

**Psychosocial characteristics
of patients seeking weight loss surgery**

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Abstract

This study investigated the relationships between BMI, gender and depression, anxiety, self-esteem and disordered eating in people seeking weight loss (bariatric) surgery. The aim was to increase understanding of these relationships to improve selection of patients suitable for surgery. The study was a retrospective audit of data from 199 females and 59 males (mean BMI $48.3 \pm 8.1\text{kg/m}^2$) who attended for surgical pre-assessment. Subjects completed the Hospital Anxiety and Depression Scale (HADS), The Impact of Weight on Quality of Life-Lite (IWQOL-Lite) and the Bulimic Investigatory Test, Edinburgh (BITE). Spearman's correlations were used to investigate the relationships between BMI and the HADS anxiety and depression scores, the IWQOL-Lite self-esteem scores and the BITE symptom scale disordered eating scores. Mann-Whitney U tests were used to investigate gender differences in the psychosocial scores. There was no significant relationship between BMI and anxiety ($r=-0.39$; $p=0.532$), BMI and depression ($r=-0.101$; $p=0.106$), BMI and self-esteem ($r=-0.017$; $p=0.788$) or BMI and disordered eating ($r=-0.109$; $p=0.081$). There was a significant difference in HADS anxiety scores ($p=0.004$) between males (median=9) and females (median=12) and in IWQOL-Lite self-esteem scores ($p=0.0005$) between males (median=28) and females (median=33). There was no significant gender difference in HADS depression scores ($p=0.03$) or in BITE disordered eating scores ($p=0.028$). There was a significant difference in BMI ($p=0.001$) between males (median 49.5 kg/m^2) and females (median 46.0 kg/m^2). The results indicated that females seeking bariatric surgery were significantly more anxious and had lower self-esteem than males, and they had significantly lower BMIs than males. There was a weak negative correlation between BMI and the psychosocial scores indicating that people may be less distressed at higher BMIs but these results were not significant. Further research should investigate the relationships between the psychosocial variables in greater depth, to improve patient selection and outcomes after bariatric surgery.

This work is original and has not been previously submitted in support of a Degree, qualification or other course.

Signed.....

Date.....

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Introduction

Bariatric (weight-loss) surgery is recommended for the treatment of obesity where body mass index (BMI) is 40kg/m² or above, or 35kg/m² or above with co-morbidities (see Appendix/Glossary for BMI classification). Patients must have failed to lose or to maintain clinically beneficial weight-loss for at least 6 months and there must be no clinical or psychological contraindications to surgery (National Institute for Health and Clinical Excellence (NICE) (2006)). However, NICE found no evidence to support routine psychological assessment and many of the studies they reviewed did not report details of the preoperative work-up. Despite this many authors now support the need to assess psychosocial and psychiatric factors in bariatric surgery candidates to obtain a broader range of outcomes than weight-loss and improvement in co-morbidities alone (Fabricatore, Wadden, Sarwer & Faith 2005, Mahony 2008). Other guidelines have similar criteria for selecting suitable candidates (Sauerland et al. 2005; Collazo-Clavell, Clark, McAlpine & Jensen 2006).

Bariatric surgery is the only effective long term treatment for severe obesity (Gibbons et al. 2006). Although obesity treatment goals of 5-10% weight-loss are recommended to achieve clinically beneficial reduction of health risks (Avenell, Sattar & Lean 2006) this is unlikely to be sufficient to improve health or quality of life in those with severe obesity (Gibbons et al. 2006). People with obesity are more likely to have unrealistic expectations of weight-loss which can contribute to them feeling unsuccessful. Wadden et al. (2006) compared women with class III (morbid) obesity with women with class I-II obesity and reported that those who sought surgery (class III obesity) expected to lose an average of 47.6% of initial weight compared with 24.8% of initial weight for those with class I-II obesity (see Appendix/Glossary for definition of the classes of obesity). There is significant disparity between these expectations and the 5-10% weight-loss treatment goals

recommended by health professionals. Many patients with morbid obesity are likely to be dissatisfied with the results of any conventional weight-loss programme. This may lead them to seek surgery, however, bariatric surgery carries a risk and the benefits are not identical for all patients (Collazo-Clavell et al. 2006). For long term success after such “behavioural” surgery more pre- and post-operative education is required than for other surgery (Kral 2001). It is therefore important to select patients for surgery carefully to achieve optimal outcomes. Psychiatric and psychological assessment identifies factors which may hinder patients from maintaining long-term lifestyle changes and prepares patients for the pre- and post-operative changes required (Collazo- Clavell et al. 2006).

Although obese people are heterogenous in psychological terms and many obese people presenting for treatment may require psychotherapy as well as obesity treatment, no progress has yet been made in matching treatments to individual needs (Buckroyd & Rother 2007). However several studies show that people with severe obesity who seek bariatric surgery have more psychological problems than people with lower grades of obesity or the general population (Onyike, Crum, Lee, Lykestos & Eaton 2003), possibly because obesity can be both a cause and a consequence of psychological problems (Markowitz, Friedman & Arent 2008).

Psychological factors in obesity

Higher BMI is correlated with a number of psychosocial factors including more weight cycling, more attempts at dieting, lower self-efficacy, low levels of dietary restraint, greater emotional and binge-eating, more perceived stress, food cravings or feeling deprived, angry or upset whilst dieting (Delahanty, Meigs, Hayden, Williamson & Nathan 2002). These authors also found that heavier subjects had least motivation to lose weight as measured by stage of change related to weight-loss (Prochaska & DiClemente 1986, cited in Campbell & Haslam 2005). This could

be partly due to patients wishing to lose significant amounts of weight and perceiving this as difficult or impossible, resulting in lower self efficacy or self-esteem (Wadden et al. 2006).

Delahanty et al. (2002) studied correlates of BMI in 274 subjects with impaired glucose tolerance. They excluded subjects with major psychiatric illness and those on more than the minimum therapeutic dose of antidepressants which may explain the lack of correlation between BMI and depression and anxiety. Although 68% of subjects had a BMI > 30 kg/m², the mean sample BMI of 33.9 ± 6.9 kg/m² indicates that whilst some of the subjects would have made suitable candidates for bariatric surgery, the sample as a whole was not representative of those seeking surgery. However, this was a well designed study which used a large sample size and several validated questionnaires to assess psychosocial factors. It provides useful information on some of the psychosocial and behavioural factors correlated with higher BMI (as listed above), although such correlations do not imply that higher BMI is either a cause or an effect for these factors. As the mean BMI of this sample was lower than that of the population seeking surgery we can hypothesize that these factors may increase further as BMI rises. People may become more desperate to lose weight, make more attempts at dieting, feel they have failed, give up the attempt and subsequently regain more weight than they lost, eventually becoming increasingly desperate to lose weight so that the cycle begins again. This shows both the experience of morbid obesity and how it develops may contribute to depression, anxiety, and low self-esteem in this group (Maddi et al. 2001).

There may be differences in psychological characteristics within the group of people with morbid obesity (van Hout, van Oudheusden & van Heck 2004). Vallis et al. (2001) evaluated these characteristics in surgical candidates and identified subgroups within the morbidly obese population, including a "high functioning" group

who function very well psychologically and have little emotional distress, functional impairment and dysfunctional eating; a “poor functioning” group with the opposite characteristics and a “moderate functioning” group which falls in between. van Hout et al. (2004) conclude that within the population of morbidly obese individuals (including those who seek surgery) there are those who can resist the negative impact of their obesity and function well, whereas others are extremely negatively affected by their obesity. Since emotional distress, functional impairment and dysfunctional eating could all have a detrimental effect on outcome after bariatric surgery, it is important to understand more about what differentiates these groups. Females may be more likely than males to suffer negatively due to society’s pressure on women to be thin. Those who function less well may be more likely to seek surgery. The fact that women are significantly more likely to seek surgery than men (Kolotkin et al. 2008) may support these two hypotheses.

Patients seeking bariatric surgery are described as depressed, anxious, and having low self-esteem and poor quality of life (van Hout et al. 2004). Their previous failure with a variety of non-surgical treatments (Pessina, Andreoli & Vassallo 2001) may contribute to these psychological problems, for example, people may attempt to diet, feel they cannot succeed, feel depressed and overeat or binge-eat as a consequence. Repeated failure to meet their individual expectations of weight-loss could explain why many patients believe bariatric surgery is the only solution to their problems. Assessing the degree to which psychiatric and psychological problems exist in patients seeking surgery may be complicated by some patients failing to disclose problems because they fear these would mean they would be denied surgery (Kalarchian et al. 2007; Glinski, Wetzler & Goodman 2001).

