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Obesity and health-related quality of life: results from a weight loss trial

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Abstract

Aims To measure health-related quality of life (HRQoL) in overweight and obese New Zealand adults taking part in a weight loss trial, and to compare findings with the New Zealand population.

Methods Individuals (aged over 18 years with a BMI of 28–50 kg/m^2) participated in a randomised controlled weight loss trial. HRQoL was measured using the SF-36 questionnaire.

Results The 250 study participants had a mean (SD) age of 48 (12) years and a mean BMI of 35.4 (5.3) kg/m^2. Mean physical component (PCS) and mental component summary scores (MCS) were 47.2 (9.0) and 46.9 (11.1) respectively. Participants in the highest BMI tertile (>37 kg/m^2) reported significantly lower PCS scores compared with those in the middle and lowest tertiles (p=0.01), but no significant differences were seen in MCS scores (p=0.65). Comparison with population norms revealed significantly lower mean scores in all 8 SF-36 domains except mental health. No significant effect of modest weight loss on HRQoL was seen.

Conclusions These overweight and obese New Zealand adults experienced significantly impaired HRQoL compared to the New Zealand population. Small reductions in weight had no significant impact on HRQoL in this substantially overweight population.

Overweight and obesity are increasingly prevalent in developed and developing countries[1–3] and are important contributors to cardiovascular disease,[4–6] type 2 diabetes mellitus,[7,8] and several common cancers.[9,10] Body mass index (BMI) is the anthropometric measure that provides the most useful population-level indicator of excess body weight, although because it is a generalised measure that does not distinguish between weight associated with lean body mass and fat it is possible that measures of central body fat such as waist circumference and waist-hip ratio may be better predictors of certain diseases including diabetes.

The World Health Organisation (WHO) guidelines define a BMI of 18.50 to 24.99 kg/m^2 as normal and >25 kg/m^2 as overweight.[11] Estimations of the burden of disease attributable to excess weight indicate that high BMI is a leading cause of loss of healthy life worldwide;[12] and across developed regions, high BMI has been estimated to account for approximately 7% of all disability-adjusted life years (an integrated measure of population health incorporating both fatal and non-fatal outcomes),[12] which places high BMI close behind tobacco (12%), high blood pressure (11%), alcohol (9%), and high cholesterol (8%) as a leading cause of loss of healthy life in these regions.

While the physical effects of excess body weight are well recognised, less is known about the social and psychological effects. Evidence suggests that overweight and obese individuals are subject to stigmatisation and discrimination in various areas of life, including employment, education, and healthcare;[13,14] and they have an increased incidence of depression.[15]

Health-related quality of life (HRQoL) refers to the 'physical, psychological, and social domains of health, seen as distinct areas that are influenced by a person's experiences, beliefs, expectations and perceptions'.[16] Assessment of HRQoL can be made using a variety of measures, the most widely used and evaluated of which is the Short Form 36-question Health Survey (SF-36),[17] a generic measure based on ratings made by individuals themselves.[18] There is evidence that people who are overweight or obese experience significant impairment in quality of life,[19 20] but no New Zealand-specific data exist.

The objective of these analyses was to measure HRQoL in 250 overweight and obese New Zealand adults and compare findings with the New Zealand population. In addition, the effects of weight loss on HRQoL were evaluated.

Methods

Study participants—Individuals were participants in a randomised controlled trial of the effect of the dietary supplement, chitosan, on body weight.[21] Study participants were recruited using newspaper advertisements and all participants provided written informed consent. Men and women aged over 18 years who wished to lose weight and had a BMI of between 28 and 50 kg/m^2 were included. Exclusion criteria were current treatment with chitosan containing supplements; current or recent treatment with weight loss medications; current or recent attendance at a commercial weight loss clinic/programme; allergy to seafood; pregnancy or lactation; active gastrointestinal disease or obesity surgery; involvement in another clinical trial; and individuals judged to be unlikely to comply with study treatment and follow-up procedures.

The study was conducted at the University of Auckland, New Zealand, between November 2001 and December 2002. The study protocol and related documents were approved by the Auckland Ethics Committee.

HRQoL— HRQoL was measured using the Australasian standard version (version 1) of the SF-36 questionnaire,[18] a generic measure of HRQoL that assesses eight domains of perceived health over the previous 4 weeks. These domains are: physical functioning (PF), role limitations related to physical problems (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role limitations related to emotional problems (RE), and mental health (MH). These dimensions are ordered from first to last according to the extent to which they measure physical or mental functioning.

Scores range from 0 (worst health state) to 100 (best health state) for all domains. For example, a score of 100 indicates the individual can perform all activities without limitations related to health. In three domains (GH, VT, MH), scores of 50 indicate an absence of problems. To obtain scores in excess of 50 in these three domains, health must be evaluated positively. Two summary component scores can be calculated from the SF-36: the physical component summary (PCS) score and the mental component summary (MCS) score. Both scores have a mean of 50 and a standard deviation of 10 and are standardised using means, standard deviations, and factor score coefficients from the general New Zealand population scores. Scores below 50 represent scores below the population mean.

