecting the forms.

Statistical Analysis

The obtained data were analysed by SPPS software, version 21. Qualitative and quantitative variables were explained in percentage and frequency, as well as mean and standard deviation. The normality of quantitative data was studied with the Kolmogorov-Smirnov test for each group separately. Further, the chi-square test, Fisher exact test, and independent *t* test were used to estimate homogeneity between the groups in terms of demographics, anthropometrics, and midwifery features. Moreover, the independent t-test was utilized regarding dietary intake variables and pre-intervention weight. Additionally, covariance analysis was used to evaluate the effect of the intervention and to compare post-intervention values with baseline values and potential confounders. Finally, a paired *t* test was applied to study intragroup changes. $P<0.05$ was considered to be statistically significant and the analysis adopted the intention to treat approach.

Results

The sampling was carried out from 21st August to 23rd December 2018. Ninety eligible women having preconception health records in health centers were invited to refer the health centers although eight women were excluded due to hypothyroidism, diabetes, and the use of traditional medications to lose weight. Furthermore, 6 participants were unable to continue their participation because of being far away or having small babies. Similarly, 6 others were excluded due to their eminent migration to other cities. Finally, 70 eligible women remained and were divided into intervention (n = 35) and control (n = 35) groups (Figure 2).

The mean (SD) age of intervention and control groups was 28.2 (4.8) and 28.7 (4.2), respectively. Most women in intervention (94.2%) and control (88.6%) groups were housewives. Additionally, the mean (SD) of BMIs in intervention and control groups was 30.05 (2.69) and 30.63 (2.54), respectively. In both intervention and control groups, 17 (48.6%) women were obese and 18 (51.4%) had overweight. More than half of the participants in intervention (62.9%) and control (57.1%) groups had a relatively adequate level of income. In addition, 14.3% and 5.7% of women had a college education in intervention

Table 1. Structure and Content of Motivational Interviewing Sessions

Session	Content
1st	• Making a presentation and getting familiar with the group • Explaining the objectives and distributing booklets • Explaining the form of healthy dish
2nd	• Getting familiar with healthy lifestyle behavioral patterns in the pre-pregnancy period • Explaining about vulnerable women in terms of pregnancy adverse effects
3rd	• Introducing motivational interview • Determining the regulations in the group • Getting familiar with the levels of change in order to change dietary behavior
4th	• Knowing about the effects of indifference to oneself and focusing on a single day of life • Evaluating the disturbing factors of healthy dietary behaviors • Identifying the behavior change-resisting factors and the ways to overcome
5th	• Re-assessing and re-thinking on not adopting healthy dietary behaviors • Identifying participants' personal values and highlighting the discrepancies between personal values
6th	• Being devoted to change behavior • Assessing self-confidence and comparing it with obsession • Reviewing the aims and motivators • Reviewing the barriers in order to facilitate healthy lifestyle behavioral patterns

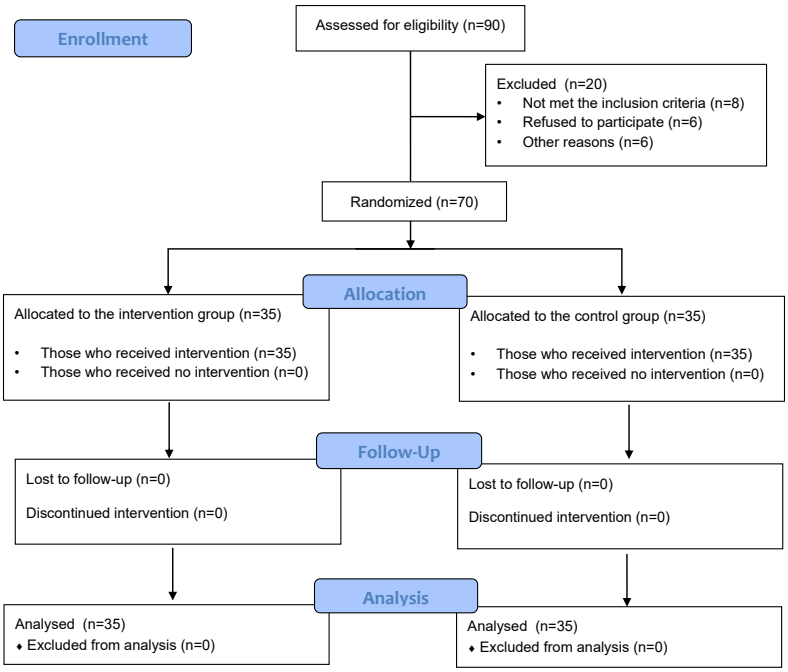

Figure 2. Flowchart of the Study.

and control groups, respectively, while others had a secondary or high school education and diploma. There was no statistically significant difference in terms of demographics between the 2 groups ($P > 0.05$), the details of which are presented in Table 2.

