

Effects of Lifestyle Intervention on Blood Chemistry, Self-Image and Quality of Life among Individuals with Obesity in Malaysia

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Abstract

Malaysia faces obesity epidemic—a disease rooted in lifestyle; yet very few evidence-based lifestyle intervention options are available for its population. Additionally, obesity faces medical and non-medical comorbidities; nonetheless very few obesity interventions address both aspects of the disease. Quality of life and self-image are among some of the non-medical ill effects of obesity that have not been adequately documented in the weight loss programs in this population. Data about effectiveness of community-based non-drug interventions that address both the medical and non-medical comorbidities of obesity is needed.

A lifestyle intervention program was conducted among a group of obese adults with the focus of not only promoting weight loss but also general wellbeing. The intervention resulted in increased physical activity level, healthier dietary practice, measurable reduction of risk factors of certain chronic diseases, improvement of body image and quality of life among its participants. All 41 participants lost weight, with mean weight loss of 5.76 kg or 7% of initial weight ($p < 0.001$) in 10 weeks. About 63% of them lost 5% or more of their baseline weight. Important lipid components and fasting blood glucose showed statistical significant reduction ($p < 0.001$ to < 0.05). Participants improved 6 out of 8 domains of health quality of life ($p < 0.0001$ to $p < 0.05$) as measured by the Medical Outcome Study 36-item Short Form Health Survey. Body Shape Questionnaire showed body image improved significantly ($p < 0.000$), from mean score 63.05 (± 15.16) to 45.39 (± 15.41). However, the change of weight was not significantly correlated with the change of body image.

Though the sample size is small, the study serves as a good case study of the effects of a community-based weight loss program on quality of life and mental wellness specifically body image of the individuals. The study represents one of very few published data from Malaysia showing that obese population in the East responded in similar manner as Western populations to a non-pharmacological obesity intervention. The study provides evidence suggesting physical and psychosocial health improvement is possible through lifestyle intervention among a group of adults in a free living environment.

Keywords: Obesity; Body Image; Quality of Life; Weight Loss; Comorbidities

Introduction

Malaysia, as many countries in Asia, is in nutritional transition, that is, it faces challenges from communicable diseases as well as non-communicable diseases. Obesity, for example has seen an epidemic increase in the past decades. The country recorded the highest obesity prevalence in South East Asia region in 2014, with almost half of the adult population considered obese [1].

Obesity presents a serious public health threat, as it is arguably not a disease that acts alone but comes with many co-morbidities. For instance, obesity predisposes an individual to greater risk of developing other chronic diseases such as cardiovascular disease, diabetes,

hypertension, dyslipidemia and some forms of cancer [2-4], all of which in turn lead the individuals to further morbidity and mortality. Unfortunately, the adverse impact of obesity goes beyond blood chemistry or cellular dysfunction. Emerging research contends that psychosocial health may be compromised due to obesity, though the evidence of the ill effects is not as well documented or consistent as the medical [5,6].

The scope of psychosocial health is wide ranging; nevertheless, quality of life has been suggested to be an important barometer of psychosocial health of obesity [7]. Despite a lack of consensus on the definition of quality of life, it is generally agreed that quality of life is a broad, subjective and multidimensional construct that includes the physical, psychological, and social domains of health [8]. Specifically, the notion of health-related quality of life (HRQoL) has recently been proposed to be an important surrogate of the impact of obesity, as obesity intercepts an individual's perception of vitality, functionality and overall well-being [9,10].

A growing number of evidence appears to indicate a strong inverse relationship between obesity and health-related quality of life, that is, as body weight increases, quality of life decreases [11-13]. The excessive body weight and the accompanying physical disability or medical comorbidities may contribute to low perceived quality of life. Health-related quality of life is frequently used as one of the primary outcome measurement for weight reduction either through bariatric surgery [14,15], behavior or dietary interventions [16,17], suggesting that the accompanying weight loss might result in enhancement of quality of life in the population with obesity.

