
PUBLIC HEALTH RESEARCH

Effectiveness of Combined Malaysia Healthy Plate Method (Half-half Quarter) and Physical Activity intervention at Workplace Setting Among Healthcare Workers

Sreevali Muthuvadivelu,¹ Narwani Hussin,¹ Prema Muninathan,¹ Low Phei Keow,² Nancy Anne Josop,³ Ahmad Mu'alzaffardan Putra Bin Kamaruddin⁴, Noor Hayati,² and Kogilavani³

¹Clinical Research Centre (CRC), Taiping Hospital, Perak.

²Dietetic Department, Taiping Hospital, Perak.

³Physiotherapy Unit, Taiping Hospital, Perak.

⁴Health Education Unit, Taiping Hospital, Perak.

*For reprint and all correspondence: Sreevali Muthuvadivelu, Clinical Research Centre (CRC), Taiping Hospital, Jalan Taming Sari, 34000, Taiping, Perak.

Email: Shree0279@yahoo.com

<https://doi.org/10.17576/ijphr.1301.2023.03>

ABSTRACT

Introduction	Overweight and obesity are becoming a major health issue which contributes to the increase in morbidity and mortality. This study aimed to evaluate the effect of the diet intervention and exercise for weight reduction among obese but healthy adults.
Methods	This was a quasi-experimental study using designed Structured Diet with Program adapted from Malaysia Healthy Plate method (half-half quarter) with physical exercise for weight reduction. The anthropometry and biochemistry parameters were monitored and collected pre- and post-program. The body mass index (BMI) cut off points by World Health Organization (WHO) for Asian population was used to define obesity in this study.
Results	30 healthcare workers (HCWs) were recruited. However, only 27 HCWs completed the program. The pre- and post-program mean BMI was 32.90 kg/m ² and 31.39 kg/m ² and weight was 81.25 kg to 77.37 kg. The total cholesterol reduced significantly with mean 5.65 mmol/l to 5.34 mmol/l. Other blood parameters showed some reduction but not statically significant with mean Fasting Blood Sugar (FBS): 4.82mmol/l to 4.69mmol/l, mean High Density Lipoprotein (HDL): 1.43mmol/l to 1.32mmol/l mean Low Density Lipoprotein (LDL): 3.54mmol/l to 3.42mmol/l and mean TG 1.52mmol/l to 1.31mmol/l.
Conclusions	Overall, the programme led to a considerable reduction in body weight, BMI, and total cholesterol. Even though other blood parameters did not show statistically significant reduction but they still showed some reduction in post-programme. This method was recommended to be implemented among Malaysians for longer duration to achieve significant reduction in blood parameters. However, the commitment and motivation of the HCWs were highly needed to ensure the effectiveness and adherence to the diet method.
Keywords	Diet intervention (Malaysia Healthy Plate) - Physical Activity - Healthcare Workers.

Article history

Received: 4 October 2022

Accepted: 4 January 2023

Published: 1 March 2023

INTRODUCTION

Overweight and obesity are increasing consistently worldwide and becoming a significant public-health threat which likely to continue in the coming years. Obesity is exposing the population to various non-communicable diseases that may result in permanent disabilities or mortality. Malaysian has topped the ranking of overweight among Southeast Asian nations with prevalence of 44.2%¹ and it is shocking when statistics showed that 1:3 are overweight and 17.7% (3.3millions) adults which aged 18 years and above are obese¹. Thus, there is a need to initiate effective programme to promote healthy lifestyle among overweight and obese population especially among healthcare workers (HCWs). However, previous studies showed overweight and obese people have good knowledge in dietary control and physical activity but failed to apply in daily life.²⁻³

HCWs play a vital role to promote and maintain health consciousness and healthy life style practices but unfortunately, most of them are also overweight and obese.⁴⁻⁷ A study was done among nurses in a district hospital in Perak found that the prevalence of overweight and obesity was high.⁸

Ministry of Health (MOH) of Malaysia has introduced Malaysia Healthy Plate Module in 2016,⁹ which promotes the division of plate portion to a quarter for protein, a quarter for complex carbohydrates, and half for fruits and vegetables. In view of the high prevalence of overweight and obesity among nurses in our hospital,⁸ we implemented Malaysia Healthy Plate Module combined with standard exercise (aerobic/brisk walk) workplace intervention for obese but healthy adults as a weight reduction program. There is a systematic review concluded that workplace setting intervention for reducing weight had given positive and successful results,¹⁰⁻¹¹

This programme was implemented (diet and exercise intervention) in order to promote a healthy lifestyle to our obese but healthy HCWs in the workplace and help them to successfully lose weight. This research was designed to investigate the pre- and post-effect of the diet intervention towards BMI and weight in obese but healthy HCWs. This study also measured blood pressure,

lipid profile and blood sugar pre- and post-intervention.