At the beginning of the study, the mean (SD) of daily energy, carbohydrates, fat, and protein intake in the intervention group were 2185.3 (595.3 kcal), 271.5 (77.24 g), 82.7 (38.61 g), and 101.0 (33.12 g) while 2166.8 (849.0 kcal), 274.5 (83.66 g), 76.5 (31.32 g), and 96.13 (28.83 g) in the control group, respectively. Thus, there was no significant difference between the 2 groups ($P>0.05$). Eight weeks after the intervention, the mean (SD) of daily energy intake in the intervention group was 1841.3 kcal (567.8) that was significantly lower than that of the control group 2131.0 kcal (568.7) considering the AMD of -334.3 kcal and a 95% confidence interval (CI) of -667.2 to 21.5. The mean (SD) of carbohydrate intake was 222.8 g (114.8) and 259.2 g (134.8) in intervention and control groups, respectively. Fat intake was also 72.7 g (44.7) and 76.6 g (37.6) in intervention and control groups, respectively. Protein was 97.16 g (46.4) and 113.0 g (56.45) in the 2 groups, indicating no significant difference between the groups in this regard (Table 3).

Eight weeks after the intervention, intragroup analysis (Table 4) showed that the amount of daily energy intake (MD=-337.9 kcal, 95% CI = -536.0 to -139.9) and carbohydrates (MD = -48.66 g, 95% CI = -81.72 to -15.6) in the intervention group significantly decreased but in the control group, no significant difference was observed in terms of energy intake and macronutrients through the study ($P > 0.05$).

At the baseline, the mean (SD) weight was 75.88 kg (6.39) and 75.78 kg (7.44) in intervention and control groups, respectively ($P = 0.993$). Eight weeks after the intervention, it was 74.4 kg (6.94) and 75.7 kg (7.82) in intervention and control groups, respectively, representing a difference between the groups in this regard (AMD = -1.30k g, 95% CI=-2.09 to -0.51). In terms of intragroup analysis, the weight loss was significant in the motivational interview group (MD = -1.457 kg, 95% CI = -2.061 to -0.852) although no significant difference was observed in the control group (MD= -0.157 kg, 95% CI = -0.696 to -0.382), related data are presented in Table 5.

Discussion

To the best of our knowledge, the present study was the first analysis of the preconception period in terms of studying the effect of MI on women's dietary intake and weight loss with the emphasis on achieving normal BMI in the preconception period. The previous investigations mainly focused on the effect of preconception MI regarding controlling or avoiding drinking alcohol (22).

Our findings showed that the use of motivational group interviewing significantly reduced daily energy intake and weight loss when compared to the control group.

Saffari et al studied the long-term effect of MI on dietary habits and weight loss among women with obesity and overweight. They found that there was a significant increase in the consumption of fibre, fruits, and vegetables one year after the intervention. However, a significant decrease was observed in the amount of consumed meat products, fat, and carbohydrates, along with daily energy intake when compared to the control group. Moreover,