Additionally, a wealth of research evidence indicates that obesity is associated with impaired self-image [18,19]. While body image disturbance and body shape anxiety are pronounced and well documented among individuals with eating disorder [20,21], experts recently have come to agree that the same pervasive negative thoughts are also pronounced among individuals with obesity [22]. The psychological stress experienced by individuals with obesity due to high degree of body dissatisfaction apparently could color the individual's perception of quality of life. Body image and quality of life are clearly some of the multidimensional detrimental effects obesity puts an individual at risk of. Unfortunately, most obesity intervention programs focus more on weight loss and physiological benefits and not enough on the non-medical effects such as these.

In short, obesity faces a myriad of medical and non-medical comorbidities. Obesity interventions should strive to address both aspects of the disease. However, in Malaysia, surgical and pharmacological intervention remains the mainstay treatment for obesity, focusing merely on weight loss and reduction of medical complications. Lifestyle factors that give rise to the disease, or concomitant psychological or social impairment have not been adequately incorporated into the obesity management and treatment regimes.

The lack of public health education and governmental regulations with regards to safe, effective and scientific non-pharmacological weight loss interventions has also led to a proliferation of commercial slimming centers whose operators do not have relevant medical or clinical trainings and whose focus is more on profit than health.

There is scarcity of data with regards to the non-pharmacological management of obesity that is evidence-based. There is also a shortage of credible lifestyle intervention program in the community that focuses not only weight loss but also other emotional and mental well-being of the individuals with obesity.

Therefore, the purpose of this study was to investigate the impact of a group based weight loss program that is based on the science of behavior change and obesity comorbidities, with the emphasis on lifestyle modification and psychosocial well-being among the obese adults in a free-living environment in Malaysia. In addition to biochemical markers: blood lipids, blood glucose and blood pressure, psychosocial indicators namely health-related quality of life and body shape concern would be examined.

Material and Methods

Subjects

As part of an organization-wide workplace wellness initiative, 41 employees (mean age 34 ± 7.17 , mean BMI 28.63 ± 3.93): 24 males

(59%) and 17 females (41%) were recruited by the human resource department to participate in this study. There were 26 (63.5%) Chinese, 14 (34%) Malays and one Indian (2.5%) in the group, reflecting the multi-ethnicity of the country.

The followings were criteria for enrollment in the intervention: Participants must have BMI < 23 kg/m² and obtained medical clearance from their primary care physicians to be included in the study. Malaysians, as in many Asia populations adopt a lower cut-off point of BMI < 23 kg/m² to define pre-obese or overweight given their increased health risk at lower BMI [23]. Before the intervention, every participant was screened for readiness for change. For those who indicated they were not ready for change they would be advised to withdraw from the intervention. Only those who indicated they were ready for change were finally enrolled in the program.

The protocol and content of intervention was reviewed and approved by the Medical and Dental ethic board of the hospital as well as the human resource department of the organization. Participation was entirely voluntary and could be withdrawn at any given time. Written informed consent was obtained from all participants prior to the study. All information about the participants were kept private and confidential and used strictly by the research team for the sole purpose of data analysis.

Intervention

Participants attended a 3-full day educational group classes held at the premises of their workplace over a 10-week period. The content syllabus was designed by a preventive care specialist who has extensive academic training and clinical experiences with obesity.

The participants met as a group with the preventive care specialist, health educators and dietitians once a month. The group classes focused on changing lifestyle rather than weight loss per se; issues addressing the emotional and mental wellness such as stress management, positive thinking, goal setting were incorporated into the topics on exercise and nutrition. Clear goals for weekly physical activity and daily consumption of fruits and vegetables were established and encouraged throughout the intervention period, that is, participants were encouraged to exercise a minimum of 3 times a week; filling up half of their dining plate with plant food at every meal every day. Healthy cooking demonstrations utilizing common local food produce were incorporated into the class. To encourage behavior, change compliance, participants were required to complete food and exercise diary for the intervening period between group classes. At every class time the dairies were submitted for review by the dietitians who would provide individualized feedback to the participants. Principles of behavior change and motivation were interwoven throughout the entire intervention period. Participants were divided into groups of 5 to promote accountability and support during the intervention period.