METHODS

This was a quasi-experimental study using structured diet program based on Malaysia Healthy Diet (Half-Half Quarter)¹² combined with physical exercise (aerobic/brisk) for obese but healthy adults in the workplace setting. Few consultations were conducted with stakeholders (qualified dieticians and physiotherapists) prior to the program. The HCWs involved in this study were from one of the district hospitals in Perak. This study involved collaboration from Clinical Research Centre, Physiotherapy Unit Dietetic Department and Health Education Unit.

The intervention was carried out for 10 weeks but the participation duration for each participant was 12 weeks, week 0 as baseline, 10 weeks for intervention and week 12 as post intervention to evaluate the parameters. This study was conducted in compliance with ethical principles, registered in National Medical Research Register (NMRR-17-1552-35458) and approved by Medical Research and Ethics Committee (11) (KKM/NIHSEC/P17-1362). This study was conducted from 15 July 2017 until 15 January 2018.

HCWs with body mass index (BMI) (≥ 27.5 kg/m² Obese I), aged between 20 – 45 years old, no co-morbidities, blood pressure was equal or less than 120/80mmHg and Fasting Blood Sugar (FBS) was equal or less than 7.0mmol/l were recruited in this study (Table 1). Those who were pregnant, involved with other trial/study, breastfeeding and staff that lose weight more than 10% of their body weight in the last six months at the period of data collection was excluded. HCWs who had participated in a formal weight loss program or slimming product in the last three months, or on any medication that may affect body weight, lipid profile, glucose level and blood pressure, physical impairment which may affect intervention of physical activity also excluded from the study. The World Health Organization (WHO) BMI criteria for Asian population cut off points was used to define obesity in this study.¹²

Table 1 Interpretation of BMI Asian population cut off point

18.5 - 22.9 kg/ m ²	Ideal
23.0 - 27.4 kg/ m ²	Pre-Obese
27.5 - 34.9 kg/ m ²	Obese I
35.0 - 39.9 kg/ m ²	Obese II
40.0 kg/ m ²	Obese III

The HCWs from our hospital who fitted the inclusion and exclusion criteria signed the consent form. About 56 HCWs showed interest to join this study, once consented, they answered a *self-*

reported questionnaire, which included demographic data. After screening, 50 HCWs were eligible, only 30 HCWs were randomly selected using online computer-generated random numbers.

Those who were not eligible and not met the criteria were excluded from the study and referred to relevant department in hospital for further management.

Anthropometry and Blood Pressure.

Recruited HCWs' weight (WT), height (HT), weight circumference (WC), hip circumference (HC), BMI and blood pressure (BP) was measured. WT of the HCWs were measured in kilogram (kg) with their light clothing without shoes (after removal of all the personal accessories). HT was measured in meter (m) without shoes, standing straight and looking forward. The subjects' height was recorded at the point when the arm of the measuring rod was resting on the head. Height and weight were measured using calibrated SECA weighing machine (Digital Column Scale with BMI Function). Height and weight were measured to the nearest 0.5cm and 0.1kg and Body Mass Index (BMI) in kilograms, divided by height in meters squared.

WC was measured with standing up position midway between the inferior margin of the last rib and the crest of the ilium in a horizontal plane. The measurer sat by the side of the subjects and fitted the tape snugly but did not compress soft tissues. WC measured to the nearest 0.1 cm. HC measurement was taken around the pelvis at the point of maximal protrusion of the buttocks. All measurements were taken by the same person at each visit. The measurement of the blood pressure was taken twice in seating position after subjects had rested for 15 minutes using Spot Vital sign (NIBP)/Philips BP set (systolic blood pressure (SBP) and Diastolic blood pressure (DBP)). All measurements were recorded during Baseline (Week 0), intervention (Week 1 to 10) and post intervention (Week 12).

