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Original Article

Adherence and Attrition in a Web-Based Lifestyle Intervention for People with Metabolic Syndrome

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Abstract

Background: The aim of this study was to determine adherence and attrition rates in a lifestyle intervention for people with metabolic syndrome.

Methods: Adherence and attrition data from a randomized controlled trial were collected. Participants were classified as adherence group if they completed assessments at 3 and 6 months follow-up and as attrition group if they did not. Physical activity and quality of life was measured using the International Physical Activity Questionnaire (IPAQ) and the Short Form Health Survey (SF-36). Generalized Estimating Equations (GEE) was used to explore predictors of attrition.

Results: The mean age of participants (n=160) was 44.1 years. Attrition rate in the intervention and control groups at first follow-up were the same (20%). However, the control group had significantly higher attrition rate (%33.7) compared to the intervention group (%20) at 6 months follow up. Results showed that low educated participants were more likely to not stay in the study than better educated participants (OR=2.95,CI:1.39-6.33,*P*=0.05). According with length of the study, attrition was decreased at six month (OR=0.66,CI:0.52-0.83,*P*<0.001). Also, some aspects of health-related quality of life contributed to the attrition rate. Those who had higher scores on general health (OR=0.66,CI:0.54-0.97,*P*=0.023), social functioning (OR=0.44,CI:0.40-0.76,*P*=0.032), role emotional (OR=0.74,CI:0.54-0.98,*P*=0.18), vitality (OR=0.55,CI:0.38-0.90,*P*=0.015) and mental health (OR=0.63,CI:0.45-0.85,*P*=0.033) were more likely to stay in the study.

Conclusion: It remains a concern that Web-based lifestyle programs may fail to reach those who need it most. Participant in the study generally had better quality of life than those who were lost to follow up.

Keywords: Web-based intervention, Metabolic syndrome, Attrition, Adherence, R controlled trial

Introduction

Metabolic syndrome is the most responsible risk factor for developing the cardiovascular diseases (1). It is a major public health problem worldwide (2-4). Recently the National Cholesterol Education Program (NCEP) expert panel on detection, evaluation, and treatment of high blood cholesterol in adults recommended that in order to decrease high blood cholesterol should put more focus on the metabolic syndrome and its favorable modification through changes in lifestyle (5). Changes in lifestyle should be emphasis on healthy nutrition and physical activity in order to decreasing metabolic syndrome (6-7).

Lifestyle changes interventions might be implemented through different approaches including interventions that are using the Internet. Despite the high rates of Internet access and substantial growth of Internet-mediated health programs, the web-based interventions often encounter with the attrition problem. High rate of attrition is one of the fundamental methodological challenges in Web-based trials (8). Eysenbach suggests that there are two forms of attrition: non-usage and dropout attrition. Non-usage attrition also called low adherence and occurs when the study participants never using or stop using the e-health interventions. Dropout attrition also called lost to follow-up or low retention and describes the phenomenon that the study participants did not complete the follow-up measurements (9-10). It is argued that attrition patterns of Web-based interventions vary for different topics, settings and populations (11). For instance a review paper on Web-based behavior therapy on depression reported that the medium dropout rate for such interventions was 60% (11). In addition, high rates of dropout have been reported for open access websites with substantial number of users that not completing the offered programs (12). The adherence rates for web-based lifestyle promotion programs differ from 0 to 52% depending on outcome measures were used (13), the topic (14), and the characteristics of participants (15). However, there is evidence that lifestyle modification programs tend to reach those who need them the least (16). This also remains controversial for web-based interventions for users with metabolic syndrome.

Thus, the aim of this paper is to report the rates of adherence and attrition in a randomized controlled trial and determine the potential predictors of attrition for a web-based lifestyle intervention for people with metabolic syndrome.