Measurements

All the following assessments were performed at pre and post intervention.

Anthropometric

Anthropometrics (height, weight, percent body fat and BMI), blood pressure, waist circumference and blood screening were assessed at baseline and 10 weeks later. Anthropometric was assessed using the Tanita body composition machine model TBF300. Blood pressure was taken by a trained health care provider using a mercury sphygmomanometer and the Korotkoff sound technique. Abdominal fat was assessed by means of waist circumference that was measured at a point immediately above the iliac crest on the midaxillary line at minimal respiration to the nearest 0.1cm [24].

Diet and Activity Questionnaire

Dietary habit and physical activity was assessed in a self-reported questionnaire. Furthermore, participants were encouraged to keep weekly activity and food diary as a way to encourage behavior formation.

Blood Screening

All blood screening was performed by medical doctors and nurses at the employee's clinic of the organization. Screening results were given to us for the purpose of our study, one before the intervention and another one at the end of 10 weeks. A full blood lipid profile analysis (total cholesterol, HDL, LDL, triglycerides), and fasting blood glucose were performed.

Health Related Quality of Life

Quality of life was measured using the Medical Outcome Study Short Form-36 (SF-36), a validated self-reported assessment tool commonly used to measure health-related quality of life of the obese population [25]. The survey contains 36 questions, covering 8 domains of health: physical functioning, bodily pain, role limitations due to physical health problems, personal problems and emotional problems; emotional well-being, social functioning, energy/fatigue, and general health. The responses are converted to a score of 0 to 100 with higher value indicating more favorable health state.

Body Shape Questionnaire

Concerns with body shape were assessed by the Body Shape Questionnaire (BSQ)-a validated self-report survey developed by Cooper [26], and is frequently used to assess body image related concern in a weight loss program [27,28]. The self-reported questionnaire contains 16 questions which measure levels of concern with body shape in the last 4 weeks on a 9 points Likert scale: 1 = Never, to 6 = Always. The scores are clustered into 4 categories, namely: no concern, mild concern, moderate concern, and marked concern; with higher scores indicating increasing higher degree of concern with body shape.

Statistical Analysis

To analyze the data, SPSS version 21 was used. Paired sample T- test was used to determine if the mean difference between the scores at pre and post intervention was significant for the following dependent variables: weight, body fat, waist circumference, blood lipids (total cholesterol, LDL, HDL, triglyceride), blood glucose, and Health-Related Quality of Life. To assess if there was a significant change of body image among the participants at the end of the intervention, paired-T test was performed on the mean scores; additionally, Wilcoxon sign-rank test was employed to determine if there was a change in the category of concern.

Results

At the end of 10 weeks, all 41 participants lost weight, from 0.8 kg (1.3%) to 13.6 kg (15.7%). Mean weight loss in 10 weeks was 5.76 kg or 7% of initial weight ($p < 0.001$). About 63% of them lost 5% or more of their baseline weight (Table 1).

Weight loss	Unit of loss	% of baseline weight
Maximum	13.6 kg	15.7%
Minimum	0.8 kg	1.3%
Average	5.76 kg	7%
Weight loss	# of Participants	% of total participants
< 5% of original weight	15	37%
≥ 5% of original weight	26	63%

Table 1: Weight Loss Record of 41 participants in 10 weeks.