Biochemical

Fasting Blood Sugar (FBS) and Fasting Lipid Profile (FLP) were taken at baseline (Week 1) and post intervention (Week 12). The subjects were told to fast at least 6 hours prior blood taking procedure. A total of 5 ml venous blood was drawn from each subject using the venipuncture method. All blood samples were sent to the lab for analysis.

Structured Diet Plan

The diet educational sessions were conducted by qualified dietician at Week 1, 2, 3, 4, 7 and Week 9. The diet plan aimed mainly on reduction of calorie intake (approximately 500-750kcal/day), food/drink portion control, goal setting and motivational support and healthy eating using the Malaysia Healthy Plate. Pamphlets consisted of general healthy eating information based on plate method also provided to the subjects. The dietary intake was recorded by the subjects in the food diary (2 records for weekdays and 1 record for weekend). Education

on food/drink portion control, food labelling, and substitution and meal replacements was also emphasised. The subjects were also had group discussion to share their experiences on daily diet intake.

Physical Activity

Alternated weeks (week 2,4,6 and 8) of physical exercise (aerobic/brisk walk which were practicing in our hospital) for 2 hours /week was conducted by qualified physiotherapist. Pedometer was provided to the subjects for them to monitor their daily step counts. Workout CD was provided for the subjects as a guide for exercise. Subjects were assigned into group of five and WhatsApp application group was formed to motivate and to monitor their progress. Pedometer and food diary with standard exercise were carried out, there was no analysis done for pedometer and food diary since our objective was only to measure WT, BMI and blood parameters pre- and post-intervention.

Outcome Measurement

Weekly blood pressure and anthropometry (WT, BMI, WC, and HC) were the outcomes of this study. FBS and FLP which were recorded in Week 0 and Week 12 also served as the outcome of this study.

Sample Size

Power & Sample Size Calculator, Dupont and Plummer, 1997 were used to calculate the sample size. With 90% power and alpha 0.05, we needed at least 25 HCWs to detect the different of 1.5kg/m² in mean BMI with SD 1.6¹³. With anticipation of 20% dropouts, we recruited 30 HCWs.

Statistical Analyses

All data were analysed using the statistical package SPSS version 21.0 (IBM Corp, Armonk, NY, US). Data were presented as percentages for categorical variables and as mean and standard deviation (or median and inter-quartile range) for continuous variables. Differences in categorical and continuous variables between groups were assessed with the chi-square or Fisher's exact test where appropriate, and independent samples t-test. Paired t test was used to compare pre- and post-intervention.

RESULTS

30 HCWs were recruited. However, only 27 HCWs able to completed the 10 weeks weight and diet management programme. One subject dropped out of the study due to personal and another two for working schedule issues.

The demographic data showed that, 17 (63%) were married, aged range between 20-45 years old with mean age of 33.56 ±5.45. The demographic characteristics of the subjects were shown in Table 2.

Effectiveness of Half-half Quarter and Physical Activity

Table 2 Demographic characteristics

Variables	Frequency (%)	Mean \pm SD	n=27
Age	-		33.56 \pm 5.45
Working Experiences	-		19.52 \pm 5.20
Marital Status			
Married	19.52 \pm 5.2		-
Widower/Divorced	4.00 (14.8)		-
Single	6.00 (22.2)		-
Education level			
Certificate	5.00 (18.5)		-
Diploma	14.00 (51.9)		-
Degree	7.00 (25.9)		-
Others	1.00 (3.70)		-

The pre- and post-intervention related variables were shown in Table 3 and Table 4. The mean body weight and the BMI showed significant reduction from pre- to post-intervention ($p = .001$). A total of 26 (96.2%) from 27 subjects showed reduction in weight with a mean reduction of 3.87kg \pm 3.01. Moreover, Total Cholesterol (TC) also significantly decreased from baseline ($p = .001$). Some of the biochemistry parameters of the subjects was not significantly decreased but clinically

decreased from pre- to post-intervention, including mean LDL 3.54 \pm 0.70 ($p = .302$), mean HDL 1.43 \pm 0.380 ($p = .044$), and mean TG 1.52 \pm 0.79 ($p < .060$) and FBS mean 4.82 \pm 0.64 ($p < .251$). Moreover, the anthropometry also showed clinically significant mean pre- and post-SBP (117 \pm 9.057 mmhg, 115 \pm 7.27mmhg), mean pre- and post-DBP (70 \pm 9.74, 66 \pm 9.18 mmhg), pre- and post-WC (95.48 \pm 12.18 cm, 89.25 \pm 12.35 cm, pre- and post-HC (114 \pm 10.63 cm, 104 \pm 11.91cm).