Psychiatric illness in obesity

A substantial minority of obese people have either significant emotional complications of obesity or underlying psychiatric illness (Wadden, Sarwer & Womble et al. 2001, cited in Averbukh et al. 2003). Wadden et al. (2001) (cited in Fabricatore et al. 2005) found that people who sought bariatric surgery (mean BMI 52.7 kg/m²) reported greater depression and more low self-esteem than those seeking behavioural and pharmacological treatments (mean BMI 36.0 kg/m²). Onyike et al. (2003) examined data from the third National Health and Nutrition Examination Survey (NHANES III) and found depression was associated with severe obesity. This large study focussed on 8,773 subjects aged 15-39 years who were randomly selected for structured psychiatric interviews. This age group was chosen to avoid identifying depression due to the chronic medical conditions commonly seen in the morbidly obese. However many surgical candidates will be older than 39 years and may have sought treatment because of their health problems, so these data should not be directly compared with data from studies of surgical candidates. The 338 subjects excluded because of missing data were not representative of the whole sample, being less obese, less educated and less likely to be white. However, these limitations may be partially offset by the large sample size. Overall, this was a robust cross sectional study involving measurement of subjects using strict criteria for obesity (BMI \geq 30 kg/m²) and psychological examinations identifying depression according to Diagnostic and Statistical Manual of Mental Disorders, Fourth edition (DSM-IV) (American Psychiatric Association 1994). Prevalence rates of depression were similar for those who were underweight, normal weight and overweight. Rates were increased for obesity classes I and II and were significantly higher in obesity class III. Of the 267 morbidly obese subjects, 202 were female and only 65 were male, and among women the prevalence of depression was higher with increasing obesity. This relationship remained strong after adjusting for potential confounders such as age and race. The

authors state that routine screening for depression should be standard care for people with severe obesity, since depression is associated with poorer treatment outcomes.

This study highlights the methodological differences which contribute to different findings between studies. Some studies classifying all subjects with a BMI ≥ 30 kg/m² as obese (instead of grouping subjects by degree of obesity) have found no relationship between depression and obesity (Friedman & Brownell 1995, cited in Onyike et al. 2003). Simon et al. (2006) also studied obese subjects with BMI ≥ 30 kg/m² and found that the obese had higher rates of depression and anxiety than those with BMI < 30 kg/m², but found no differences between males and females. Another limitation of this study is the use of self report height and weight data, which may lead to underestimates of obesity (Kucsmarski, Kucsmarski & Najjar 2001). This may offset the otherwise robust features of the study such as the large sample size and the use of DSM-IV criteria for assessing mental disorders. Onyike et al. (2003) also highlight the differences between classifying depression as past-month, past-year and lifetime depression. Different methods of identifying depression can also account for different findings between studies.

Other authors report that female gender and morbid obesity predict a relationship between depression and obesity. Onyike et al. (2003) used a population-based approach, whereas Wadden et al. (2006) studied clinical samples. These latter authors examined depression scores of women seeking bariatric surgery (obesity class III) and those seeking behavioural and lifestyle treatment (obesity classes I-II), to control for the effect of treatment seeking status. They found that 25% of women with obesity class III were at risk of a significant mood disorder. Mean Beck Depression Inventory (BDI) scores indicated significantly more symptoms of depression for women with Class III obesity than for those with Class I-II obesity.

46% of women with class III obesity reported a history of depression, anxiety or emotional problems, compared with 29% of women with class I-II obesity. However, unlike Onyike's study (2003), there was no comparison with males and no examination of the effect of potential confounders such as educational level. In addition, applicants with a BDI score ≥ 30 were not accepted for the lifestyle study. Since the severe depression category is indicated by BDI scores of 29-63, this would have excluded almost all subjects in obesity class I-II with severe depression, making the difference in severe depression between the two groups more marked. It also potentially confounds the authors attempt to control for treatment seeking status, since not all those who sought treatment were included. However this study does add to the population study of Onyike et al. (2003) in demonstrating that a significant proportion of women seeking bariatric surgery are at risk of clinical depression.

Glinski et al. (2001) reported that 17% of gastric bypass candidates had anxiety at the time of pre-operative evaluation and 12% reported a past episode of anxiety. This is a preliminary study suggesting routes for further more rigorous investigation and the data are not representative of the population seeking bariatric surgery. Kalarchian et al. (2007) carried out a more robust study examining the relationship of psychopathology to BMI and functional health status in patients seeking bariatric surgery and like Onyike et al. (2003) studied prevalence of both current and lifetime psychiatric disorders. The sample (n=288) studied by Kalarchian et al. (2007) was mostly women (83%) and in contrast to Onyike et al. (2003) the prevalence of psychiatric disorders did not differ by sex, possibly due to the small number of men studied (n=49). Kalarchian et al. (2007) used the Structured Clinical Interview for DSM-IV (SCID) administered by trained doctorate level psychologists, whereas the Diagnostic Interview Schedule (DIS) used by Onyike et al. (2003) is administered by trained lay interviewers. The personnel used may have contributed to the

differences in results for the two genders, since both interview schedules are designed to detect psychiatric disorders according to DSM-IV (see Appendix/Glossary) criteria. The samples used in the two studies are not comparable since Onyike et al. (2003) used a population sample and Kalarchian et al. (2007) studied subjects seeking bariatric surgery. Height and weight were self-reported by participants in Kalarchian's study which could have reduced accuracy and biased the results. However Kalarchian et al. studied a wider range of psychiatric disorders than in other studies. They found that 45.5% of the sample had a lifetime mood disorder and 15.6% had a current mood disorder. The most prevalent class of disorder at the time of the pre-operative evaluation was anxiety disorders (24%), which could be due to an individual's concern over whether or not they will be accepted for surgery, however 37.5% had a lifetime anxiety disorder which may refute this possibility.

Kalarchian et al. (2007) found that 29.5% of patients seeking surgery had a lifetime eating disorder and 16.3% had a current eating disorder, most of which were accounted for by binge-eating disorder (BED). Kalarchian et al. (2007) reported that subjects with a current Axis I disorder (mood, anxiety, substance use and eating disorders) had a significantly higher BMI than those without (54.2 kg/m² and 51.0 kg/m² respectively; $p=0.006$). Kalarchian et al. (2007) compared their results with population data reported by Kessler et al. (2005). Kessler used face-to-face interviews in a large sample of adults including a one hour diagnostic assessment. Kessler et al. (2005) found lifetime prevalences for mood disorders of 20.8% and 28.8% for anxiety disorders, substantially lower than those found in those seeking surgery (Kalarchian et al 2007).

Possible risk factors for co-morbid obesity and depression include severe obesity and female gender (Markowitz et al. 2008). These authors conducted a critical

review of the links between obesity and depression and proposed possible mechanisms for a bi-directional pathway between the two. Obese women may be at risk for depression via a pathway involving repeated dieting in response to body image dissatisfaction (BID). Obese men may be less vulnerable to developing depression through this pathway as they may experience less body image dissatisfaction than women. However, severely obese men may be vulnerable to developing depression via functional impairment and poor self-rated health.

Markowitz et al. (2008) highlight the inter-relationships between the psychosocial factors linked with obesity. There is a relationship between BID, low self-esteem and depression. This could be one reason for previous studies reporting a stronger relationship between depression and obesity in women than in men. Friedman, Reichman, Constanzo and Musante (2002) studied BID and degree of obesity as potential mediators of the relationship between obesity and depression. These authors assessed body image, depression, self-esteem and binge-eating in 80 women and 30 men who self-referred to a residential facility for weight-loss and lifestyle change. BMI measurements ranged from 25.8-71.9 kg/m² for women and from 29.1-73.4 kg/m² in men, suggesting that men seek obesity treatment at a higher BMI than women do. There were significant gender differences in mean BMI (38.4 kg/m² in women and 44.8 kg/m² in men), however this sample is not representative of the population seeking surgery even though many were morbidly obese. Women were more depressed and had lower self-esteem than men, and were more likely to binge-eat, however only the latter difference was significant ($p < 0.05$). Scores on the body image scales did not differ significantly for men and women. BID partially mediated the relationship between BMI, depressive symptoms and self-esteem. Gender differences in experience of BID might be expected, since societal pressures to be thin are more marked for women. In this study, degree of obesity was associated with higher levels of depression and lower self-esteem,

however the authors do not report the detail of these results so it is unclear how they arrived at this conclusion. This study provides useful data on BID as a mediator of the relationship between obesity and depression and low self-esteem, but without the data relating to morbidly obese subjects these facts cannot be extrapolated to the population seeking surgery.

Obesity, quality of life and self-esteem

There may be a bi-directional pathway between obesity and low self-esteem (van Hout et al. 2004). Low self-esteem may lead to disordered eating (Glinski et al. 2001) which can be perpetuated by feelings of worthlessness and more low self-esteem. Morbidly obese patients may be ashamed of their lack of control over their eating behaviour and may blame themselves for their failure to lose weight or sustain weight-loss. Ikeda, Lyons, Schwartzman and Mitchell (2004) examined self-report information on dieting experiences of women with BMIs of 30-70 kg/m² and found that heavier women had made more attempts to lose weight. Comments about dieting experiences were overwhelmingly negative and subjects reported that dieting undermined their self-esteem and contributed to their increasing weight over time. 79% of women reported being unable to lose and maintain any weight-loss permanently. This study identified a strong link between higher BMI, frequency of dieting experiences, perceived failure to maintain weight-loss and low self-esteem. However, the methods used to select subjects indicate this was not a representative sample of larger women. The use of self-reported height and weight data means it is not appropriate to draw conclusions about the specific relationship of morbid obesity (BMI \geq 40 kg/m²) to low self-esteem from this study. It would be helpful to study self-esteem in those seeking weight-loss surgery where weight and height have been measured, and to examine whether self-esteem changes with BMI (as is suggested by this study). There may also be gender differences in self-esteem within the obese population (Kolotkin, Crosby, Kosloski & Williams 2001a).