Table 2. Participants' Demographics Characteristics

Characteristics	Intervention Group (n = 35)	Control group (n = 35)	*P* Value
Age (y), mean (SD)	28.2 (4.8)	28.7 (4.2)	0.617[a]
18-24	9 (25.7%)	7 (20.0%)	
25-30	12 (34.3%)	13 (37.1%)	
31-35	14 (40%)	15 (42.9%)	
Job			0.084[b]
Housewife	33 (94.3%)	31(88.6%)	
Working at home	1 (2.9%)	3 (8.6%)	
Working outside home	1 (2.9%)	1 (2.9%)	
Education			0.716[c]
Secondary school	16 (45.7%)	15 (42.9%)	
High school & diploma	14 (40%)	18 (51.4%)	
College education	5 (14.3%)	2 (5.7%)	
BMI (kg/m^2)	30.0 (2.6)	30.6 (2.5)	0.001[a]
25 to 29.9	17 (48.6%)	17 (48.6%)	
30 to35	18 (51.4%)	18 (51.4%)	
Husband's education			0.382[c]
Primary school	10 (28.6%)	5 (14.3%)	
Secondary school	8 (22.9%)	9 (25.7%)	
High school and diploma	12 (34.3%)	18 (51.4%)	
College education	5 (14.3%)	3 (8.6%)	
Husband's Job			0.078[d]
Unemployed	1 (2.9%)	1 (2.9%)	
Clerk	2 (5.7%)	6 (17.1%)	
Worker	9 (25.7%)	15 (42.9%)	
Private sector	23 (65.7%)	13 (37.1%)	
Income adequacy			0.001[c]
Adequate	3 (8.6%)	4 (11.4%)	
Partially adequate	22 (62.9%)	20 (57.1%)	
Inadequate	10 (28.6%)	11 (31.4%)	
Residential status			0.188[d]
Owner	16 (45.7%)	19 (54.3%)	
Rental	9 (25.7%)	13 (37.1%)	
Husband's parents' home	6 (17.1%)	2 (5.7%)	
Own parent's home	4 (11.4%)	1 (2.9%)	
Pregnancy number			0.11[c]
0	8 (22.9%)	9 (25.7%)	
1	11 (31.4%)		
≥2	16 (45.7%)	8 (22.9%)	
Delivery number			0.233[c]
0	8 (22.9%)	10 (28.6%)	
1	16 (45.7%)	20 (57.1%)	
≥2	11 (31.4%)	5 (14.3%)	

Data reported as mean (SD) or percentage.
[a] *t* test; [b] Fisher Exact test; [c] Trend chi-square; [d] Chi square test.

weight and BMI demonstrated a significant decrease in the intervention group when compared to the control group (16). In the above-mentioned study, the dietary habit was assessed using a food frequency questionnaire. To avoid recall bias, dietary diary (food recording form) was used in this study.

In another study conducted by Mirkarimi et al about the effect of MI on a weight-loss program based on the protection motivation therapy, 150 overweight and obese women were randomly allocated to 3 groups of control (a standard weight control program), MI, and MI plus the implementation of intention intervention. The findings revealed a significant weight loss in all 3 groups. The weight loss in the control group was because of receiving a standard weight control program including diet, exercise, and health education programs (23).

In a systematic review by Van Buskirk et al on the effect of MI on primary cares (i.e., drug use, diet, physical exercise, following treatment, colon cancer screening, and hypertension) in 12 studies, it was revealed that the MI approach was successful in achieving the objectives in 9 studies, but there was a controversy over the number of effective sessions (24). Accordingly, future studies are necessary for determining the number of effective sessions in this approach.

Similarly, Mirkarimi et al evaluated 100 overweight and obese women randomly divided into MI and nutrition education groups and showed that BMI was significantly different between the 2 groups in 2- and 6- month follow-ups. A remarkable decrease in BMI was observed in the MI group over time while no significant change was found in the control group (25). It seems that MI can be effective in enhancing a weight efficacy lifestyle among women with overweight and obesity.

Miller and Rollnick believed that most of the interventions are more successful if they come in the form of group interviews. In this regard, MI is a good example that if administered in the forms of group interviews leads to more effective results (26). In addition, group counseling provides situations for sharing ideas and emotions, preparing the context for a better support system to self-care, and obliging the person to devote him/herself for a change (27).

For motivating and internalizing the provided training materials during interventions, the participants were provided with nutritional counselling taken from a training booklet designed according to national protocols, along with the use of healthy dishes (18). The form was designed exactly like an average-size healthy dish provided with figures and explanations and proportionate amounts of each nutritional type with clear and transparent colors. Then, the form was presented to the participants and they were advised to attach the form wherever they cook or eat their food (Figure 1).

The advantage of the present study was the utilization of motivational group interviewing with the aim of making people devoted to change their dietary behaviours in order to improve their pregnancy outcomes. The interviews took place in 6 sessions in the form of group work encouraging people to participate in discussions. There was no sample drop during the intervention or follow-ups. Another advantage of our study was the use of healthy dishes for enhancing motivation and providing an objective (not imaginary) example of a healthy diet to the participants. However, the main limitation was the shortness of the follow-up time period. Thus, health centers are suggested to combine motivational group interviewing with other weight loss programs in order to keep weight in its normal

Table 3. The Comparison of Daily Energy Intake and Macronutrients Pre- and Post-intervention Between the 2 Groups