Table 3 Pre and Post intervention in 10 weeks

Variables	Pre intervention	Post intervention	n=27
Weight lost			
Overweight	0	7	
Obese I	19	14	
Obese II	4	3	
Obese III	4	3	

Table 4 Pre and Post Intervention of Blood Parameters

Variables	Pre intervention	Post intervention	n=27
TC	5.65	5.34	
LDL	3.54	3.42	
HDL	1.43	1.32	
TG	1.52	1.31	
FBC	4.82	4.69	

DISCUSSION

HCWs were targeted in this study at their workplace as an innovative approach to reduce their weight and also to promote healthy lifestyle. This study found that 10-week weight loss and diet intervention gave a positive outcome in most of the anthropometric and biochemical parameters.

These findings were significant and in accordance with most of the previous studies. To the best of our knowledge and literature review, this was the first intervention study which used Malaysia Healthy plate module with physical exercise and also analysed blood parameters such as FLP and FBS. The interpretation and implications of these findings were discussed below.

According to national data NHMS 2015¹⁴, the highest percentage of pre-obese & obese ranges between age 35 & above¹⁵ and it was older than our study population (mean age of 33.56 years) but it was similar to study which had done in Malaysia.¹⁶ Our subjects were also younger compared to subjects in others studies.¹⁸⁻¹⁹ Majority were not married (85%) and mostly were seniors who had worked for more than 19 years in their field.

A total of 26 (96.2%) from 27 subjects showed reduction in weight with mean reduction of 3.88kg \pm 3.01 compared to another similar combined intervention studies.^{10-11,17-18} Mean BMI showed reduction of 1.51kg/m². There was a significant difference in mean weight and BMI pre-

and post-intervention ($p < .001$) similar to previous similar studies.¹⁵⁻¹⁹

This study finding also showed great reduction of WC with mean of 9.23 cm and HC 10 cm in 10 weeks of combined intervention compared to similar studies.^{10-11,17-18} Even though some studies showed statistically significant findings in WC¹⁷⁻¹⁹ and HC¹⁷⁻¹⁸ but our study was not in line with these findings.

In addition, blood parameters showed clinically significant reduction with mean LDL 0.12mg/dl,¹⁸ HDL 0.11mg/dl, TG 0.21 mg/dl, FBS 0.13mg/dl but not statistically as reported in previous studies.¹⁷⁻¹⁸ However, total cholesterol showed reduction with this intervention suggesting that even a slight decrease in body weight could make changes in total cholesterol level as reported in previous study.¹⁷

This workplace interventions study also showed reduction in pre- and post-blood pressure²⁶⁻²⁷ measurements. Even though, BP clinically significant pre- and post-intervention but not statically significant.^{10,18} A positive result of combination, nutrition education guidance and physical intervention appeared to guide our subjects to change to healthier lifestyle.²⁰ Obesity and metabolic and cardiovascular diseases are highly related, so more workplace setting interventions^{10,24} can be initiated as a preventable measure. Workplace setting can play very important role to create and promote a healthy environment for the staffs which may prevent weight gain in future.²⁵ On the other hand, combination of diet and exercise intervention will be able to prevent or delay disability in obese especially women.¹⁹

Most of our subjects also shared their opinions that they really appreciated and welcomed more interventions on healthy lifestyles at the workplace because these activities will promote team spirit²¹⁻²² and motivated them to sustain their weight loss for long term.¹⁰ Moreover, weekly weighing²³ and group discussion during the intervention helped the subjects to share their weekly weight reduction success.

This study used valid and reliable instruments to measure the anthropometrics and blood parameters with comprehensive combined diet and physical intervention to reduce weight of the subjects. Besides, this was the first study in Malaysia that applied Malaysia Healthy Plate module with physical activity into the weight reduction intervention together with basic aerobic exercises. Thus, this study had demonstrated good outcome in terms of BMI, body weight, WC, HC, BP and improved blood parameters.