Differences in the findings of studies investigating the relationship between obesity and self-esteem may be due to methodological differences such as use of different tools for assessing self-esteem and different methods of classifying obesity. For some obese people low self-esteem may promote weight gain, possibly mediated by binge-eating which in turn may be linked to repeated dieting failure (Markowitz et al. 2008). For others low self-esteem is a consequence of obesity. van Hout et al. (2004) suggest that psychopathology is in itself a co-morbidity of morbid obesity and that the severe co-morbidities of morbid obesity can lead to low self-esteem in some people.

Quality of life may impact on an individual's decision to seek surgery independent of psychiatric symptoms such as depression (Stout, Applegate, Friedman, Grant & Musante 2007). There are difficulties in comparing studies which have used different methods of assessing quality of life, even when examining studies focussing on weight-related quality of life.

Self-esteem is part of quality of life (QOL) which refers to an individual's level of satisfaction with the physical, psychological and social aspects of their life. Health related quality of life (HRQOL) refers to an individual's subjective evaluation of their health status and its impact on their general functioning (Mitchell & de Zwaan 2005). There are numerous methods of assessing these and some have been developed specifically for use in particular populations, including in obesity or morbid obesity (Duval, Marceau, Perusse & Lacasse 2006). Generic measures of quality of life allow comparison of results across different clinical populations; however, they may not detect problems specific to a condition (Karlsson, Taft, Sjostrom, Torgerson & Sullivan 2003). One condition-specific measure, the Impact of Weight on Quality of Life-Lite (IWQOL-Lite) tool assesses self-esteem specifically whereas others do not. The literature reviewed will focus on self-esteem and therefore on this tool rather than the other generic measures.

Self-esteem is an important part of an individual's perception of their quality of life. Unrealistic expectations of weight-loss are likely to contribute to feelings of low self-esteem in obese populations. It would be expected that the morbidly obese who have the greatest amount of weight to lose would suffer more in this respect. Wadden et al. (2006) found a significant difference in self-esteem scores between women with class I-II obesity who sought behavioural weight-loss treatment and women with class III obesity who sought surgical treatment. The latter group had higher scores indicating lower self-esteem. A significantly higher number of women with class III obesity reported symptoms of depression and psychiatric complications compared to those with class I-II obesity. As with the study by Ikeda et al. (2004) the authors did not include men and the differences may not be the same in obese men. There are likely to be different causes of low self-esteem due to obesity in men and women due to gender differences in society's expectations. Men may suffer more due to reduced ability to work and provide for their family, whereas women may suffer more due to society's pressures for women to be thin.

Gender differences in self-esteem and work-life as measured by the IWQOL-Lite tool are examined in a study by Kolotkin et al. (2001a). These authors studied obese subjects with different BMIs and varied treatment-seeking status to develop a shorter version of the Impact of Weight on Quality of Life tool (the IWQOL-Lite). The authors found that all five sections of the tool showed significantly higher scores (indicating poorer quality of life) for subjects with higher BMIs. The gender differences seen were mainly in the areas of self-esteem and sexual life and the differences seen between men and women were more marked at the lower BMIs and were much less marked at the higher BMIs ($\text{BMI} \geq 35 \text{ kg/m}^2$). Whilst it is useful to see results portrayed according to BMI classification and by gender, these results should be interpreted with caution. The demographic data for this study is given according to the original study from which the participants' data was drawn. These

included studies of the effects of obesity medication, an intensive lifestyle change programme, general community subjects, subjects seeking bariatric surgery and subjects from other obesity studies. Only 51 subjects out of the total 1987 (2.6%) were surgical candidates and of these only 11 were male. Although it can be assumed from the mean BMI data for the other categories that other subjects who were not seeking surgery also had a BMI ≥ 40 kg/m², the exact numbers of subjects within each BMI category are not provided. The total number of subjects (in particular the number of males) with a BMI ≥ 40 kg/m² may not be large enough to make the significant results reported in this category of value. It is not therefore advisable to draw conclusions from this paper about the detailed IWQOL-Lite scores given according to BMI and gender for each section of the tool. However the raw data does indicate that the gender differences seen for quality of life might vary according to BMI category. This warrants further more specific study with a larger defined number of subjects per BMI category.

Health-related quality of life (HRQOL) may differ among subgroups of obesity according to treatment seeking status (van Nunen, Wouters, Vingerhoets, Hox & Geenen 2007). These authors reviewed the literature examining differences in HRQOL in seekers of surgical treatment, seekers of non-surgical treatment and non-treatment seekers. They studied reports of studies of adults who were overweight, obese or severely obese and reported that the surgical treatment seeking population demonstrated very severely reduced HRQOL scores on all scales of the IWQOL-Lite tool. The authors identified five study populations; the general population, general obese people, non-treatment seeking obese people, conservative-treatment seeking obese people and obese people seeking bariatric surgery. They recognise that there is some overlap between the study populations used by different investigators. The general population included some obese and morbidly obese people, and the general obese population, who were recruited

purely on the grounds of their weight, would have included some people who were not actively seeking treatment and some who were. This may have biased the results, however the total sample size of over 6,000 subjects may offset this. The authors reviewed studies which assessed HRQOL with the IWQOL-Lite and those that used the SF-36 (Medical Outcomes Study 36 item short-form health survey) to assess quality of life. The latter tool is intended to assess general quality of life whereas the former assesses only weight-related quality of life. This allowed the authors to control for the effects of BMI and they found that the SF-36 detected reduced quality of life in the population seeking surgery, but not in the other populations studied, even after adjustment for weight. Their suggestion that some morbidly obese people suffer reduced quality of life due to emotional problems which are not entirely due to their weight and that for these people weight-loss alone will be insufficient to improve quality of life may support the findings of Vallis et al. (2001) and van Hout et al. (2004) concerning the psychological heterogeneity of the morbidly obese.

There may be inter-relationships between HRQOL and other psychosocial variables in morbidly obese people seeking bariatric surgery. Fabricatore et al. (2005) examined the relationships between BMI, HRQOL and depression in 306 people seeking bariatric surgery. These authors used validated tools to measure depression (Beck Depression Inventory (BDI)) and HRQOL (SF-36). They found that impairments in HRQOL were seen in over 40% of subjects and that those with impaired HRQOL (defined as score ≥ 1 standard deviation below national means) scored above the cut-off point for clinically significant depression and those without such impairment scored below this point regardless of their BMI. However, the authors measured subjects' weight but used subjects self-reported height to calculate BMI which is likely to have led to inaccuracies and reduces the value of the BMI findings. These authors categorised BMI within the overall group of the

morbidly obese (i.e. BMI 40-49.9 kg/m², BMI 50-59.9 kg/m², BMI ≥ 60 kg/m²) which is not seen in many studies and this would otherwise have been a useful feature of this study. This study demonstrates heterogeneity of HRQOL within the population seeking surgery and provides evidence of a link between depression and HRQOL. The authors conclusion that impairments in undertaking activities of daily living, difficulties fulfilling social and occupational roles and the experience of significant pain are stronger determinants of mood disorder than degree of extreme obesity may well be justified on the basis of these results. However, the conclusion that extreme obesity and depression are only weakly correlated until BMI reaches 60 kg/m² may not be justified.

Fabricatore et al. (2005) report no substantial differences between men and women in HRQOL or depression, however there may be gender differences in the numbers of people who inaccurately report height and weight which could have biased these findings. Kolotkin et al. (2008) also investigated gender differences in HRQOL in 794 subjects seeking bariatric surgery and aimed to understand why women are five times more likely to undergo bariatric surgery. Like the review by van Nunen et al. (2007), these authors used both the SF-36 and the IWQOL-Lite to measure HRQOL. The sample consisted of 674 women and 120 men and BMI was significantly ($p=0.013$) lower in women (46.3 kg/m²) than men (50.3 kg/m²). Women reported significantly ($p<0.001$) greater rates of depression (48.5%) than men (22.5%) as measured by a medical history obtained via questionnaire. Women had significantly more impairment on the IWQOL-Lite self-esteem ($p<0.001$), sexual life ($p=0.002$) and work ($p=0.004$) scales. The authors state that although overall studies on gender differences in HRQOL in bariatric surgery candidates have provided inconsistent results, this and other similar studies (White, O'Neil, Kolotkin & Byrne (2004); Karlsson, Sjostrom, Sullivan (1998), cited in Kolotkin et al. 2008) report self-esteem and sexual life gender differences using the IWQOL-Lite tool.

They suggest these may be particularly important factors in women seeking bariatric surgery. These results also provide further evidence that morbidly obese women seeking bariatric surgery are more likely to be depressed than men seeking surgery.

