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Research Article

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Effectiveness of A Hospital-Based Weight Maintenance Program in Sustaining Weight Loss: A Retrospective Study

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Abstract

Background: It is generally accepted that most individuals can lose weight but cannot maintain weight loss, hence, the need for an effective weight maintenance intervention after weight loss. Most studies on weight maintenance deals on behavioral intervention through personal- contact or interactive technology-based intervention and these have lead to sustained weight loss. Few trials have explicitly tested alternative strategies to sustain weight loss. This study was undertaken to evaluate the effectiveness of a hospital- based Weight Maintenance Program in sustaining weight loss.

Methodology: This is a retrospective analysis of 55 patients who completed the weight maintenance program of the Weight Management Center of St. Luke's Medical Center (SLMC) between 2003 and 2011. The weight maintenance program is a 6-month program consisting of diet and exercise. The changes in body weight, body mass index (BMI), waist circumference, blood pressure (BP), fasting blood sugar (FBS) and lipids before and after the program were obtained.

Results: At the completion of the weight maintenance program, the average weight loss was 3.66 kg (3.86%) ($p = <0.0001$). BMI decreased by 3.89% ($p = <0.0001$) and waist circumference by 3.53cm ($p = <0.0001$). FBS, cholesterol, LDL, and VLDL did not show significant change after the program but significant increase in HDL was noted. Systolic blood pressure was also significantly decreased.

Conclusions: The weight maintenance program was effective in enabling the participants to sustain weight loss and even achieve additional weight loss within 6 months.

Keywords: Obesity; Overweight; Weight maintenance program

Introduction

Indeed, the prevalence rates of overweight and obesity are increasing rapidly in most countries. According to the 2008 National Nutrition Survey by the Food and Nutrition Research Institute (NNS-FNRI), the prevalence of overweight and obesity in the Philippines has escalated to 26.6% from 24% in 2003 and 16.9% in 1998 [1]. In Asia, the prevalence of overweight ranges from 10% to 28.3% and obesity from 2.2 to 6.8% in the 1990's [2]. The International Association for the Study of Obesity (IASO) estimated that approximately 1 billion adults are overweight and at least 400 million are obese [3]. The World Health Organization (WHO) predicts that 2.3 billion adults will be overweight and more than 700 million will be obese by 2015 [4].

The presence of overweight and obesity in a patient is of medical concern. These conditions substantially increase the risk of morbidity from Cardiovascular Diseases (CVD), Diabetes Mellitus (DM), hypertension, dyslipidemia, stroke, gallbladder disease, osteoarthritis and sleep apnea as well as malignancy [5]. Data from NHANES III [6] shows that morbidity for a number of health conditions increases as body mass index increases in both men and women.

Weight loss (5-15% of the body weight) in obese individuals reduces the risk factors associated with obesity [7] and evidence suggests that benefits persist as long as weight loss is maintained [5]. It is generally accepted that most individuals can lose weight but cannot maintain weight loss. Given the vast scope of overweight and obesity, there is a critical need for practical, affordable and scalable intervention strategies that effectively maintain weight loss and may also play an important role in preventing weight gain, thereby reducing the incidence of overweight and obesity [8]. Successful weight maintenance is defined as regain of weight that is less than 3 kg (6.6 lbs) in 2 years and a sustained reduction in waist circumference of at least 4 cm (1.6 inches) [5].

Most studies on weight maintenance focus on behavioral

intervention through personal- contact or interactive technology-based intervention and these have lead to a sustained weight loss. Few trials have explicitly tested alternative strategies to sustain weight loss.

In our local setting, the Weight Management Center of the St. Luke's Medical Center has a hospital-based weight management intervention that includes a weight loss program followed by a weight maintenance program. The initial weight loss program is a comprehensive multidisciplinary weight loss program, which was found to be effective yielding a 6% weight loss in 6 months. The weight maintenance program is a continuation program through diet therapy and exercise.

This study was undertaken to evaluate the effectiveness of a hospital-based weight maintenance program in sustaining weight loss after undergoing an initial comprehensive multidisciplinary weight loss program, with the following specific objectives: 1) to determine the changes in body weight, BMI, and waist circumference before and after the program; 2) to compare the changes in blood pressure, fasting blood sugar and Lipid Profile before and after program. This is a benchmark study in our local setting.