Materials & Methods

Study design and participants

This report is derived from a randomized trial carried out from Jun to August 2012 in Tehran, Iran (IRCT201111198132N1).. The study protocol is well documented (17). In summary this was a 6-months two arm randomized controlled trial (RCT) of an online intervention designed to help people with metabolic syndrome in order to modify lifestyle and reduce metabolic syndrome risk factors Participants were recruited through a free online website designed to raise public's awareness about a healthy heart (http://www.Heartresearch.ir). Those who were visiting the website were informed that they could register to receive more information on the topic if they wish. They were eligible to register if they had metabolic syndrome. Metabolic syndrome was defined according to the criteria of the National Cholesterol Education Program's Adult Treatment Panel III (ATP III) (18). In particular eligible participants should have waist circumference ≥90 cm (cut-off for metabolic syndrome in Iran for both genders (19-21), blood pressure of ≥130/85 mmHg and one more metabolic syndrome components. The following information also was recorded for each participant: name, gender, age, waist circumference, weight, and e-mail address. Then, trained research assistants reviewed the study website database and identified registrants aged 20 and over living in Tehran (the study setting). Subsequently, they were contacted by a telephone call. During the initial contact, individuals were screened for eligibility and participants who consented to participate were asked to schedule for a free clinic visit and clinical measurements by a trained research assistant at Tehran Heart Center. Recruitment of participants continued until the required sample size for the study was reached. A total of 160 members were recruited at baseline.

The enrolled participants completed all baseline assessments and were allocated to intervention or control groups. The allocation sequence was concealed from the researcher in sequentially numbered, opaque, sealed and stapled envelopes. Randomization sequence was created by a biostatistic specialist using excel software to assign participants to either intervention or control condition and at individual level, using a 1:1 allocation ratio with block size of 4. Due to the nature of the study (waiting-list controlled) it was not possible to blind participants to intervention allocation.

The intervention group received a username and password for log-in but the controls did not.

Intervention

All participants in the both intervention and control group were aware of their metabolic syndrome conditions and its components through the e-mail and encouraged to making appropriate changes in dietary and physical activity behaviors in order to treat metabolic syndrome. Participants in intervention group were received additional intervention by using a five-part interactive website with multiple features for prevention of metabolic syndrome. For using the website those in the intervention group should log-in to the interactive section namely 'My Healthy Heart Profile'. The website enabled users to frequently log-in and visit their homepage or ask questions at any time they wish. The homepage of intervention website contained educational materials that were updated every 2 weeks. My Healthy Heart Profile had interactive sections to record all metabolic syndrome risk factors, send feedback and showed the changes of risks over time by a diagram. The healthy heart website was designed so as to encouraged both intervention and control groups adopting healthy lifestyle and changing physical activity and nutrition behavior to decrease metabolic syndrome risk factors. Controls had not access to the 'My Healthy Heart Profile'. They were kept in waiting list and received e-mail messages every 3-weeks that included information about metabolic syndrome and general information about healthy nutrition and benefits of fruit and vegetable intakes, physical activity and body weight loss.

Baseline and follow-up assessments

Participants were assessed at three points in time: at baseline, 3- and 6-months follow-up. The study stopped at six month because there is evidence that lifestyle interventions might change metabolic syndrome components at six months (22). Assessment included recording of demographic, anthropometrics and clinical information. The weight of individual dressed in light clothing without shoes was measured using a calibrated scale (Seca model 8811021658, Hamborg, Germany). Height was measured without shoes using a stadiometer (Seca, Hamborg, Germany). Waist circumference was measured in horizontal plane, midway between the lowest rib and the iliac crest with a measuring tape in centimeter. Blood pressure was measured with mercury sphygmomano-meter twice in the same arm after the individual seated at rest 10-15 min. The systolic and diastolic measurement represented the mean of two readings. Blood sampling were collected for measurements of Total cholesterol, Triglycerides, LDL-cholesterol, HDL-cholesterol, Fasting Blood glucose for all participants included in the study. Overnight fasting for 12-14 h is needed before blood sampling. Venous blood samples (5ml) were collected. Body Mass Index (BMI) was calculated by individual's weight divided by the square of the height.