Furthermore, combined diet with exercise^{10,28} were significantly showed greater improvement in reducing WT, BMI and other parameters BP²⁹ that experienced for either the exercise or diet alone group²⁸. Similar studies

revealed mean weight loss of 8.9 kg for combination diet and exercise group compared to diet alone (7.2 kg), exercise alone (2.0kg) and controls group (0.7 kg). In addition, combination of diet and exercise showed improvement in WC with 7.0 cm reduction and fat intake also decreased by 20% (% of total kcal/day) compared to other groups such as diet alone with 4.5 cm reduction or exercise alone 2.0 cm reduction²⁸.

The limitations of this study were small sample size involving single study site and the HCWs were generally obese but healthy with young aged 25-45 years old. The findings may not be generalized to older or those who were with comorbidities. Hence, the data suggest the work place may be useful for engaging HCWS to do life modification at work. Implementation of physical activities at work place will nurture healthy life style among HCWs.

CONCLUSION

In conclusion, the 10-weeks combination of diet and physical activity intervention program led to significant improvement in anthropometric and some of the blood parameters and this method is recommended to Malaysians who are aiming to reduce their weight and BMI. This method needs to be followed for longer time to achieve significant reduction in blood parameters. However, the commitment and motivation of each individual is highly needed to ensure the effectiveness and adherence to the diet and exercise method.

CONFLICT OF INTEREST

The authors declare they have no conflicts of interest.

ACKNOWLEDGEMENTS

The authors would like to thank all the HCWs who participated in this study. The authors would like to thank Hospital Director for the support. The authors also would like to acknowledge the Director General, Ministry of Health, Malaysia for granting the approval to publish this article.

REFERENCES

1. Maierbrugger, A., 2012. Malaysians most obese in Southeast Asia. Investvine. 2017 [cited 18 August 2017]. A URL <https://investvine.com/malaysians-most-obese-in-southeast-asia/>
2. Kantachuvessiri A, Sirivichayakul C, KaewKungwal J, Tungtrongchitr R, Lotrakui M. Factors associated with obesity among workers in a metropolitan waterworks authority. Southeast Asian Journal of Tropical Medicine & Public Health. 2005 Jul 1;36(4):1057-60.