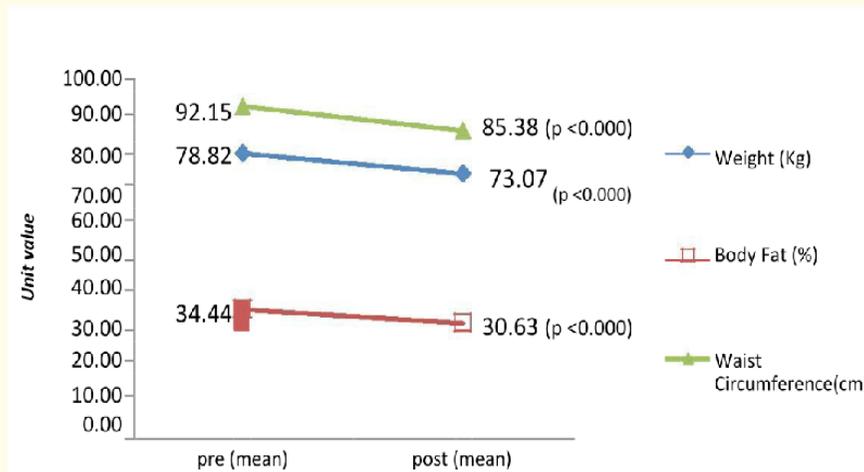


Figure 1: Shows that weight change, body fat and waist circumference reduction were all significant at post intervention.

The self-reported questionnaire revealed that number of people with desirable dietary practices increased after the intervention, which means, more people are adopting healthy eating habits, that is, eating more fruits, vegetables, whole grains, legumes and good fat such as nuts, seeds and avocado.

Healthy Dietary Habits: consumption of	Frequency	Increased by
Nuts, seeds, and avocado	≥ 2 times/per week	+23.7%
Legumes	≥ 2 times/per week	+35.7%
Whole grains	≥ 2 times/per day	+11.9%
Fruits	≥ 3 servings/per day	+33.3%
Vegetables	≥ 3 servings/per day	+40.5%

Table 2: Healthy Dietary Habits.

On the contrary, the unhealthy dietary habits such as eating out, or consumption of unhealthy food such as the following were reported to be decreased after the intervention. Coconut milk, a hugely popular local food among the locals but is high in saturated fat was intentionally included in the dietary assessment.

Unhealthy Dietary Habits	Frequency	Decreased by
Eat out	≥ 1 times/per day	-14.2%
Deep fried food consumption	≥ 2 times/per week	-47.7%
High fat and sugary food consumption	≥ 2 times/per week	-40.4%
Coconut milk consumption	≥ 2 servings/per week	-28.5%
Red meat/seafood (not including fish) consumption	≥ 2 servings/per week	-16.7%

Table 3: Unhealthy Dietary Habits.

At the end of the intervention we found more people exercising at a desired frequency. The percentage of participants who exercised 3 or more times a week increased by 52.3% after the intervention, from 31% to 83.3%.

Due to various work commitment, only 26 participants completed both pre-post blood screening Figure 2 shows their total blood cholesterol, LDL, blood triglyceride and fasting blood glucose improved significantly ($p < 0.001$ to < 0.05).

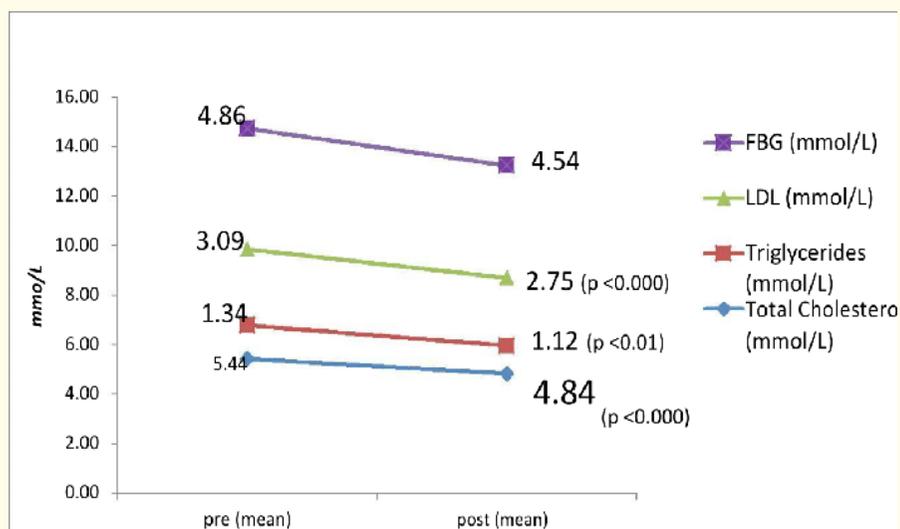


Figure 2: Blood Profile Changes in 10 weeks (n=41).