Health-related quality of life (HRQOL) was measured using the SF-36 questionnaire (23). The SF-36 questionnaire was a reliable and valid measure of health related quality of life among the general population. It has been demonstrated that reliability test for internal consistency for all eight SF-36 scales met the minimum reliability standard by the Cronbach's α coefficients ranging from 0.77 to 0.90 with the exception of the vitality scale (α = 0.65). The SF-36 yields eight subscales namely: physical functioning, role physical, bodily pain, general health, vitality, social functioning; role emotional; and mental health. The scores on the SF-36 range from 0 to 100 where the higher scores represent better conditions. The international physical activity questionnaire (IPAQ) by the last 7 days, short form (24) was used to estimate the total amount of time spent in physical activity per week. IPAQ instrument provide a total score to describe overall level of activity. Physical activity was categorized into high, moderate and low activity according to guidelines for data processing and analysis of the IPAQ (24). High level of activity categorized when any one of the following 2 criteria were met: vigorous-intensity activity on at least 3 days and accumulating at least 1500 MET-minutes/week or five or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum

of at least 600 MET-min/week. Moderate level of activity categorized when any one of the following 3 criteria were met: 3 or more days of vigorous activity of at least 20 minutes per day or five or more days of moderate-intensity activity or walking of at least 30 minutes per day or 5 or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum of at least 600 MET-min/week. The last category was the lowest level of physical activity those individual did not met criteria for categories high or moderate.

Participants in both groups were received an e-mail message every 3 weeks to keep them involved in the study. Several e-mails and up to 4 telephone call reminders were used in order to encourage participants to attend for assessments at Tehran Heart Center at 3- and 6-months follow up. Boosting strategies for both intervention and control groups were free blood testing at all three assessment times. To save participants' time, the test results were sent through e-mail within 24 hours.

Measures of adherence and attrition

For the purpose of this paper, the two outcomes of interest were adherence and attrition. We defined adherence as attending for clinical assessment at 3 and 6 months follow-ups. Thus, by using a strict definition of adherence, participants who completed the clinical assessments at both follow-ups (3 and 6 months) were considerate to be adherent. Attrition was defined as incomplete follow-up assessments. The attrition meant drop-out attrition and we will therefore just use the term attrition. Adherence and attrition indicated for both intervention and control groups.

Sample size

The sample size was calculated based on one standard deviation decrease (2.5) in waist circumference as the main outcome measure for the original trial (25). As such a study with a power of 90% at 5% significance level would need 60 participants in each arm. Giving that there might be an attrition risk, 80 participants per each group were sought.

Analysis

The registration data were extracted from the live database and transferred into the SPSS software. To explore the data we used descriptive statistics including reporting on mean, standard deviation, frequency, and percentage. To evaluate the difference between groups we used chi-square and t-test. Simultaneous effect of different factors on the attrition at 3 and 6 months was assessed using the Generalized Estimating Equations (GEE) methods. All statistical analysis performed by SPSS software (Version 21.0, IBM Co. Chicago, IL). *P*-value less than 0.05 considered as statistically significant.

Ethics

The ethics committee of Tehran University of Medical Sciences approved the study. All participants gave written informed consent for the main study.

Results

Participants

The initial data were extracted from the registration records on the study website, 1437 (male: 929, female 508). The age ranged from 18 to 78 years with an average 39.3 (SD= 11.4), 64.6% were male. Of those, 815 were excluded for the reasons such as living outside the study setting (356), having waist circumference less than 90 cm (n= 392) and diseases (67). A total of 622 registered participants were screened for eligibility by telephone contacting and 305 were excluded for the reasons as cardiovascular diseases (n=68), diabetics (n=51), taking antihypertensive medications (n=45), taking cholesterol-lowering medications (n=32), having blood pressure <130/85 (mmHg) (n=96), renal and cancer diseases (n=12), and being pregnant (n = 1). Then, 317 participants were invited that 229 were able to be attended for clinical assessments and were scheduled for a baseline visit. Finally, of 171 enrolled participants with metabolic syndrome 160 participants completed the baseline

measures questionnaire and were randomly assigned to intervention and control groups.

The characteristics of the study participants are shown in Table 1. The mean age of participants was 44.5 (SD=10) years. Most participants were married (83.8%), employed (71.3%), and had an average Internet usage of 12.2 hours per week (SD=15.2). There were no significant differences between the intervention and control groups exception LDL-cholesterol level. The characteristics of the study participants according to attrition in each condition are shown in Table 2. In addition baseline physical activity and metabolic parameters among the study samples are shown in Table 3. Overall the prevalence of metabolic syndrome was 75%. There were no significant differences between the intervention group and the controls.