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Methodology

Research design

This is a retrospective analysis of the medical charts of the 55 patients who completed both the initial weight loss program and the weight maintenance program of the Weight Management Center of St. Luke's Medical Center between 2003 and 2011. Participants are ≥ 18 years of age and with a BMI >23 kg/m² and are not taking anti-obesity drugs. The Asia-Pacific classification of obesity and overweight was used [9]: overweight (BMI 23-24.9 kg/m²), class I obesity (BMI 25-29.9 kg/m²), and class II obesity (BMI >30 kg/m²).

Data gathering procedures

Demographic data (age, sex and co-morbid conditions), body weight, BMI, waist circumference, BP and serum levels of FBS and Lipids were recorded. The changes of the said data at the start and at the end of the weight management program were obtained.

BMI was calculated as mass in kilograms divided by square of height in meters. Height (cm) and weight (kg) were measured using a detector physician scale with height rod while patients wore light clothing and no shoes. Waist circumference was measured at the level of the top of the hip bone. Hip circumference was measured as the maximal circumference over the buttocks.

Effective weight maintenance is defined as a sustained weight without a regain of more than 3 kg and a sustained reduction of waist circumference of at least 4cm.

Procedural weight management program

This program started at SLMC in 2003. All procedures and therapeutic exercise are done at the Weight Management Center of SLMC.

Comprehensive multidisciplinary weight loss program: This program includes evaluation of patient's (a) medical status that includes endocrine, cardiac and pulmonary clearance, (b) psychological evaluation, (c) exercise capacity evaluated by the rehabilitation medicine physician and (d) nutritional habits. This includes 6 sessions of nutritional counseling, 3 sessions of counseling and cognitive-behavioral modification, 2 sessions with rehabilitation medicine for exercise prescription, 3 sessions with an endocrinologist for assessment of the type and severity of obesity, evaluation of secondary causes of obesity, evaluation and treatment of endocrine related diseases. The entire program lasts 6 months that includes 36 sessions of exercise at a frequency of two to three exercise sessions per week.

Weight maintenance program: This is a continuation program after the comprehensive weight loss program. Patients enrolled in this program are those who achieve the target weight loss from the comprehensive weight management program. The weight maintenance program includes 4 sessions of nutrition counseling, 2 sessions with rehabilitation medicine for exercise prescription and 36 sessions of therapeutic exercise at a frequency of 1-2 sessions per week. Patients are prescribed with individualized goals for caloric intake based on prescribed need for weight maintenance or additional weight loss. This lasts 6 months.

Data Analysis

Data were encoded and tallied in SPSS version 10 for windows. Descriptive statistics were generated for all variables. For nominal data, frequencies and percentages were computed. For numerical data, mean \pm SD were generated.

Repeated Measures ANOVA was used for the comparison of numerical data that are dependently measured.

Paired T-test was also used to compare two groups with numerical data that are dependent. For comparison of two independent groups, t-test was used.

The level of significance was set at alpha = 0.05.

Results

A total of 55 subjects were included in the study. Their ages range from 18 to 74 years with a mean age of 36.80 years. There is an equal distribution of males and females noted. A total of 31 (56.4%) were noted to have co-morbid illness with hypertension (61%) being the most common followed by dyslipidemia (52%). Other co-morbid conditions noted were Diabetes Mellitus and Obstructive Sleep Apnea (OSA). The BMI profile showed that a high number of participants (42) belong to the Class II Obesity. The average weight of patients is 94.7 kg, with a mean weight loss of 10.35kg, which is equivalent to 9.85% decrease from the weight loss program. The mean BMI is 34.98 ± 9.16 kg/m² and the mean waist circumference is 105 cm (Table 1).

At the end of the program, the mean weight was significantly decreased to 91.05 kg or a mean weight loss of 3.66kg (3.86% decreases) from the start of the maintenance period ($p \leq 0.0001$) (Table 2).

As to the change in BMI, there is an almost 4% decrease with a p value of <0.0001 (BMI 35 kg/m² to 33.62 kg/m²) (Table 3).

As to waist circumference, result shows that there is a significant decrease of 3.53 cm or a decrease of 3.33% from the start of the maintenance program (Table 4).

When comparing percent change in weight, BMI, and waist circumference by age, sex, co-morbidity and BMI, no significant differences were noted (Table 5).

Blood pressure significantly decreased by 2 mmHg SBP ($p = <0.001$) and by < 1 mmHg DBP, which was not significant ($p=0.24$) (Table 6).