Effectiveness of Half-half Quarter and Physical Activity

3. Kaufer-Horwitz M, Villa M, Pedraza J, Domínguez-García J, Vázquez-Velázquez V, Méndez JP, García-García E. Knowledge of appropriate foods and beverages needed for weight loss and diet of patients in an Obesity Clinic. *Eur. J. Clin. Nutr.* 2015 Jan;69(1):68-72.
4. Institute for Public Health Portal [Internet]. Institute for Public Health. 2017 [cited 10 August 2017]. Available from: <https://iku.gov.my/>
5. Ramli A. Obesity and Habitual Physical Activity Level among Staffs Working in a Military Hospital in Malacca, Malaysia. *IUM Medical Journal Malaysia.* 2013;12(1).
6. Kunyahamu MS, Daud A, Jusoh N. Obesity among Health-Care Workers: Which Occupations Are at Higher Risk of Being Obese? *International journal of environmental research and public health.* 2021 Apr 20;18(8):4381.
7. Anderson LM, Quinn TA, Glanz K, Ramirez G, Kahwati LC, Johnson DB, Buchanan LR, Archer WR, Chattopadhyay S, Kalra GP, Katz DL. The effectiveness of worksite nutrition and physical activity interventions for controlling employee overweight and obesity: a systematic review. *Am. J. Prev. Med.* 2009 Oct 1;37(4):340-57.
8. Muthuvadivelu S, Hussin N, Muninathan P, Wee Kooi C. Prevalence of Obesity Among Shift and Non-Shift Nurses In Taiping Hospital, Perak, Malaysia. *J.Health Manag.* 2019; 16:61-72.
9. Ministry of Health. Malaysian Healthy Plate Guideline. National Coordinating Committee on Food and Nutrition; Ministry of Health Malaysia: Kuala Lumpur, Malaysia, 2016.
10. Christensen JR, Overgaard K, Carneiro IG, Holtermann A, Sjøgaard K. Weight loss among female health care workers-a 1-year workplace based randomized controlled trial in the FINALE-health study. *BMC Public Health.* 2012 Dec;12(1):1-0.
11. MinSuk O, Sue K, KiYong A, JiHee M, HyukIn Y, JunGa L, DongIl K, HyeSun L, JiWon L, Jeon JY. Effects of alternate day calorie restriction and exercise on cardio-metabolic risk factors in overweight and obese adults: an exploratory randomized controlled study. *BMC Public Health.* 2018;18(1124).
12. Consultation WE. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *Lancet.* 2004 Jan 10;363(9403):157-63.
13. Ross R, Damon D, Peter J.H.J, Heidi S, Anne P, Robert H, and Ian J. Reduction in Obesity and Related Comorbid Conditions after Diet-Induced Weight Loss or Exercise-Induced Weight Loss in Men. *Annals of Internal Medicine.* 2000, 133(2):92.
14. Institute for Public Health Portal [Internet]. Institute for Public Health. 2021 [cited 3 March 2018]. Available from: <https://iku.gov.my/>
15. Siriwoen R, Chongsuwat R, Tansakul S, Siri S. Effectiveness of a weight management program applying mobile health technology as a supporting tool for overweight and obese working women. *Asia Pac J Public Health.* 2018 Sep;30(6):572-81.
16. Aina MB, Norhisham AR, Argeela S, Yuhanis AK, Nor Asma M, Siti Harirotul HA. Efficacy of 3-month weight loss intervention program using 10 kg in 10 weeks module adapted from Malaysia Ministry of Health (MOH). *Med J Malaysia.* 2022;72 Supplement (1 August 2017):A113).
17. Lee A, Jeon K, Kim H, Han S. Effect of a 12-week weight management program on the clinical characteristics and dietary intake of the young obese and the contributing factors to the successful weight loss. *NRP.* 2014;8(5):571.
18. Lang H, Chou C, Sheu W, Lin J. Weight loss increased serum adiponectin but decreased lipid levels in obese subjects whose body mass index was lower than 30 kg/m². *Nutr Res.* 2011;31(5):378-386.
19. Anton SD, Manini TM, Milsom VA, Dubyak P, Cesari M, Cheng J, Daniels MJ, Marsiske M, Pahor M, Leeuwenburgh C, Perri MG. Effects of a weight loss plus exercise program on physical function in overweight, older women: a randomized controlled trial. *Clin Interv aging.* 2011; 6:141.
20. Dansinger ML, Gleason JA, Griffith JL, Selker HP, Schaefer EJ. Comparison of the Atkins, Ornish, Weight Watchers, and Zone diets for weight loss and heart disease risk reduction: a randomized trial. *JAMA.* 2005 Jan 5;293(1):43-53.
21. Brownell KD, Cohen RY, Stunkard AJ, Felix MR, Cooley NB. Weight loss competitions at the work site: impact on weight, morale and cost-effectiveness. *Am J Public Health.* 1984 Nov;74(11):1283-5.
22. Peregrin T. Weighing in on corporate wellness programs and their impact on obesity. *J Am Diet Assoc.* 2005;8(105):1192-4.

23. Rigsby A, Gropper DM, Gropper SS. Success of women in a worksite weight loss program: Does being part of a group help? *Eating behaviours*. 2009 Apr 1;10(2):128-30.
24. Zapka JM, Lemon SC, Magner RP, Hale J. Lifestyle behaviours and weight among hospital-based nurses. *J Nurs Manag*. 2009 Nov;17(7):853-60.
25. Thompson DL. The costs of obesity: what occupational health nurses need to know. *AAOHN Journal*. 2007 Jul;55(7):265-70.
26. Shimizu T, Horiuchi I, Kato T, Nagata S. Relationship between an interview-based health promotion program and cardiovascular risk factors at Japanese companies. *J Occup Health* 2004, 46:205–212.
27. MI N, Sarina MY, Maisarah S, RH RN. Comparison of different exercise modalities in improving metabolic syndrome risk factors among obese females. *MoHE*. 2018 July; 7(2): 135-144.
28. Foster-Schubert KE, Alfano CM, Duggan CR, Xiao L, Campbell KL, Kong A, Bain CE, Wang CY, Blackburn GL, McTiernan A. Effect of diet and exercise, alone or combined, on weight and body composition in overweight-to-obese postmenopausal women. *Obesity*. 2012 Aug;20(8):1628-38.