HRQoL was measured at baseline and 6 months post-randomisation in this study. All questionnaires were checked for errors or missing data prior to data entry and standard guidelines for handling missing data were applied.[18]

Statistical analysis—Crude PCS and MCS scores were calculated using the New Zealand-specific factor weights.[22] Participants were stratified by baseline BMI tertile (28-32 [n= 83], 32.1-37 [n=85], >37 kg/m^2 [n=80]) to ensure equal numbers of participants across all groups, and scores were compared across these groups using analysis of variance (ANOVA).

Potential confounding factors such as age, gender, ethnicity (European/Non-European), socioeconomic status (SES) (using the New Zealand Socio-economic Index),[23] comorbidities (sum of doctor-diagnosed conditions including diabetes, hypertension, hyperlipidaemia, coronary heart disease, stroke, hyperthyroidism, hypothyroidism, gallbladder disease, osteoarthritis, back pain, sleep apnoea, shortness of breath, asthma, cancer, depression, other), and any other confounding factors discovered during stratified analyses, were controlled for by including these factors as covariates in an analysis of covariance (ANCOVA) model. Due to the small size of our study sample, comorbidities were not weighted, and a crude classification was used for adjustment as has been used in other similar studies.[24,25]

We assessed whether percentage weight change from baseline to 6 months was associated with changes in summary scores using multiple regression analysis after adjustment for age and other confounders (see above). Analyses were based on an intention-to-treat (ITT) approach with the last recorded observation carried forward (LOCF) for any missing data. In the case of missing SF-36 domain scores, scores were assumed to have remained the same as baseline scores—i.e. no change. In the case of missing weight data, the last recorded weight was used, which may have been recorded at baseline or at any of the subsequent 6 follow-up visits. A 'completers only' analysis (limited to participants with complete data) was also conducted as a sensitivity analysis. All statistical analyses were conducted using SAS for Windows (version 8.0) or Microsoft Excel (version 9.0).

Results

Participant characteristics—The 250 study participants had a mean (SD) age of 48 (12) years, 206 (82%) were female, and their mean BMI was 35.4 (5.3) kg/m^2 (Table 1).

Table 1. Characteristics of the study participants

Variable	Mean	SD
Age, years	47.6	(11.7)
Females, n (%)	206	(82.4)
Current smoker, n (%)	23	(9.2)
Current alcohol drinker, n (%)	122	(48.8)
Ethnic group, n (%)		
- New Zealand European	186	(74.4)
- Maori	29	(11.6)
- Pacific Islands	7	(2.8)
- Other	28	(11.2)
Body Mass Index, kg/m^2	35.4	(5.3)
Systolic Blood Pressure, mmHg	123.2	(18.3)
Diastolic Blood Pressure, mmHg	69.7	(9.5)
Total Cholesterol, mmol/L	5.5	(1.0)
Blood glucose, mmol/L	5.3	(1.4)
Diagnosed comorbidities, n (%)		
- 0	76	(30.4)
- 1	78	(31.2)
- 2	41	(16.4)
- 3	30	(12.0)
- >3	25	(10.0)
SF-36 Physical Component Summary Score, 0–100	47.2	(9.0)
SF-36 Mental Component Summary Score, 0–100	46.9	(11.1)

Seventy-four percent of participants classified themselves as New Zealand European, and the remainder were Maori (12%), Pacific peoples (3%), or other ethnicities (11%). Seventy percent had one or more comorbidities. Younger age (p=0.01), female

sex (p=0.04), low high-density lipoprotein (HDL) cholesterol levels (p=0.003), and high systolic blood pressure (p=0.002) were significantly associated with higher BMI tertile, but no significant associations were seen with other potential confounders examined including SES, ethnicity, smoking status, and comorbidities (although they were included as covariates in the analyses).

HRQoL—Complete SF-36 questionnaires were available for 248 (99%) participants at baseline and 156 (62%) at follow-up. The mean (SD) PCS score for participants was 47.2 (9.0) and mean MCS score was 46.9 (11.1). Participants in the highest BMI tertile reported significantly lower mean [SD] PCS scores (44.1 [10.3]) compared with those in the middle (48.0 [7.5]) and lowest BMI tertiles (49.2 [8.3]) (p=0.01), but no significant differences were seen in MCS scores across tertiles (p=0.65) (Table 2).