FBS, triglycerides, LDL and VLDL did not show significant changes after 6 months of the program. Cholesterol level was not significantly decreased at 95% confidence interval; however, it was significant at 90% confidence interval. HDL after 6 months was significantly higher by 12.5% (Table 7).

Discussion

In this study of overweight and obese individuals, the weight maintenance program was able to sustain the weight loss and even yielded an average of 3.86% (3.66kg) weight loss in 6 months. In the randomized study by Woo et al. [10], results showed that a lifestyle modification program in weight maintenance was effective in maintaining weight loss and improvements in metabolic and cardiovascular risk factor profile.

Our study compares favorably with the Weight Loss Maintenance Randomized Controlled Trial (WLM) [11] and Trials of Hypertension Prevention Phase II (TOHP-II) [12] in sustaining weight loss through behavioral weight maintenance intervention. In the former, a sizeable proportion of overweight and obese adults ($n=341$) in the personal contact group enrolled in an initial 6-month behavioral intervention followed by a 30-month intervention sustained a clinically significant weight loss of at least 4 kg in 30 months. In the latter, a 2.3 kg weight loss was sustained after an intensive behavioral weight loss intervention followed by a less intensive intervention for a total of 3 years. Also, our

finding agrees with McTigue et al. [13] who reported that counseling on diet or physical exercise and behavioral interventions resulted in small to moderate degrees of sustained weight loss (3-5 kg). In the systematic review with meta-analysis on the effect of diet-plus-exercise and diet-only interventions among overweight and obese, Curioni and Lourenco [7] reported that diet associated with exercise results in a significant and clinically meaningful weight loss that is partially sustained after 1

Characteristics	Frequency (n=55)	Percentage
Age, yrs		
≤20	7	12.7
21 - 30	17	30.9
31 - 40	7	12.7
41 - 50	12	21.8
51 - 60	8	14.5
61 - 70	3	5.5
71 - 80	1	1.8
Mean ± SD = 36.80 ± 15.22		
Sex		
Female	29	52.7
Male	26	47.3
Co-morbidity		
Without	24	43.6
With	31	56.4
DM	5	16.1
Dyslipidemia	16	51.6
Hypertension	19	61.3
OSA	2	6.5
BMI Category, kg/m²		
Overweight(BMI 23-24.9)	6	11
Class I Obesity (BMI 25-29.9)	15	27
Class II Obesity (BMI >30)	34	62
	Mean ±SD	Change from weight loss program, mean (%)
Weight,kg	94.73 ± 30.96	-10.35 (9.85%)
BMI,kg/m²	34.98 ± 9.16	-3.68 (9.52%)
Waist Circumference,cm	104.88 ± 21.00	-8.51 (7.51%)

Table 1: Characteristics of Subjects.

	Mean ± SD*	Mean Wt loss	% decrease
Weight at the start of maintenance program	94.71 ± 30.96	-----	-----
Weight at the end of maintenance program	91.05 ± 27.90	3.66 ± 7.44	3.22% ± 5.67%

*P value (from paired T-test) = <0.0001

Table 2: Changes in mean weight, kg.

	Mean ± SD*	Mean decrease	% decrease
BMI at the start of maintenance program	34.97± 9.16	---	-----
BMI at the end of maintenance program	33.62±8.76	1.35+ 2.83	3.59±7.21

*P value (from paired t-test) = <.0001

Table 3: Changes in BMI, kg/m².

	Mean ± SD *	Mean decrease	% decrease
Start of maintenance program	104.87+ 20.99	----	----
End of maintenance program	101.34+ 20.34	3.53±4.49	3.33±3.83

P value (paired t-test) =<0.0001

Table 4: Changes in waist circumference, cm.

	% Change in Weight	% Change in BMI	%Change in WC
Age, in years			
< 40	3.64± 5.80	3.5±6.3	3.25±2.94
≥40	2.7±5.58	3.7±8.4	3.45±4.80
P value	0.546	0.929	0.387
Sex			
Male	3.93±6.11	1.9±5.4	3.17±3.27
Female	2.59±5.29	5.5 ±8.6	3.49±4.32
P value	0.389	0.065	0.727
Co-morbidity			
Present	12.28±7.69	3.56±8.1	2.92±2.59
Absent	11.10±10.09	3.62±6.09	3.66±4.58
P value	0.639	0.979	0.479
BMI			
*23-29.9	1.56±3.21	2.82±7.46	3.07±2.93
≥30	4.34±6.67	4.10±7.11	3.51±4.36
P value	0.075	0.519	0.681

*Overweight and Obese 1 pooled, too few subject for overweight

Table 5: Percent change in weight, BMI and waist circumference by age, sex, co morbidity and BMI.