Health-related quality of life scores as measured by the SF-36 are presented in Table 4. There were significant differences between participants and attrition group for vitality and mental health scores indicating that people who did not stay in the study reported poorer conditions compared with participants ($P < 0.001$).

Table 1: Baseline characteristics of the study participants

	Total (n=160)	Control (n=80)	Intervention (n=80)	*P*
Age (yr)	44 .5 ± 10	44.8 ± 10	43.3 ± 10.1	0.345†
Gender No. (%)				0.403*
Males	106 (66.3%)	56 (70.0%)	50 (62.5%)	
Females	54 (33.8%)	24 (30.0%)	30 (37.5%)	
Education (yrs) No. (%)				0.080*
≤12	71 (44.4%)	41 (51.3%)	30 (37.5%)	
>12	89 (55.6%)	39 (48.8%)	50 (62.5%)	
Marital status No. (%)				0.113**
Single	21 (13.1%)	14 (17.5%)	7 (8.8%)	
Married	134 (83.8%)	62 (77.5%)	72 (90.0%)	
Divorced/ widowed	5 (3.1%)	4 (5.0%)	1 (1.3%)	
Employment status No. (%)				0.99**
Employed	104 (71.3)	54 (67.5)	60 (75)	
Unemployed	46 (28.7)	26 (32.5)	20 (25)	
Smoking No. (%)	22 (13.8%)	8 (10.0%)	14 (17.5%)	0.168*
Alcohol drinking No. (%)	9 (5.7%)	5 (6.3%)	4 (5.1%)	0.99**
Addiction No. (%)	2 (1.3%)	2 (2.5%)	0 (0.0%)	0.497**
Weight (Kg)	87 ± 15	88 ± 14	87 ± 16	0.574†
Body mass index (Kg/m²)	30.1 ± 4.6	30.5 ± 4.5	29.8 ± 4.7	0.374†
Waist circumference (Cm)	104 ± 9	105 ± 9	103 ± 9	0.199†
Systolic blood pressure (mmHg)	132 ± 11	132 ± 13	131 ± 8	0.593†
Diastolic blood pressure (mmHg)	88 ± 6	88 ± 7	89 ± 6	0.594†
Total cholesterol (mg/dL)	195 ± 39	191 ± 35	199 ± 44	0.181†
LDL cholesterol	129 ± 32	123 ± 31	134 ± 33	0.019†
HDL cholesterol (mg/dL)				
Women	39 ± 8	39 ± 10	39 ± 7	0.683‡
Men	46 ± 11	48 ± 12	44 ± 10	0.086‡
Triglycerides (mg/dL)	192 ± 113	198 ± 127	186 ± 96	0.534‡
Fast blood glucose (mg/dL)	90 ± 14	91 ± 15	89 ± 12	0.772‡
Physical activity (Met/mins)	493 ± 716	471 ± 750	515 ± 684	0.224‡

† Derived from t-test, ‡ Derived from Mann-Whitney test, * Derived from Chi-Square test, ** Derived from Fisher exact test.

Table 2: The characteristics of the study participants according to attrition in each condition