Stout et al. (2007) studied obese patients with a BMI ≥ 35 kg/m² who chose either an intensive residential cognitive-behavioural weight-loss programme (n=101) or bariatric surgery (n=76), to investigate the psychological factors which might underpin their choice. The authors hypothesized that patients seeking bariatric surgery would be more depressed, have more eating pathology and poorer weight-related quality of life. The selection process could not ensure that those choosing the residential programme had not previously been refused surgery and the ratio of females to males was higher in the surgical group. The residential group were significantly older ($p < 0.01$) than the surgical group. Strengths of the study are the authors use of validated tools to assess psychological state (Beck Depression Inventory (BDI), Binge-Eating Scale (BES), and IWQOL-Lite). Both the surgical and residential groups had similar mean BDI scores indicating mild depression. In the residential group there were no substantial differences between males and females for depression, however the females reported more emotional eating and greater impairment in their physical function and self-esteem quality of life because of their weight than did the males. There were no correlations in the surgical group between gender and depression, emotional eating behaviour or quality of life. The surgical group as a whole reported significantly greater ($p < 0.01$) negative impact of their weight on all areas of quality of life and more frequent episodes of emotional and binge-eating than the residential group. The gender differences seen were only in the non-surgical group suggesting that women suffer more emotional eating and poorer self-esteem at lower treatment-seeking status than men. This may support the findings of Kolotkin et al. (2001a) who suggested that gender differences in HRQOL as measured by the IWQOL-Lite were significant only at BMIs < 35 kg/m²

and are much less marked in the severely obese seeking surgery. Stout et al. (2007) found more emotional and binge-eating and greater impairment in weight-related quality of life in those choosing surgery than in those choosing behavioural treatment, even though BMIs and levels of depression were similar.

Stout et al. (2007) did not find any gender differences in the psychological variables reported by surgical candidates, which is similar to the findings of Fabricatore et al. (2005) but not the study by Kolotkin et al. (2008). This may have been due to different methods of classifying depression, since both Fabricatore et al. (2005) and Stout et al. (2007) used the Beck Depression Inventory whereas Kolotkin et al. (2008) used subjects' reports of a diagnosis of depression. This could indicate that Kolotkin et al. (2008) were capturing lifetime diagnoses of depression whereas the other authors were measuring current symptoms only, and there may be gender differences in the incidence of lifetime versus current depression.

In summary, most studies studying BMI by category rather than studying all obese subjects together, show that poorer quality of life is associated with higher BMI. Some studies show gender differences in quality of life and depression whilst others do not. The lack of consensus may be due to methodological differences. If men have better quality of life than women, their scores for anxiety, depression and disordered eating may also differ from those of women with similar BMIs. Men may seek surgery at higher BMIs than women do. Psychosocial indices that might predict outcomes after surgery may be different in men than in women.

Obesity and disordered eating

Stout et al. (2007) concluded that patients seeking bariatric surgery had greater emotional and binge-eating than patients seeking behavioural obesity treatment, despite similar BMIs and similar levels of depression. Eating behaviour before

surgery is believed to predict weight-loss after surgery (Kinzl et al. 2006). Kalarchian et al. (2007) examined 288 individuals seeking weight-loss surgery and found that 29.5% reported a lifetime eating disorder (mainly binge-eating disorder (BED) and 45.5% reported a lifetime mood disorder. They concluded that depression and BED may contribute to the development of severe obesity in vulnerable individuals. As some individuals report overeating or binge-eating when depressed and since depression is often recurrent, this shows how repeated episodes could contribute to weight gain over time. However, the high prevalence of both depression and binge-eating in this sample does not necessarily mean that either is caused by or is linked to the other.

van Hout et al. (2004) list differences in the eating behaviour of morbidly obese patients compared with the general population. These include compulsive or binge-eating behaviour (rapid consumption of large amounts of food, often accompanied by feelings of loss of control), grazing (eating smaller amounts of food continuously throughout the day), and mindless eating or frequent snacking on high-calorie foods and drinks. Morbidly obese patients may report greater levels of hunger and a long history of dieting and weight cycling which can contribute to feelings of low self-esteem. These authors state that many patients feel shame about their eating behaviours and may under-report these, if they believe admitting to them will result in them being denied bariatric surgery. This may be partly responsible for differences seen in studies investigating eating behaviours in obesity, particularly since most studies use self-report measures (van Hout et al. 2004).

Dieting failure may contribute to episodes of binge-eating and negative cognitions (such as "I cannot diet or lose weight, therefore I am a failure") which increases the risk of depression and obesity (Markowitz et al. 2008). Where this pattern is repeated several times over a long period it may contribute to the development of

morbid obesity alongside binge-eating, depression and low self-esteem. The experience of restricting calorie intake or “being on a diet” can contribute to low mood (Ikeda et al. 2004).

Dieting itself may be distressing for patients who use food to regulate emotions (Markowitz et al. 2008). Dieting, hunger and low mood can all lead to overeating or binge-eating (Yager 2008). These factors may be a dysfunction in a person’s ability to manage their thoughts, feelings and behaviours (Glinski et al. 2001). Negative emotional states may contribute to the disordered or binge-eating seen in some patients with morbid obesity. Walfish (2004) studied the contribution of emotional factors to weight gain in patients seeking surgery. Patients self-estimated how much negative emotional states (eating when anxious, tired, bored, stressed, angry and depressed or upset) contributed to their weight gain. Results indicated that some patients (40% in this group) are “emotional eaters”, whilst others are not (38% of these subjects indicated that emotional factors did not contribute greatly to their weight gain). As with depression, differences in the contribution of emotional factors to obesity in the morbidly obese population could explain the lack of a clear relationship between BMI and disordered eating.

Emotional eating and other eating behaviour factors were examined by Fabricatore et al. (2006). They studied 552 bariatric surgery candidates with extreme obesity (mean BMI 52.4 kg/m²). The authors administered a self-report questionnaire, The Weight and Lifestyle Inventory (WALI) which includes 24 items assessing the eating behaviour to which respondents attribute their excess weight. The authors found five factors which most reliably assessed eating behaviour in this group. These were:

1. eating in response to negative mood (eating when stressed, depressed/upset, angry, anxious, alone, bored or tired);

2. eating in response to positive mood and social and sensory cues;
3. general overeating and impaired appetite regulation (hunger, cravings and lack of satiety);
4. overeating at early meals (breakfast and lunch);
5. snacking between meals and after dinner.

Each factor was related to symptoms of binge-eating disorder and all but the second factor were linked to negative mood. There were no significant gender differences ($p=0.29$) and no correlation with BMI ($p\geq 0.13$). The authors administered the Beck Depression Inventory (BDI) and found significant differences between those who reported severe versus minimal symptoms of depression ($p<0.001$). Those with higher BDI scores (indicating more symptoms of depression) scored significantly higher on all factors ($p<0.05$) except eating in response to positive mood and social factors. The authors administered the Questionnaire on Eating and Weight Patterns (QEWP) and found that 45% of the sample had no binge-eating symptoms, 23% reported eating unusually large amounts of food but with no loss of control whilst eating, and 27% met full criteria for binge-eating disorder (BED). This latter group scored significantly higher ($p<0.001$) on the negative mood and snacking behaviour factors than people with fewer or no symptoms of BED. They also scored consistently higher for all other eating factors than those with no BED symptoms. Significant relationships ($p<0.05$) were found between the eating behaviour factors and both symptoms of depression as measured by the BDI, and binge-eating as measured by the QEWP. A weakness of the study is that using self report instruments relies on subjects having good insight into the factors which drive their overeating. However, this was a well conducted study which provides useful insights into typical factors driving eating behaviour in bariatric surgery candidates and shows these are significantly mediated by both depression and symptoms of binge-

eating disorder. It may be that these data could predict outcome after bariatric surgery.

This study suggests that the morbidly obese population seeking surgery are heterogenous in terms of disordered eating behaviour. This provides further support for the views of van Hout et al. (2004) who state that the morbidly obese are heterogenous in terms of psychological functioning, with some people much more negatively affected by their obesity than others. The study by Fabricatore et al. (2006) indicates that there are relationships between emotional eating factors, depression and BED. Markowitz et al. (2008) conclude that binge-eating is an important link between obesity and depression. They suggest that binge-eating can occur in response to low mood which leads to a cycle of weight gain and further low mood such that this mediator operates between the two in both directions.

Those with more binge-eating, emotional eating and depression before surgery may be less likely to achieve optimal surgical outcomes. However, some studies find no link between the presence of pre-surgical psychological difficulties and poorer outcome (Vallis et al. 2001) whereas others identify differences in outcomes between those who do and do not have pre-surgical psychological problems (Buddeberg-Fischer, Klaghofer, Sigrist & Buddeberg 2004). Psychological factors such as having high self-esteem, good mental health, good support networks, realistic expectations and undisturbed eating behaviours may be linked to successful surgical outcomes (van Hout, Verschure & van Heck 2005). Evidence from the Swedish Obese Subjects (SOS) study shows that following initial dramatic weight-loss during the first post-operative year, an average of 25% of this is regained between one and eight years after surgery, after which weight stabilises at the new higher level (Sjostrom et al. 2004). The weight regain is likely to be due to over-eating which may in turn be due to re-occurrence of some psychological factors

after surgery, possibly after the weight-loss period of 2 years after which many patients no longer receive follow-up.

In summary, the literature review of psychological characteristics of patients seeking bariatric surgery reveals that people with morbid obesity vary in psychological terms, with some patients much more negatively affected by their obesity than others. Several studies identify significant psychological differences between the morbidly obese and those with BMIs less than 40, however very few studies have focussed on further subdivisions of BMI within the group with BMI ≥ 40 kg/m². There is evidence of a two-way relationship between obesity and psychological factors such that obesity can be a cause or a consequence of these factors. Inter-relationships exist between psychosocial factors, for example the link between obesity and depression is often mediated by binge-eating, however the relationships may be different for men and women. There may not be simple correlations between BMI and any one psychosocial factor. To detect a relationship between BMI and psychosocial status it may be necessary to examine several factors together, for example depression scores alongside binge-eating and self-esteem. Methodological differences between studies including different methods of classifying obesity and measuring psychological factors, account for much of the differences seen in the results. Whether psychological factors can be used to predict surgical outcome remains to be determined.