Table 2. Effect of baseline body mass index on baseline health related quality of life

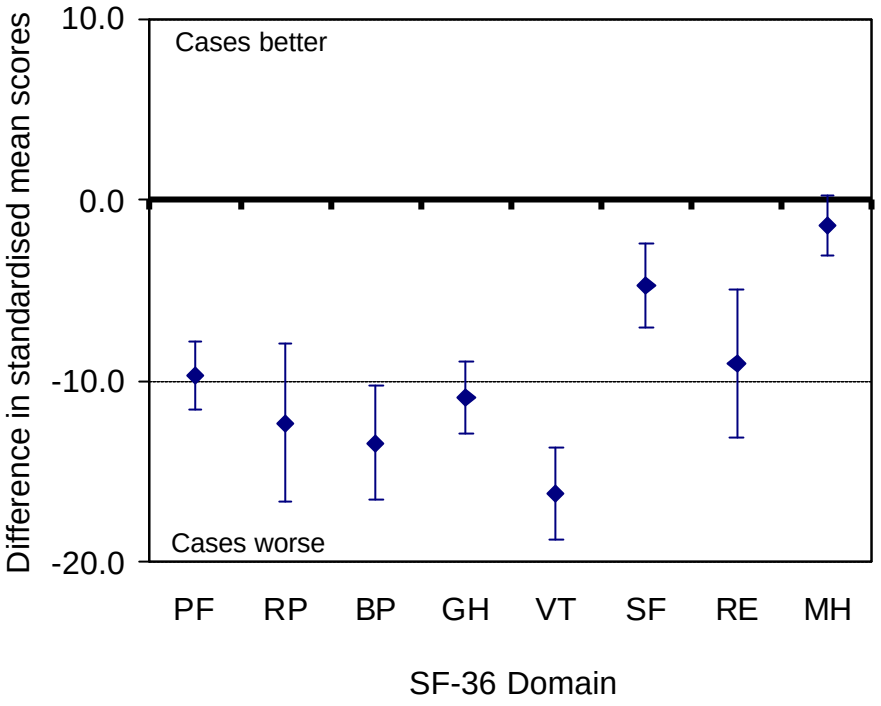
Variable	BMI Tertile			
Domain, mean (SD)	28–32 kg/m^2 (n=83)	32.1–37 kg/m^2 (n=85)	>37 kg/m^2 (n=80)	p value
Physical functioning	82.6 (17.2)	81.2 (15.2)	69.6 (22.8)	0.004
Role physical	78.7 (30.9)	76.5 (31.0)	71.3 (36.0)	0.50
Bodily pain	72.0 (24.2)	71.7 (21.2)	66.2 (23.1)	0.45
General health	70.7 (19.6)	71.3 (17.8)	60.6 (21.4)	0.09
Vitality	56.6 (21.6)	57.6 (19.1)	48.5 (20.0)	0.26
Social functioning	84.6 (21.12)	85.9 (19.6)	77.8 (24.2)	0.50
Role emotional	73.9 (36.8)	78.0 (35.5)	79.2 (32.4)	0.55
Mental health	75.0 (15.6)	78.0 (14.2)	74.2 (16.8)	0.46
Physical component summary score	49.2 (8.3)	48.0 (7.5)	44.1 (10.3)	0.01
Mental component summary score	46.4 (11.8)	48.3 (10.3)	45.8 (11.0)	0.65

Analyses adjusted for age, gender, ethnicity (European/Non-European), socioeconomic status (using the New Zealand Socio-economic Index)[23], comorbidities, baseline systolic blood pressure, and baseline HDL-cholesterol level.

Significantly lower PF scores (p = 0.004) were also reported by those in the highest BMI tertile (69.6 [22.8]) compared with those in the middle (81.2 [15.2]) and lowest (82.6 [17.2]) tertiles. There was a general trend for people in the highest tertile to have lower scores for most domains but differences were not statistically significant for domains other than PCS score and PF domain (Table 2).

Comparison of standardised (for age and sex) mean SF-36 domain scores reported by study participants with the New Zealand population norms revealed significantly lower mean scores in all domains except in the case of MH (Figure 1). The largest differences were seen in the VT (16.2), BP (13.5), and RP (12.3) domains, but substantial differences were also seen in the GH (10.9), PF (9.7) and RE (9.1) domains, with more modest differences seen in the SF (4.8) domain.

Figure 1. Standardised comparison of health related quality of life reported by overweight and obese study participants with New Zealand population norms



PF=physical function; RP=role limitations related to physical problems; BP=bodily pain; GH=general health; VT=vitality; SF=social functioning; RE=role limitations related to emotional problems; MH=mental health; Point estimates are standardised mean differences and bars are 95% confidence intervals around the differences.

The effect of weight change from baseline to 6 months on the PCS score was evaluated in an ITT analysis. Twenty-three participants lost more than 5% of their baseline weight (mean=8.2%) over the 6-month study period, 95 lost less than 5% (mean=1.7%), while 123 did not change or gained weight (mean=+1.7%).