	Intervention (n=80) Participants/(n=64) No. (%)	Attrition/(n=16) No. (%)	*P**	Control (n=80) Participants/(n=53) No. (%)	Attrition/(27) No. (%)	*P**	*P***
Age (years)							
Mean (SD)	43.5 (10.3)	42 (9.4)	0.594	44.7 (10.6)	44.7 (10.7)	0.999	0.407
Gender			0.083			0.327	0.446
Males	43 (67.2)	7 (43.8)		39 (73.6)	17 (63)		
Females	21 (32.8)	9 (56.2)		14 (26.4)	10 (37)		
Education (yrs)			0.248			0.582	0.647
≤12	22 (34.4)	8 (50%)		26 (49)	15 (55.5)		
>12	44 (68.8)	8 (50%)		27 (50.9)	12 (44.5)		
Marital status			0.004			0.607	0.168
Single	3 (4.7)	4 (25)		8 (15)	6 (22.2)		
Married	61 (95.3)	11 (68.8)		42 (79.2)	20 (74)		
Divorced/ widowed	0	1 (6.25)		3 (5.6)	1 (3.7)		
Employment status			0.053			0.354	0.497
Employed	51 (79.9)	9 (56.3)		37 (69.8)	17 (62.9)		
Unemployed	13 (20.3)	7 (43.8)		16 (30.2)	10 (37.1)		
Smoking (Yes/No)	12 (18.8)	2 (12.5)	0.556	2 (3.8)	6 (22.2)	0.581	<0.001
Alcohol drinking	3 (4.7)	1 (6.25)	0.808	4 (7.7)	1 (1.9)	0.755	0.508
Drug addiction	0	0		1 (1.9)	1 (3.7)	0.564	<0.001
Internet usage (hours/week)	17 (17.9)	9.2 (10.1)	0.099	12.7 (14.8)	7.3	0.073	0.160

* Significance for within group comparison./ ** Significance for between attrition in two group comparisons.

Table 3: Physical activity and metabolic parameters among the study sample

	Intervention (n=80)			Control (n=80)			
	Participants (n=64) Mean (SD)	Attrition (n=16) Mean (SD)	*P**	Participants (n=53) Mean (SD)	Attrition (n=27) Mean (SD)	*P**	*P***
Weight (Kg)	87.1 (15.1)	85.5 (18.2)	0.731	88.4 (12.6)	87.5 (16.8)	0.798	0.721
Body mass index (Kg/m²)	29.7 (4.5)	30.23 (5.5)	0.689	29.9 (3.8)	31.5 (5.6)	0.650	0.488
Waist circumference (Cm)	103.5 (8.3)	103.1 (10.5)	0.839	104.9 (8.4)	105.8 (9)	0.683	0.376
Systolic blood pressure (mmHg)	131.3 (8.5)	131.2 (7.1)	0.973	132.7 (15.2)	131.3 (8.8)	0.65	0.986
Diastolic blood pressure (mmHg)	88.9 (6.2)	86.8 (3.5)	0.203	87.9 (7.8)	88.2 (5.4)	0.594	0.407
Total cholesterol (mg/dL)	199.1 (41.1)	199.4 (53.8)	0.977	190.2 (30.8)	191.9 (42. 2)	0.65	0.612
LDL cholesterol (mg/dL)	132.9 (32.1)	140.7 (35.5)	0.396	123.7 (26.2)	120.4 (38.6)	0.895	0.093
HDL cholesterol (mg/dL)							0.433
Women	42.1 (8.1)	46.8 (13.9)	0.245	49.3 (13.1)	47.2 (10.7)	0.674	
Men	39.1 (6.7)	38.2 (6.5)	0.75	38.5 (8.9)	40.6 (11.6)	0.483	
Triglycerides (mg/dL)	180.1 (94.8)	208.8 (100.4)	0.288	197.1 (113.2)	199.6 (153.6)	0.932	0.832
Fast blood glucose (mg/dL)	88.9 (12.6)	88.5 (11.3)	0.914	90 (15.1)	92.6 (14.9)	0.478	0.355
Physical activity No. (%)			0.512			0.477	0.968
High	1 (1.56)	0		1 (1.8)	1 (3.7)		
Moderate	18 (28.2)	5 (31.2)		12 (22.6)	6 (22.2)		
Low	45 (70.3)	11(68.8)		40 (75.4)	20 (74.7)		

* Significance for within group comparison./ ** Significance for between group comparisons.