Variable	Pre-intervention		P^a	Post-intervention			P^b
	Intervention (n=35) Mean (SD)	Control (n=35) Mean (SD)		Intervention (n=35) Mean (SD)	Control (n=35) Mean (SD)	AMD (95% CI)*	
Energy (kcal/d)	2185.3 (595.3)	2166.8 (849.0)	0.698	1841.3 (567.8)	2131.0 (568.7)	-334.4 (-667.2 to -21.5)	0.037
Carbohydrate (g/d)	271.5 (77.24)	274.5 (83.66)	0.876	222.8 (114.8)	259.2 (134.8)	-34.6 (-89.7 to 20.5)	0.215
Energy from carbohydrates (%)	49.6 (8.84)	50.8 (7.19)	0.526	48.54 (11.4)	47.80 (11.10)	(-4.62 to 6.11)0.742	
Protein (g/d)	101.0 (33.12)	96.13 (28.83)	0.508	97.16 (46.4)	113.0 (56.45)	-18.1 (-42.1 to 5.9)	0.137
Energy from proteins (%)	18.0 (3.38)	17.7 (3.37)	0.778	19.02 (3.96)	20.40 (5.82)	-1.37 (-3.74 to 1.0)	
Fat (g/d)	82.7 (38.61)	76.5 (31.32)	0.457	72.7 (44.7)	76.6 (37.6)	-7.139 (-25.122 to 10.8)	0.431
Energy from fat (%)	32.37 (8.74)	31.4 (7.67)	0.623	32.42 (42.11)	31.58 (9.18)	(-4.37 to 5.51)0.571	

Note. AMD: adjusted mean difference; CI: confidence interval; SD: standard deviation.
[a] *t* test; [b] ANCOVA adjusted for baseline.

Table 4. The Comparison of Energy Intake and Macronutrients Pre- and Post-intervention in Each Group

Group	Energy (kcal/d)	Carbohydrates (g/d)	Protein (g/d)	Fat (g/d)
Intervention (n=35)				
Pre-intervention	2185.3 (595.3)	271.5 (77.24)	101.0 (33.12)	82.7 (38.61)
Post-intervention	1847.3 (567.8)	222.8 (114.8)	97.16 (46.4)	72.7 (44.7)
Mean difference (95% CI)	-337.9 (-536.0 to -139.9)	-48.66 (-81.72 to -15.6)	-3.91 (-18.7 to 10.85)	-10.07 (-24.0 to 3.84)
P^a	0.001	0.005	0.594	0.151
Control (n=35)				
Pre-intervention	2166.8 (849.0)	274.5 (83.66)	28.83 96.13()	76.5 (31.32)
Post-intervention	2131.0 (568.7)	259.2 (134.8)	56.45 113.0()	76.6 (37.6)
Mean difference (95% CI)	-35.73 (-336.34 to 264.88)	-15.19 (-62.38 to 33.99)	16.91 (-3.96 to 37.8)	0.148 (-14.13 to 14.43)
P^a	0.093	0.517	0.109	0.983

Note. CI: confidence interval.
[a] Paired samples *t* test.

Table 5. Comparison of Weight Changes of Obese and Overweight Women Eight Weeks Post-intervention in Intervention and Control Groups

Weight	Intervention (n=35) Mean (SD)	Control (n=35) Mean (SD)	AMD (95% CI)	*P*
Pre-intervention	75.88(6.39)	75.87 (7.44)	-1.30 (-2.0 to -0.51)	0.993[a]
Eight weeks post-intervention	74.4 (6.94)	75.70 (7.82)		0.002[b]
MD (95% CI)	-1.457 (-2.061 to -0.852)	-0.157 (-0.696 to 0.382)		
P^c	<0.001	0.558		

Note. CI: confidence interval; SD: standard deviation; MD, mean difference; AMD: adjusted mean difference.
[a] t test; [b] ANCOVA adjusted for baseline; [c] Paired samples *t* test.

range among preconception women. Further, longer follow-up periods (6 months) are suggested for future studies in order to evaluate the long-term effectiveness of the intervention.

Implications for Further Research

MI contributes to the weight loss and energy intake change of preconception women with overweight or obesity.

Conclusions

The preconception period is one of the critical periods of a woman's life that affects later pregnancy outcomes. On the other hand, pregnancy is not a ground for either weight loss interventions or diet changes. MI is an efficient method of weight loss and energy intake change can help preconception women with obesity or overweight to safeguard themselves against the adverse consequences of their pregnancy.

Conflict of Interests

The authors declare that there is no conflict of interests.

Ethical Issues

The study was approved by the Regional Ethics Committee of Tabriz University of Medical Sciences (IR.TBZMED.REC.1396.266) and registered in the Iranian Registry of Clinical Trials (identifier: IRCT2017052333834N4).

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