Study aims and objectives

This study therefore aimed to extend the understanding of how depression, anxiety, self-esteem and disordered eating, as measured by the tools used in routine clinical practice at Leicester Royal Infirmary, were modulated by gender and BMI in patients seeking bariatric surgery. The expected benefit was to increase the understanding of factors linked with poorer bariatric surgery outcomes and to improve the surgical

team's decision making about patients' suitability for surgery as well as about the prescription of individually tailored psychological treatment programmes aimed at improving surgical outcomes.

The objectives were:

- to examine the correlations between BMI and anxiety, depression, self-esteem, and eating disorder scores in patients seeking weight-loss surgery;
- to examine the differences in anxiety, depression, self-esteem, and eating disorder scores between male and female surgical candidates.

The null hypotheses were:

1. there is no correlation between BMI and anxiety scores;
2. there is no correlation between BMI and depression scores;
3. there is no correlation between BMI and self-esteem scores;
4. there is no correlation between BMI and disordered eating scores;
5. there is no difference in anxiety scores between males and females;
6. there is no difference in depression scores between males and females;
7. there is no difference in self-esteem scores between males and females;
8. there is no difference in disordered eating scores between males and females; in patients seeking weight-loss surgery.

Method

Subjects

All subjects were patients referred to University Hospitals of Leicester NHS Trust at Leicester Royal Infirmary, who attended for pre-assessment for bariatric surgery between 1st January 2007 and 31st December 2008. As the ratio of males to females attending for pre-assessment was 1:4, in order to increase the likelihood of the results for both males and females being statistically significant it was decided to include all patients seen in a two year period for whom data collection was complete. The total number of subjects was 258 of which 199 were female and 59 were male.

Ethical approval was obtained from the Faculty Research Ethics Committee, Faculty of Health and Applied Sciences, University of Chester. A copy of the letter granting ethical approval is in the Appendix.

The study was deemed by the NHS to be an audit of existing data and as there was no actual involvement for subjects, and data was collected retrospectively, informed consent was not required for this study.

Design

The study design was a retrospective audit of data collected as part of routine clinical practice. The dependent variables were BMI and the scores for anxiety, depression, self-esteem and disordered eating. The independent variable was gender.

Materials

Height was measured using the Seca 240 Stadiometer. Weight and BMI were measured using the Marsden DP2400 BMI indicator scales.

The psychosocial tools used were

- Hospital Anxiety and Depression Scale (HADS) to measure anxiety and depression;
- Impact of Weight on Quality of Life-Lite (IWQOL-Lite) to measure self-esteem;
- Bulimic Investigatory Test, Edinburgh (BITE) to measure disordered eating.

Copies of the three tools can be found in the Appendix.

The HADS is validated for use in a wide variety of clinical areas and in the literature, including the literature on morbid obesity. It has 14 questions and is quick to administer and provides separate scores for anxiety and depression. The HADS was developed to detect anxiety and depression in surgical and medical outpatients (Zigmond & Snaith 1983). These authors reported that the anxiety and depression subscales were valid measures of the severity of emotional disorder. It is divided into an anxiety subscore and a depression subscore and symptoms of anxiety or depression relating also to physical disorder (eg dizziness, fatigue, headaches etc) are deliberately excluded. This makes it a useful tool for the present study since patients seeking bariatric surgery may report a variety of physical symptoms (Fabricatore et al. 2005) which would otherwise interfere with the results seen for depression and anxiety. Bjelland, Dahl, Haug and Neckelmann (2002) reviewed the literature on validity of the HADS and concluded that there was good correlation between the HADS and other tools such as the General Health Questionnaire. The HADS performed well in detecting cases and severity of symptoms of anxiety and depression, in the general population and in a range of medical, psychiatric and primary care patients. Lowe et al. (2004) compared the validity of the HADS with two other depression screening questionnaires in 501 subjects and concluded that the HADS can be recommended to detect depression in clinical practice and

confirmed the accuracy of the recommended clinical cut-off point of a score of 8 or more to detect “any depression”.

Scoring is as follows:

Anxiety score – sum of the answers to the odd numbered questions.

Depression score - sum of the answers to the even numbered questions.

The maximum score for each scale is 21. A score of 0-7 is considered normal and scores above this level would suggest mild or “possible cases” (8-10), moderate or “probable cases” (11-14) and severe cases (15 and over) (Zigmond & Snaith 1983).

The IWQOL-Lite is an obesity specific tool measuring quality of life in five domains (physical function, self-esteem, sex life, public distress and work/home life) and is a short form of the original IWQOL which is used less often due to its length. Kolotkin, Crosby, Williams, Hartley and Nicol (2001b) studied the health related quality of life (HRQOL) changes in obese patients attending an outpatient weight reduction programme and correlated changes in IWQOL-Lite scores with weight changes. They demonstrated that weight changes were significantly correlated with changes in IWQOL-Lite scores for all five subscales. Self-esteem and physical function were most strongly affected by weight-loss. Their subjects had an average BMI of 41 kg/m² at the start of the study although they were not seeking weight-loss surgery, demonstrating that the tool has been tested in morbidly obese patients as well as in the obese. The IWQOL-Lite is accurate in assessing post-surgical changes in QOL (Dymek, le Grange, Neven et al. 2002). Duval et al. (2006) reviewed a range of obesity specific QOL questionnaires and concluded that the IWQOL-Lite results correlated well with BMI and with a range of other QOL tools. The tool showed good test-retest reliability and good support for construct validity.

For this study the score used was the sum of the scores given in the section titled self-esteem, which has seven questions. Possible scores range from 7-35 with categories as follows:

“Because of my weight my self-esteem is never (7-10), rarely (11-17), sometimes (18-24), usually (25-31) or always (32-35) negatively affected” (Kolotkin, Crosby, Kosloski & Williams 2001a).

The BITE is a 33-item self-report questionnaire, designed as an objective screening test for use in a wide variety of settings to identify subjects with symptoms of bulimia or binge-eating. The threshold for clinical significance is symptom score of 20 or more (Nakazato et al. 2004).

Henderson and Freeman (1987) developed the BITE to detect clinical and subclinical cases of binge-eating and to cover all items in the DSM-III definition of bulimia. They used data from two separate populations to study the questionnaires face validity and acceptability, and validity (sensitivity and reliability and ability to identify cases accurately). They initially studied a group of binge-eaters and a group of controls and found that the BITE detected 14 out of 15 binge eaters and 2 out of 40 controls, which was highly significant ($p=0.00001$). The detection of 5% of the controls as binge-eaters may have been an accurate detection since the control subjects were hospital staff and medical students rather than subjects known not to be binge-eaters. In the second study, BITE scores were above the cut off of 25 for all 32 binge-eaters and scores were all below this level for the 32 controls, and the differences were highly significant ($p<0.001$), thus demonstrating the tool's ability to accurately identify cases of binge-eating. The authors conclude that the tool is able to detect binge-eaters and non binge-eaters as well as detect less severe cases. It is sensitive to changes in symptoms and behaviour so can be used to measure

response to treatment. It is easy to use and score and the tool was acceptable to the subjects.

The value of this tool in clinical practice in the obesity clinic is that it provides separate scores for underlying thinking and for current eating behaviour in a short tool. Although not designed for obesity the BITE is easily administered with a small amount of explanation by the Dietitian.

For this study the total score for underlying thinking about food (symptom scale) will be used. All questions except 6, 7 and 27 make up the symptom scale.

Underlined questions (1, 13, 21, 23, 31) score one point for a “No” response.

The remaining 25 questions score one point for a “Yes” response. The maximum score is 30. Scores are categorised as follows:

0-9 (indicates no compulsive or binge-eating),

10-19 (indicates an unusual eating pattern which could include compulsive eaters who eat excessively but do not binge-eat. A score of 15-19 should be followed up as this may reflect a sub-clinical group of binge-eaters)

20+ (indicates a highly disordered eating pattern and the presence of binge-eating) (Henderson & Freeman 1987).

All three tools were chosen for use in routine pre-assessment for surgery as part of clinical practice because they are acceptable to patients and can be completed whilst waiting to be seen or during the appointment itself. They were not selected specifically for this study.

Procedure

All data collection was carried out by the lead researcher. A pilot study was carried out on a random selection of 30 patients (23 female and 7 male) in order to assess the time required to collect the data and to check that the data sheet recorded all

the information necessary to complete the analyses required. Data was collected by selecting the relevant patient dietetic record card and recording the scores on the attached tools (HADS, IWQOL-Lite, BITE) onto the data collection sheet. The data collected included BMI to one decimal place, age and gender (taken from the dietetic record itself), and HADS anxiety score, HADS depression score, IWQOL – Lite self-esteem score, and BITE symptom score (taken from the tools attached to the record). The pilot showed the data sheets included all necessary information and that data could be collected in 2-3 minutes per patient. Statistical analyses (see below) were run for the pilot data.

The data sheet was modified for the main study as follows:

1. To ensure data was collected for all patients who were pre-assessed in the time period selected without duplication, the date of assessment and the hospital unit number were also recorded.
2. Since the aim was to stop collecting data when sufficient data on males was available, data was recorded on separate sheets for males and females and subject numbers were assigned M1, F1 etc.