Table 4: The SF-36 scores of the both intervention and control groups based on adherence and attrition

	Intervention (n=80)			Control (n=80)			
	Participants (n=64) Mean (SD)	Attrition (n=16) Mean (SD)	*P**	Participants (n=53) Mean (SD)	Attrition (n=27) Mean (SD)	P*	*P***
Physical functioning	93.2 (11.7)	93 (8.7)	0.941	91.2(13.4)	86.4 (19.3)	0.267	0.97
Role physical	86.1 (29.3)	87.5 (34.1)	0.868	81.9 (31.2)	77.4 (40.5)	0.559	0.265
Bodily pain	44.2 (28.6)	51.4 (32.1)	0.380	40.1 (31.4)	34.3 (27.8)	0.447	0.090
General health	58.2 (18.7)	58.1 (13.1)	0.963	59.3 (18.4)	58.1 (15.6)	0.774	0.811
Social functioning	87.5 (18.1)	85.3 (27.1)	0.697	85.4 (23.2)	78.8 (30.1)	0.282	0.296
Role emotional	70.8 (40.5)	72.9 (40.7)	0.853	67.9 (44.3)	61.70 (44)	0.541	0.419
Vitality	60.24 (18.1)	58.4 (14.1)	0.046	61.5(17.8)	51 (19.1)	0.048	0.746
Mental health	66.6 (15.9)	57.7 (12.8)	0.043	66.6 (18.2)	58.9 (18.5)	0.049	0.556

Table 5: The results obtained from generalized estimating equations for attrition at 3- and 6-months follow-up

	Odds ratio	95% Confidence Interval		*P*
		Lower	Upper	
Follow up/3-month	1.0 (ref.)			
6-month	0.66	0.52	0.83	<0.001
Arm				
Control	1.0 (ref.)			
Intervention	1.03	0.48	2.24	0.933
Gender				
Female	1.0 (ref.)			
Male	0.58	0.26	1.30	0.185
Age (years)				0.500
<35	1.0 (ref.)			
35-50	0.69	0.26	1.87	0.469
50+	1.12	0.36	3.48	0.841
Education				
>12	1.0 (ref.)			
≤ 12	2.95	1.39	6.33	0.05
Marital status				0.174
Married	1.0 (ref.)			
Single	2.09	0.72	6.08	0.175
Divorced or widowed	8.16	0.24	272.43	
Internet usage (hours per week)	0.03	0.00	113.1	0.392
Physical activity				0.259
Low	1.0 (ref.)			
Intermediate	0.97	0.43	2.19	0.937
High	1.48	0.06	33.72	0.807
Quality of life				
Physical functioning	1	0.87	1.08	0.895
Role physical	0.96	0.72	1.18	0.113
Bodily pain	0.89	0.75	1.23	0.197
General health	0.66	0.54	0.97	0.023
Social functioning	0.44	0.40	0.76	0.032
Role emotional	0.74	0.54	0.98	0.018
Vitality	0.55	0.38	0.90	0.015
Mental health	0.63	0.45	0.85	0.033
Cardiometabolic parameters				
Weight (kg)	1.04	1.00	1.1	0.05
BMI (kg/m^2)	0.98	0.91	1.06	0.651
Waist circumference	0.97	0.82	1.16	0.752
Systolic blood pressure	1.03	0.93	1.15	0.569
Diastolic blood pressure	1.02	0.98	1.05	0.290
Fast blood glucose	1	0.97	1.03	0.898
Total cholesterol	0.98	0.94	1.02	0.342
Triglycerides	0.99	0.97	1.00	0.69
HDL-cholesterol	1.00	1.00	1.01	0.314
LDL-cholesterol	1.00	0.96	1.05	0.962

Adherence and attrition patterns

Of 160 participants in the study, 20% of participants in both intervention and control groups did not attend for clinical measurements after 3 month. Attrition rate in the intervention and control groups at first follow-up (3 months follow-up) were the same (20%) but at 6 months follow-up it was varied by the study arms. The overall attrition rate at 6 months follow up was 26.9%. The control group had significantly higher attrition rate (%33.7) compared to the intervention group (%20) at 6 months follow up ($P < 0.001$). We found a significant difference ($P < 0.05$ between participant and attrition groups with regard to two characteristics. In intervention group the women had more attrition rate than men (56.2%); while in the control group men had more attrition rate than women (63%).

Predictors of adherence and attrition

To predict attrition of the follow up at 3- and 6-months, the Generalized Estimating Equations (GEE) were used. The odds ratio and 95% confidence intervals for predicting attrition are presented in Table 5. Available variables that expected to influence on attrition were adjusted in GEE analysis for variable as age, gender, education, marital status, Internet usage, Physical activity and quality of life, the arms of study, cardiometabolic parameters and length of study.