After controlling for age, gender, ethnicity, SES, comorbidities, baseline SF-36 scores, baseline SBP, and baseline HDL-cholesterol, the effect of weight change on PCS was evaluated but no significant effect across the three categories was seen (p=0.16). A sensitivity analysis limited to participants with complete data (n=150) was also undertaken, but no significant effect of weight change was seen in this analysis either (p=0.43).

Discussion

These results demonstrate that overweight and obese New Zealand adults experience significantly impaired HRQoL compared to the population norms, particularly in the vitality, bodily pain, and role physical domains. Small reductions in body weight did not significantly improve HRQoL in this substantially overweight population.

The strengths of this study include the large, well-defined study population and the use of the SF-36 questionnaire to measure HRQoL. The SF-36 is widely used,[17] and norms (by age and sex) have been produced for New Zealand and other populations allowing international comparisons.

However, our study population may differ from overweight and obese New Zealand adults generally because study participants were relatively healthy and ambulant. Their HRQoL scores might be expected to reflect this and perhaps be higher than those of overweight and obese New Zealanders in general. However, it is equally possible that these trial participants may have been particularly keen to lose weight, thus biasing the sample towards dissatisfaction and lower HRQoL. In addition, the SF-36 (a generic measure) may have failed to evaluate the impact that excess weight would have on obesity-specific aspects of HRQoL. This might explain why no effect of BMI was detected on MCS despite it being recognised that people who are overweight or obese are more likely to suffer from discrimination[13] and depression.[15]

An additional point to note is that a crude classification (sum of comorbidities) similar to that used in other studies[24,25] was used to adjust for the effect of comorbidities, but it is possible that there could be a differential impact of comorbidities associated with pain (e.g. osteoarthritis) and those that are asymptomatic (e.g. hypertension), although unfortunately it was beyond the scope of this small study sample to weight individual comorbidities accordingly.

Finally, the New Zealand population norms for HRQoL are based on data collected in 1996/7 and the indications are that the population prevalence of overweight and obesity has increased since then.[26] This shifting baseline may have influenced the comparison of HRQoL data collected in our weight loss study (2001/2) with the population data (1996/7).

Mean PCS and MCS scores in this group of overweight and obese adults were 47.2 (9.0) and 46.9 (11.1) respectively. Because the standardised means of the summary scores are set at 50, these scores indicate some impairment in both physical and mental domains. This places obesity in the same category as chronic conditions such as visual impairments, cerebrovascular and/or neurological conditions, cancer, and respiratory conditions, which have also been found to have a negative impact on both summary scores.[27]

Participants with BMI levels exceeding 32 kg/m^2 also had significantly lower PCS scores of approximately 5 points, when compared with those who had a BMI in the lowest tertile (28–32 kg/m^2). It is suggested that a difference of 5 points in summary scores is clinically and socially significant (John Ware, personal communication, 2001).

Age and sex standardised analyses demonstrated significant differences in HRQoL domain scores between this group of overweight adults and New Zealand population norms of up to 16 points, with differences being most pronounced with respect to the vitality, bodily pain, and role physical domains. It is uncertain what difference in domain scores is clinically significant, but differences of 9–16 points (compared with population norms across most domains) suggests impairment in HRQoL that is socially as well as statistically significant.[18]

We found no significant association between reduction in body weight and HRQoL. This finding is contrary to previous studies,[28,29] that found a linear relationship between HRQoL and weight loss. There are two reasons why this discrepancy may have occurred. Firstly, previous study participants on average lost 10%[29] to 17%[20] of their weight over a 1-year period, whereas only a minority (23) of our study participants lost more than 5% body weight over the 6-month period.

Several studies have confirmed that there is a dose-response effect of weight loss on HRQoL[30,31] so it seems likely that people who are very overweight and obese may need to lose in excess of 10% of their body weight in order to experience a positive impact on HRQoL. Secondly, previous studies[28,29] used obesity-specific measures of HRQoL, whereas we used a generic measure that may be less sensitive to obesity specific issues.

It seems likely that differences in proportional weight loss are most likely to account for discordance because Fontaine et al used the SF-36 questionnaire and found that weight loss was significantly associated with higher scores relative to baseline on the PF, RP, GH, VT, and MH domains.[32] The participants in the study by Fontaine et al also lost on average 10% of their body weight over the 13-week treatment programme.

The prevalence of overweight and obesity is increasing rapidly in New Zealand[33] and the results of our study confirm that obesity has a significant negative impact on HRQoL in addition to the known increase in risk of disease and death, suggesting that the psychosocial consequences of obesity should also be considered in the management of obesity. However, our results also imply that small reductions in weight have little impact on HRQoL in people who are substantially overweight, supporting the urgent need for more effective interventions to prevent and treat overweight and obesity in New Zealand.

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