An example of the data sheet can be found in the Appendix.

The data was stored in a locked drawer in the Dietetic Department until data collection was complete. The current list of objectors to audit for patients seen at Leicester Royal Infirmary was obtained. It was established that none of the subjects whose data had been collected for this study had registered their objection to their data being used, before the patient identifiable data (hospital unit number and date of pre-assessment) were discarded.

Statistical Analyses

Data was analysed as follows, using SPSS version 14 (see Appendix/Glossary):

All data was checked for normal distribution and homogeneity of variance before statistical analyses were carried out. This showed that non-parametric tests were appropriate.

Spearman's correlations were used to investigate the relationship between BMI and self-esteem, BMI and anxiety, BMI and depression and BMI and eating behaviour. Mann-Whitney U tests were used to investigate whether there was a difference between scores for self-esteem, anxiety, depression, eating behaviour and BMI in males and females.

Significant results were identified by a p value of 0.05 or less indicating that there was at least a 95% confidence that the correlations or differences seen were not due to chance (Williams & Wragg 2004).

Results

Table 1. shows the descriptive statistics for the 258 subjects studied.

Table 1. Subject descriptive statistics.

	Male n=59	Female n=199
Median Age (years)	44	40
Age range (years)	21-61	16-61
Median BMI (kg/m ²)	49.5	46.0
BMI range (kg/m ²)	34.2-74.3	34.1-78.7

Tests for correlations between BMI and the psychosocial variables

Spearman's correlations were used to investigate the relationship between BMI and self-esteem, BMI and anxiety, BMI and depression and BMI and disordered eating.

There was no significant relationship between BMI and anxiety ($p=0.532$), BMI and depression ($p=0.106$), BMI and self-esteem ($p=0.788$) or BMI and disordered eating ($p=0.081$).

The results of the Spearman's tests for correlation between BMI and the psychosocial variables are shown in Table 2.

Table 2. Results of Spearman's correlations between BMI and the psychosocial scores

Variables	Spearman's correlation coefficient	P value
BMI / HADS anxiety score	-0.39	0.532
BMI / HADS depression score	-0.101	0.106
BMI / IWQOL self-esteem score	-0.017	0.788
BMI / BITE symptom score (disordered eating)	-0.109	0.081

n=258

All correlation coefficients indicate a low or very low negative correlation (Cohen & Holliday 1996) between the variables, however the p values are all above $p=0.05$ indicating none of these relationships are significant.

Tests for difference in the psychosocial variables between males and females

Mann-Whitney U tests were used to investigate the differences in scores for anxiety, depression, self-esteem, disordered eating and BMI between males and females.

Table 3. Results of Mann-Whitney U tests for gender differences

Variable	Female median n=199	Male median n=59	P value
BMI (kg/m ²)	46.0	49.5	0.001
Anxiety score	12	9	0.004
Depression score	10	8	0.03
Self-esteem score	33	28	0.0005
Disordered eating score	14	13	0.028

The table shows results of the Mann-Whitney U tests for gender differences in BMI and the psychosocial scores. A p value of 0.01 was used to indicate significance. There was a significant difference in BMI ($p=0.001$) between males (median 49.5 kg/m²; range 34.2-74.3 kg/m²) and females (median 46.0 kg/m² range 34.1-78.7 kg/m²). There was a significant difference in HADS anxiety score ($p=0.004$) between males (median=9; range 0-18) and females (median=12; range 0-21) and in IWQOL-Lite self-esteem score ($p=0.0005$) between males (median=28; range 7-35) and females (median=33; range 7-35). There was no significant difference in HADS depression score ($p=0.03$) between males (median=8; range 1-17) and females (median=10; range 0-20) or in BITE disordered eating score ($p=0.028$) between males (median=13; range 1-27) and females (median=14; range 1-27).

Figure 1. shows the gender differences in BMI.

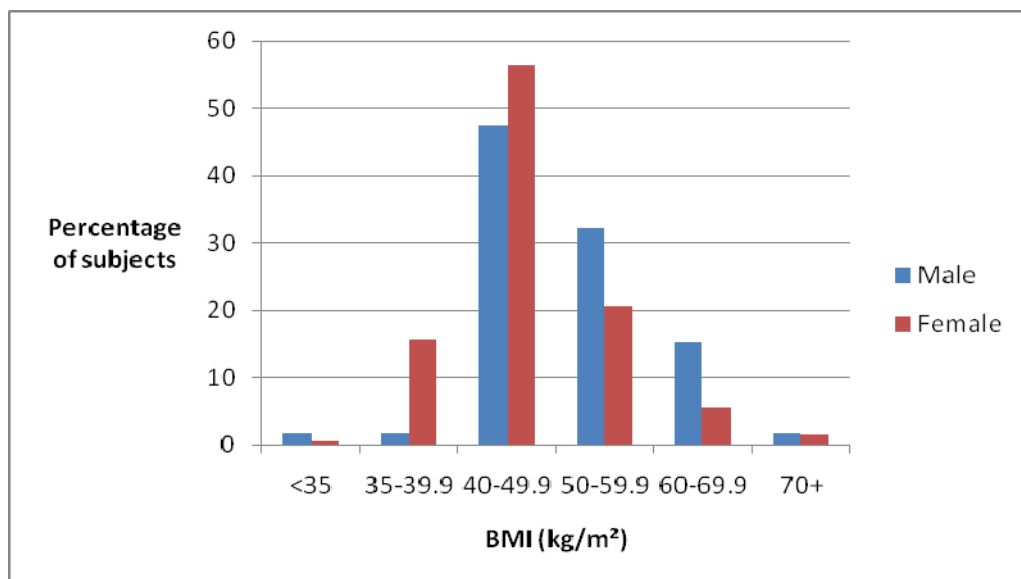


Figure 1. Gender differences in BMI

Figures 2-5 show the gender differences in psychosocial scores in terms of their clinical significance.

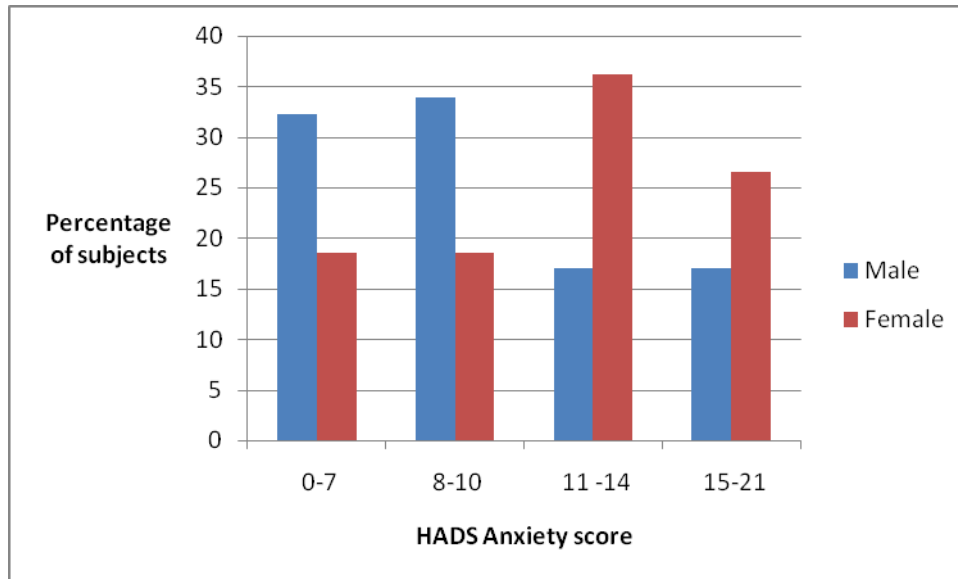


Figure 2. Gender differences in HADS anxiety scores

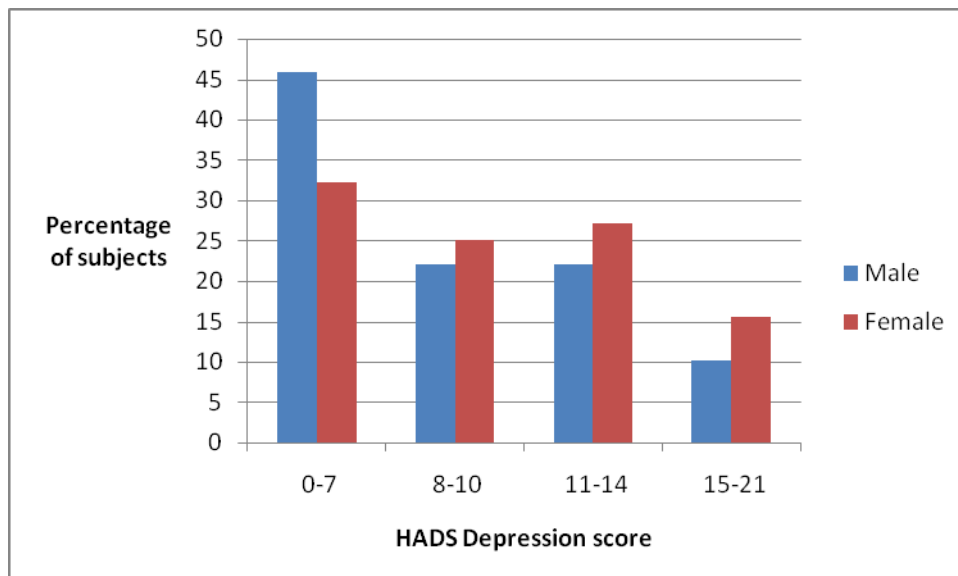


Figure 3. Gender differences in HADS depression scores

HADS scoring is as follows:

0-7 is considered normal;

8-10 indicates mild or “possible cases”;

11-14 indicates moderate or “probable cases”;

15-21 indicates severe cases of anxiety and/or depression

(Zigmond & Snaith 1983). A copy of the HADS is included in the Appendix.