Table 4 provides information on the quality of life. All 41 participants improved significantly on 6 out of 8 domains of health quality of life as measured by the SF-36 Health Survey ($p < 0.0001$ to $p < 0.05$) at post intervention. These 6 domains are: the physical role limitation (mean scores 65.00 ± 40.35 to 90.63 ± 18.51 , $p < 0.0001$); energy level (mean score 58.38 ± 14.38 to 67.5 ± 12.04 , $p < 0.005$); emotional well-being (mean scores 61.80 ± 13.09 to 68.10 ± 13.51 , $p < 0.05$); social functioning (69.51 ± 17.91 to 86.89 ± 16.52 , $p < 0.001$); bodily pain (mean scores 74.02 ± 22.14 to 81.64 ± 15.48 , $p < 0.05$); general health (means scores 60.40 ± 13.43 to 69.34 ± 11.22 , $p < 0.001$).

Health Quality Domains			Mean	Std deviation	Sig (2-tailed)
Domain 1	Physical functioning	Pre	84.62	21.72	$p = 0.097$
		Post	90.00	19.74	
Domain 2*	Physical role limitation	Pre	65.00	40.35	$p = 0.000$
		Post	90.63	18.51	
Domain 3	Emotional role limitation	Pre	75.61	38.75	$p = 0.054$
		Post	87.81	25.56	
Domain 4*	Energy level	Pre	58.38	14.38	$p = 0.002$
		Post	67.50	12.04	
Domain 5*	Emotional well-being	Pre	61.80	13.10	$p = 0.11$
		Post	68.10	13.51	
Domain 6*	Social functioning	Pre	68.51	17.91	$p = 0.000$
		Post	86.89	16.52	

Domain 7*	Bodily pain	Pre	74.02	22.14	p = 0.30
		Post	81.65	15.48	
Domain 8*	General Health	Pre	60.40	13.43	p = 0.000
		Post	69.34	11.22	

Table 4: Statistical Analysis for SF-36 Health.

*the domains which participants (n = 41) showed significant improvement as reflected in the Health-related Quality of Life measurement

Body image of the participants improved significantly (p < 0.000): from mean score 63.05 (± 15.16) to 45.39 (± 15.41). At baseline, no one was found in the category of “no concern with body shape”; at post-intervention, 16 individuals (39%) were found in this category. Conversely, 16 people (39%) reported they had “marked concern with body shape” at baseline but only 4 (10%) remained in this category at the end of intervention.

A Wilcoxon signed-rank test as shown in table 5 revealed that 30 participants registered lower scores at post intervention compared to pre-intervention-indicating reduction of anxiety relating to body shape; none had increased scores, while 11 maintained their scores. The test statistic also showed that the 10 weeks lifestyle intervention program elicit significant change in the individuals self-reported degree of body shape concern (Z = -4.998, p > 0.0005).

		N	Mean Rank	Sum of Ranks
Post-Total score for Body Image questionnaire category - Pre-Total score for Body Image questionnaire category	Negative Ranks	30 ^a	15.50	465.00
	Positive Ranks	0 ^b	.00	.00
	Ties	11 ^c		
	Total	41		

Table 5: Wilcoxon-Rank.

a. Post-Total score for Body Image questionnaire category < Pre-Total score for Body Image questionnaire category

b. Post-Total score for Body Image questionnaire category > Pre-Total score for Body Image questionnaire category

c. Post-Total score for Body Image questionnaire category = Pre-Total score for Body Image questionnaire category

However, a Pearson correlation test showed that the change of weight was not significantly correlated with the change of body image.

Discussion

This study helped to contribute to the limited knowledge base about a Malaysian obese population with regards to the effects of a structured weight loss program that is based on science of behavior change and weight loss.

The study shows that an intensive lifestyle intervention could lead to positive changes in the individuals’ dietary, activity habits and certain metabolic markers. Additionally, the study highlights other less discussed benefits of weight loss, such as reduction of body shape anxiety and improvement of quality of life.