Simultaneous effect of different factors on the attrition at -3 and 6- months by (GEE) analysis for 160 participants showed that low educated participants were more likely to not stay in the study than better educated participants (OR=2.95, CI: 1.39-6.33, P=0.05). According with length of the study, attrition was decreased at six month (OR=0.66, CI: 0.52-0.83, P<0.001) and of the cardiometabolic parameters only weight was found to be associated with increased attrition (OR=1.04, CI: 1-1.1, P=0.05). Also, some aspects of health-related quality of life contributed to the attrition rate. Those who had higher scores on general health (OR=0.66, CI: 0.54-0.97, P=0.023), social functioning (OR=0.44, CI: 0.40-0.76, P=0.032), role emotional (OR=0.74, CI: 0.54-0.98, P=0.18), vitality (OR=0.55, CI: 0.38-0.90, P=0.015) and mental health (OR=0.63, CI: 0.45-0.85, P=0.033) were more likely to stay in the study.

Discussion

Web-based programs may be an efficient way of delivering health promotion to a large number of high-risk people. The present study aimed to assess adherence and attrition rates in a Web-based lifestyle intervention for people suffering from metabolic syndrome. This study showed that, people who had participated in the study generally had better quality of life and less weight than who were lost to be followed up. These findings confirm the argument that lifestyle intervention programs may fail to reach those who need it most (14).

We have considered attrition as dropping out of clinical assessment at 3- and 6-months follow-up. The total attrition rate after 6 months follow-up for the control group was 26.9% while it was 20% for the intervention group. It seems that most dropouts occurred at the first follow-up. These findings are inconsistent with a study by Postel et al. where they found that the highest dropouts were after 3 months (26). It is argued that as the duration of an intervention increases, adherence to the intervention might decrease and adherence to a study roughly follows a downward trend with some variations (27). Observed differences among studies might be related either to the methodology or to the characteristics of the population. However, there is evidence that sending tailored feedback, provision of regular new and specific content with periodic prompts, and reminders might result in encouraging participants to stay in the study (28). Thus it has been recommended that in the long run to decrease attrition rate, interventions should be credible and persuasive (29), tailored (30), and innovative (31).

A recent publication suggested that dropping out of an assessment is different from dropping out of an intervention, and that those who drop out of e-Health programs may benefit just as much as those who do not (32). We found a positive rela-

tionship between adherence and education. Those who stayed in the study were more likely to be well educated. More educated participants might, for example, use the Internet in a different manner from younger or less-educated participants. This study also found some gender differences in participation and attrition rates but it not supported by GEE. Also, higher attrition rate in control group than intervention group of this study indicated that reminder emails may not have the same effect in different web-based communication approach that were encouraged participants to attended for clinical assessment instead of using the online interventions.

The interactive Web-based interventions could help people with metabolic syndrome to overcome their problems (33). However, since many patients do not stay online to benefit from such interventions, as Murray and colleagues suggested, it is important adjusting boosting strategies to the particular target population of the Web-based intervention. For instance it has been shown that boosted follow-up rates by using postal and telephone reminders for participants who did not respond to email reminders has increased greatly (34). Another suggestion is that in clinical settings and for clinical trials care should be given right from the start when recruiting patients (34). There is need to emphasis on the importance of adequate coverage of lifestyle changes in web-based health programs, as a driver to continue participation for at risk people who need the health programs most

Limitations

Potential limitations of this study include that only some characteristics of participants were considered as potential predictors of adherence while it is quite possible that other factors such as access to clinical assessment center, satisfaction with the study and other external factors also influenced the attrition or adherence. In addition, the study did not detect non-usage attrition and did not track the use of all features of the Web-based lifestyle modification program. For the future studies, we recommend to compare the characteristics of users related to the non-usage and dropout attrition in Web-based interventions. The results of this study could not generalize to other situations or other people because of the number of participants were limited and they were more alert than general population.

Conclusion

People dropout from Web-based interventions is more likely to be less educated, have lower quality of life and use the Internet to a lower extent. Indeed to reach this population there is need to find new approaches.

Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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