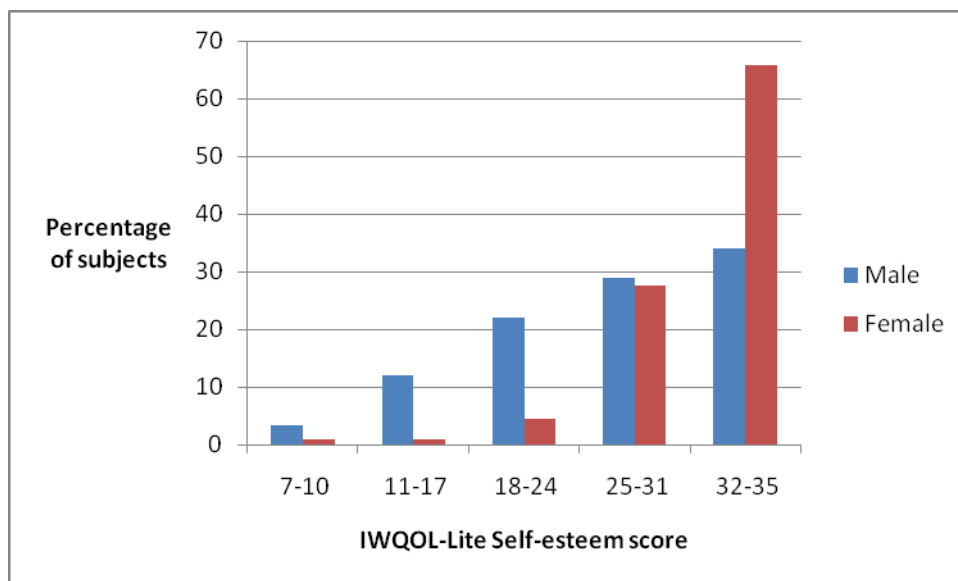


Figure 4. Gender differences in IWQOL-Lite self-esteem scores

IWQOL-Lite scoring is as follows:

“Because of my weight my self-esteem is never (7-10), rarely (11-17), sometimes (18-24), usually (25-31) or always (32-35) negatively affected” (Kolotkin, Crosby, Kosloski & Williams 2001a). A copy of the IWQOL-Lite is included in the Appendix.

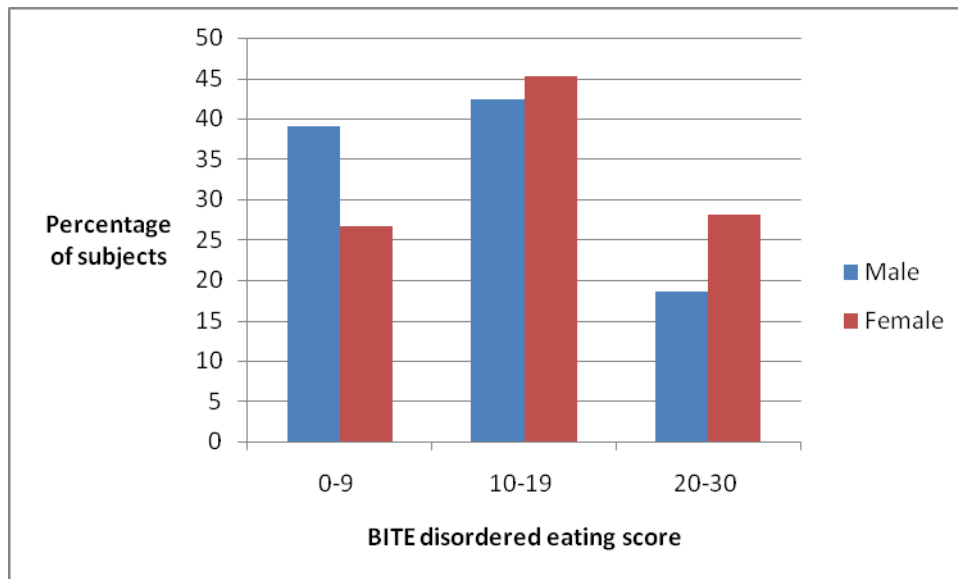


Figure 5. Gender differences in BITE disordered eating scores

BITE scoring is as follows:

0-9 indicates no compulsive or binge-eating;

10-19 indicates an unusual eating pattern which could include compulsive eaters who eat excessively but do not binge-eat;

20-30 indicates a highly disordered eating pattern and the presence of binge-eating (Henderson & Freeman 1987). A copy of the BITE is included in the Appendix.

Discussion

This study found no relationship between BMI and anxiety, depression, self-esteem or disordered eating in patients seeking weight-loss surgery. There was no significant difference between males and females for depression or disordered eating. Females had significantly more anxiety and significantly lower self-esteem than males. Males had a significantly higher BMI than females. Of the eight null hypotheses (see page 23), only two (there is no difference in anxiety scores between males and females and there is no difference in self-esteem scores between males and females) can be rejected.

The lack of relationship between BMI and psychosocial factors in the present study is consistent with the lack of evidence to support routine psychological assessment reported by NICE (2006). These findings also support the theory of van Hout et al. (2004) that the morbidly obese are heterogeneous in psychological terms. The results seen spanned the entire range possible for HADS anxiety (0-21) and IWQOL-Lite self-esteem (7-35) and nearly the entire possible range for HADS depression (0-20) and BITE symptom scale (range 1-27 where scores of 0-30 are possible). This result may also accord with the findings of Vallis et al. (2001) who studied patients seeking surgery and identified profile groups with low, medium and high psychological functioning but found no difference in pre-surgical weight between the groups. Vallis et al. (2001) used different tools than the present study to measure psychological function so the results cannot be compared directly, however the sample used was broadly similar in terms of BMI to the present study (48.1 vs.49.1 kg/m²).

The present study found that men had a significantly higher BMI than women (Table 1), a finding similar to that reported elsewhere for both surgical candidates (Kolotkin et al. 2008) and those seeking non-surgical obesity treatment (Friedman et

al. 2002). Figure 1 shows that 49% of men had a BMI ≥ 50 kg/m² but only 28% of women fall into this category. The present study also supports the findings of Kolotkin et al. (2008) that women are significantly more likely to seek surgery than men and that women seeking surgery are younger than their male counterparts (Table 1). Together with the gender differences in psychosocial scores, these facts may suggest that women's reasons for seeking surgery could be based more on their psychosocial distress than their BMI, whereas for men these priorities may be reversed, and also that psychosocial distress may be a stronger motivation for seeking surgery than high BMI alone. However the relationships and gender differences examined in the present study do not provide evidence to support this theory, and the study was not designed to investigate motivation for seeking surgery.

These results do not accord with the findings of Delahanty et al. (2002) who reported correlations between higher BMI and various psychosocial factors such as greater emotional and binge-eating and more perceived stress. However, the mean BMI was significantly lower in the study by Delahanty et al. (2002) than the present study (33.9 vs. 49.1 kg/m²), and subjects all had impaired glucose tolerance and were lifestyle intervention participants rather than patients seeking surgery. "Higher BMI" in the present study therefore refers to a much greater BMI than that referred to by Delahanty. The population studied by these authors was therefore not comparable with the present study population of bariatric surgery candidates. The findings of Delahanty et al. (2002) might suggest that there are correlations between BMI and psychosocial factors but these are more marked at lower BMIs.

Depression and anxiety

The present study found no significant correlation (Table 2) between BMI and depression ($p=0.106$) or BMI and anxiety ($p=0.532$). There was no significant difference (Table 3) between HADS depression scores for men and women ($p=0.03$), however females (median anxiety score=12) were significantly ($p=0.004$) more likely to be anxious than males (median anxiety score =9).

The results for the whole sample show median HADS depression scores of 9 indicating possible depression and median HADS anxiety scores of 11 indicating probable anxiety. In terms of the clinical significance of these results, 56% of subjects scored above the cut-off point for probable anxiety and 40% of subjects scored above this point for probable depression. 24.4% of subjects scored above the cut-off score indicating severe anxiety and 14% scored above this point for depression (Zigmond & Snaith 1983).

Analysis of the gender differences by clinical category shows clear differences between men and women for anxiety but these are less marked for depression (figures 2 and 3), reflecting the statistical differences outlined above. The majority of women had either moderate (36.2%) or severe (26.6%) anxiety whereas the majority of men had either no anxiety (32.2%) or mild anxiety (33.9%). For depression, 45.8% of males and 32.2% of females had no depression and 42.7% of females compared with 32.2% of males had moderate or severe depression.