The 10-week intervention elicited changes in other health outcome besides weight loss in kilogram and percent body fat. Medically, the intervention led to significant reduction in blood lipids and fasting blood glucose-established risk factors associated with diabetes and cardiovascular disease.

Psychosocially, significant improvement of selected indicators was observed: participants demonstrated significantly less negative preoccupation with their body shape and improvement in about 75% of the domains in the health-related quality of life. Notably, the biggest gain (25.63 points or 39.43% increase) of all the domains was in “physical role limitation” indicating that lighter weight must have

helped the participants feel less restricted in their physical mobility. The weight loss also led the individuals to report to have greater social functioning capacity, feel better about themselves, feel more energetic and vitality, and less bodily pain—a similar finding as reported in Nurses' Health study [29].

Notably the study sample size is small and more studies with larger cohort would certainly be needed, but the findings suggest that obesity intervention should perhaps emphasize less on weight loss and more on the general well-being of the individuals due to the multiplicity of the disease.

Obesity does indeed affect more than just blood chemistry. As a disease, obesity brings about deleterious effects on an individual cascading beyond physical health, but most published data regarding the emotional benefits and enhancement of quality of life accompanying weight loss comes from the Western countries. The findings from this study, which probably represents one of very few published data from Malaysia, shows that Asian population in the East responded in the similar manner as other populations did in the West. Certainly, more studies on Asian populations are needed to validate our findings.

The intervention took place at a workplace—the hub of the lives of most working adults, indicating that importance of social milieu and its inherent support. The fact that program was conducted as part of an organization wide employee wellness initiative underscores the importance of a wider environmental and policy support.

The study faces some limitations nonetheless. First of all, the intervention was conducted among a group of employees in a real life business environment with multiple and competing demands which precluded us from establishing a control group.

Our data did not show the change of weight per se to be related to the change of body shape, as reported in some studies [27,28,30]. In other words, our participants felt less anxious about their body shape at the end of the intervention, and this was not necessarily associated with weight loss. The ambiguity points to the complexity between body image disturbance and weight, in that the relationship may not be a simple linear one. Some authors have argued for some form of a reciprocal relation between changes of weight and changes of body image [31]. The question of how much or if weight loss alone could mitigate the psychosocial impairment at all definitely warrants more studies.

Conceivably, a number of variables could interfere with a person's perception of body shape, for instance, the amount of weight loss experienced by the individual, the health state and the severity of obesity of the individual (clinically vs moderate vs mildly obese) entering the intervention. The average BMI of our cohort is 28 kg/m², which is not clinically obese by the Western standard; whether or not this is a factor that moderated the relationship between weight change and body shape concern, as suggested by some authors [32] is not known in our study population. Certainly, more investigations are warranted to better determine the intricate relationship between BMI and body image across different cultural groups.

It is worth noted that the study established the immediate effect of a weight loss on the individual's quality of life and body image concern within a relatively short period time of 10 weeks. More studies are needed to ascertain the long-term effect of weight loss on those parameters. Finally, our results need to be verified with larger cohort in Malaysia.

The study is not able to establish the independent effect of the education component in the program on physical activity and diet changes, or the impact of these lifestyle modifications on the changes of metabolic markers, body image and quality of life indicators per se. However, the findings suggest that combination of a weight loss through health education and lifestyle modification is associated with measurable positive health outcome among participants in a free living environment, namely: a reduction of blood lipids and fasting blood glucose, improvement of quality of life and decrease in body image anxieties.

Public Health Implication

The fact that obesity which has its etiology in lifestyle is rising at an alarming rate and yet there is such disproportionately lack of

evidence-based lifestyle intervention options available for its population is a disturbing public health concern. Because obesity affects an individual on so many different levels, this study is important as it generates evidence that an intervention emphasizing lifestyle modification could lead to measurable reduction in some of the medical and non-medical co-morbidities. Additionally, the data from this study could provide useful insight to medical and health providers or policy makers involved in obesity management to consider adopting a holistic framework that sets therapeutic goals not only to improve blood chemistry but also emotional well-being of the individuals.

Conflict of Interest

The authors declare that they have no conflict of interest.

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