	Mean ± SD	P value
SBP at the start of the maintenance program	114.69 ± 4.76	0.010
SBP at the end of the maintenance program	112.36 ± 4.60	
DBP at the start of the maintenance program	75.38 ± 5.63	0.24
DBP at the end of the maintenance program	74.55 ± 4.25	

Table 6: Changes in systolic and diastolic BP, mmHg.

year (13 kg to 6.7 kg) and this study by Curioni indicates that programs including both diet and exercise produce greater weight loss than diet alone. Overall, this result implies that the weight maintenance program was successful in sustaining the weight loss among the participants and even achieving an almost 4% additional weight loss. In the absence of such maintenance program, the improvements achieved with the comprehensive weight loss program could be entirely lost [10].

There were 9 participants who showed a mean of 1.41 kg regain. Nevertheless, the regain is not viable enough to disprove the effectiveness of the maintenance program since minimal increase was noted. In addition, successful weight maintenance is a regain of < 3kg in 2 years [5]. The participants of this study technically have one and a half year to sustain their weight loss since, the weight management program of SLMC lasts for only 6 months. Accordingly, sustained physical activity is more helpful in the prevention of weight regain after weight loss [5]. Additional evidence for the effectiveness of greater amounts of physical activity is provided by McTiernan et al. [14]. In their study, prevention of weight gain was targeted at 300 min of moderately vigorous physical activity per week.

	Mean ± SD	P value
FBS, mg/dl		
Start of program	94.95 ± 13.46	0.580
End of program	93.53 ± 11.79	
Cholesterol, mg/dl		
Start of program	197.00 ± 37.68	0.09
End of program	177.42 ± 33.04	
Triglycerides, mg/dl		0.76
Start of program	105.11 ± 30.93	0.45
End of program	107.68 ± 40.88	
LDL, mg/dl		
Start of program	125.90 ± 29.18	0.45
End of program	119.00 ± 22.67	
HDL, mg/dl		
Start of program	45.58 ± 13.54	0.03
End of program	50.11 ± 15.26	
Percent increase	12.5 ± 18.9	
VLDL, mg/dl		
Start of program	20.90 ± 8.34	0.34
End of program	19.16 ± 5.68	

Table 7: Changes in FBS and Lipid Profile (N=19).

Successful weight maintenance was also defined as a sustained reduction in waist circumference of at least 1.6 inches (4 cm) in 2 years [5]. Our study conforms to such finding. There was a significant decrease of almost 4 cm, on average, among our subjects.

Results show that there was no significant difference between the changes in FBS, triglycerides, cholesterol, LDL and VLDL since sample size (n=19) is inadequate to establish a difference. However, even with this small sample size, we obtained a significant increase in HDL at the end of the program, an increase of almost 13%. We also found a significant decrease in systolic blood pressure, although diastolic pressure was essentially the same before and after the program. The implications of weight maintenance after an initial weight loss, on cardiovascular risk should therefore be given due importance. However, even modest weight loss can improve cardiovascular risk factors [15].

There are limitations to our study. A major limitation is the fact that it is a retrospective study; hence, other measurements of effectiveness such as dietary intake, physical activity level and quality of life were not assessed. This study is limited in terms of the length of the weight maintenance program. Foreign studies have at least 1-5 year span of weight maintenance program. But it is unknown whether patients will be motivated enough to continue such program for a longer period of time. Also, among the 55 subjects, only 19 were included in evaluating the lipid profile because the assessments of these laboratory parameters were not part of the program.

Conclusion

End result of this study revealed a sustained weight loss and even additional weight loss of 4% among overweight and obese individuals. BMI decreased with weight loss and there was sustained reduction of waist circumference. Additional benefits seen with the program was a significant increase in HDL and significant decrease in systolic blood pressure. We therefore provide evidence that the weight maintenance program at our institution is effective in maintaining weight, even

enabling further weight losses, after the initial weight loss phase.

This weight maintenance program complements the weight loss program. This research may need a follow-up study that will give emphasis on recognizing predictors for successful maintenance. Future research may also focus on longer weight maintenance intervention that entails more than 6 months of implementation.

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