Onyike et al. (2003) found that people with BMI ≥ 40 kg/m² were significantly more depressed than people of lower weights. Specifically, depression was detected in 2.8% of their normal weight sample, 2.4% of their overweight sample, 3.6% of those with obesity class I, 4.8% of those with obesity class II and 12.5% of those with obesity class III (BMI ≥ 40 kg/m²). Depression rates rose with degree of obesity but there was a far more significant rise for those with morbid obesity. Results for the

present study are not directly comparable since the HADS tool measures current symptoms of depression only using a self-report questionnaire whereas Onyike et al. (2003) used a structured psychiatric interview based on criteria in Diagnostic and Statistical Manual of Mental Disorders Third edition (DSM-III) (American Psychiatric Association 1980). The present study sample were all seeking bariatric surgery whereas it is not known what proportion of the morbidly obese population sample studied by Onyike et al. (2003) may have been actively seeking surgery. Some authors have reported that prevalence of psychological difficulties is highest in the morbidly obese seeking surgery (Wadden et al. 2006), thus it might be expected that the present study would detect higher rates of depression than that of Onyike et al. (2003). The prevalence of 14% of surgical candidates with severe depression detected by the present study may reflect a similar finding to that of Onyike et al. or it may be that the HADS cut-off point which more closely reflects the DSM-III criteria is that described as probable (including severe) depression which was detected in 40% of the present study sample. This contrasts with mean HADS scores of 5 for anxiety and 4.1 for depression, scores which are in the normal range, in women awaiting surgery for incontinence (Innerkofler et al. 2008), suggesting that distress levels in women awaiting other types of surgery may be substantially less than for those awaiting bariatric surgery.

Kalarchian et al. (2007) found that 24% of bariatric surgery candidates had anxiety and 15.6% had depression at the time of pre-operative evaluation. These results accord well with the present study's findings of 24.4% of subjects reporting severe anxiety and 14% severe depression using the HADS tool criteria. The present study results support the findings of Kalarchian et al. (2007) that anxiety was the most prevalent psychiatric disorder at the time of pre-operative evaluation for bariatric surgery. However, like Onyike et al. (2003), Kalarchian et al. (2007) used a structured interview using DSM-IV criteria to measure depression rather than a self-

report tool as in the present study. Kalarchian et al. (2007) also report no gender differences in the prevalence of psychiatric disorders which does not accord with the present study findings and may be due to different methods of selecting subjects. Although the proportion of males and females in Kalarchian's study was similar to that in the present study, the authors included only subjects who consented to participate whereas the present study used all patients available as consent was deemed to be unnecessary. It may be that the two studies are not sufficiently comparable to make the similarity of findings meaningful, however Kalarchian et al's (2007) statement that anxiety is more prevalent than depression at pre-operative evaluation may support the findings of the present study.

Onyike et al. (2003) also found that the association between morbid obesity and depression is stronger in women than in men. The present study found that 42.7% of morbidly obese women met HADS criteria for probable (including severe) depression and 15.6% met the criteria for severe depression, whereas these figures were 22% and 10% respectively in men (Figure 3). This data contrasts with the findings of Onyike et al. (2003) who found depression in 13% of females and 11.5% of males with morbid obesity, although not all of Onyike's subjects were seeking surgery so their results should not be directly compared with the present study. The findings of Onyike et al. (2003) also contrast with Wadden et al. (2006) who reported that approximately 25% of women seeking surgery would have benefited from treatment for depression. These latter authors used the Beck Depression Inventory (BDI) to measure depression which like the HADS is a self-report questionnaire and classifies respondents as having minimal, mild, moderate or severe symptoms of depression. Analysis of the authors' results indicates that 17% of morbidly obese women had moderate depression and a further 10% had severe depression, indicating that all subjects in these two categories were considered to require treatment. There is a marked disparity between the findings of Wadden et al.

(2006) and the present study which could be explained by differences in the depression tools used. The HADS tool was designed to exclude items which would detect somatic complaints (Zigmond & Snaith 1983) whereas the BDI includes both cognitive and somatic items. Munoz et al. (2007) compared the means of the cognitive and somatic items on the BDI and concluded that patients seeking surgery were more likely to endorse somatic complaints, which may not be indicative of depression, than the cognitive items. Use of the HADS tool removes this potential bias in these patients, however these differences mean that depression data collected using these two tools cannot be directly compared. Morbidly obese women in the Wadden et al. (2006) study had a higher mean BMI than women in the present study (52.6 kg/m² and 47.4 kg/m² respectively) so there are other reasons why the two study populations are not directly comparable.

Self-esteem

The present study found no significant correlation ($p=0.788$) between BMI and self-esteem (Table 2), however females (median=33; range 7-35) had significantly lower self-esteem ($p=0.0005$) than males (median=28; range 7-35) (Table 3). The median IWQOL-Lite self-esteem score for the whole sample was 33. The range of scores possible is 7-35 and 33% of subjects scored 35 indicating the lowest possible self-esteem. 58.5% reported that because of their weight their self-esteem was always negatively affected. This strongly suggests this study population as a whole had low self-esteem, even though there are no clinical cut-offs suggested for this tool. Analysis of these scores by categories shows that the proportion of subjects in each frequency category rises exponentially from the lowest to the highest frequency. The proportion of subjects stating their self-esteem is never, rarely, sometimes, usually and always negatively affected by their weight are 1.6, 3.5, 8.5, 27.9 and 58.5% respectively.

The differences are even more marked when separated by gender. 65.8% of females and 33.9% of males reported that their self-esteem was always negatively affected by their weight. In total 6.5% of females compared to 37.3% of males reported that their self-esteem was never, rarely or only sometimes negatively affected by their weight (Figure 4).

Kolotkin and Crosby (2002) are the only authors to report raw IWQOL-Lite data for bariatric surgery candidates. Their mean self-esteem scores are 26.6 which is substantially higher than their normal weight community control sample who scored 9.7. These results are cited by Mitchell and de Zwaan (2005) and these authors do not provide detail of gender differences or details of the study sample. Kolotkin and Crosby's (2002) results are lower than the median score of 33 seen in the present study, indicating their subjects had better self-esteem than subjects in the present study. Possible explanations for these differences could include sample differences in terms of demographic detail such as mean age and BMI. The median self-esteem value of 33 in the present study may not be comparable with the mean values from Kolotkin and Crosby's study but Mitchell and de Zwaan do not cite further statistical detail. Some patients may have been excluded from Kolotkin and Crosby's (2002) study due to psychiatric history, other illness or pregnancy which could have made them unsuitable for surgery. Since self-esteem may be lower in people with mental or physical health problems, excluding these subjects would predict a higher self-esteem. In the present study the only exclusions were subjects with incomplete data. Thus unknown sample exclusions could explain why the present study results indicate lower self-esteem than in the study by Kolotkin and Crosby (2002). Anxiety may be more prevalent at the time of pre-operative evaluation for surgery (Kalarchian et al. 2007). If Kolotkin and Crosby had administered the IWQOL-Lite tool at a different stage of the patient journey after patients had been accepted for

surgery, this could also explain why the present study results indicate lower self-esteem.

Like Friedman et al. (2002), the present study found that women were more depressed, had lower self-esteem and were more likely to binge-eat than men (Figures 3-5). However the study populations are not comparable since Friedman et al. (2002) did not study patients seeking surgery and mean BMIs of the sample were significantly lower than in the present study. Friedman et al. (2002) do not provide sufficient data on their morbidly obese subjects to make this a useful study for comparison and their paper does not provide evidence for their statement that degree of obesity is related to lower self-esteem and higher levels of depression.

Ikeda et al. (2004) studied dieting experiences of larger women and concluded that these were more frequent and more likely to contribute to low self-esteem in women with higher BMIs. However they did not stratify women using accepted BMI categories but instead examined those with a BMI ≥ 55 kg/m² and those with a BMI below this level, so that their results cannot be compared with a sample of patients seeking surgery.

Wadden et al. (2006) found that self-esteem in women was lower in those with class III obesity who were seeking surgery compared with those with class I-II obesity seeking behavioural treatment for their weight. The authors used the Weight and Lifestyle Inventory (WALI) to measure self-esteem and whilst this is an obesity-specific tool the results are not comparable with those collected using the IWQOL-Lite tool. The present study did not examine the group of people not seeking surgery and Wadden et al. (2006) did not differentiate between categories of morbid obesity above BMI ≥ 40 kg/m² so the samples are not directly comparable.

Kolotkin et al. (2001a) reported gender differences in self-esteem and the differences seen between men and women were more marked at the lower BMIs and were much less marked at the higher BMIs (BMI \geq 35 kg/m²). Both this study and the present study found that women had significantly lower self-esteem than men (Figure 4). The fact that there was no relationship between BMI and self-esteem in the present study contrasts with the findings of Kolotkin et al. (2001a) who reported a correlation of 0.34 ($p < 0.001$). The discrepancy may be due to sampling differences since only a small percentage of Kolotkin et al's subjects studied were surgical candidates whereas all the subjects in the present study were seeking surgery. Since the gender differences reported by Kolotkin et al. (2001a) were more marked at lower BMIs, the fact that the present study did not detect these differences may be because it did not include people with BMIs below 34 kg/m², whereas Kolotkin et al. studied subjects with BMIs ranging from <25 to >40 kg/m².

It may be that the relationship between obesity and self-esteem is mediated by factors other than BMI (Markowitz et al. 2008). This may be particularly true of people seeking surgery, some of whom are more distressed by their weight than people with lower grades of obesity (van Hout et al. 2004). It is possible that more detailed statistical analysis of several psychosocial factors together would have revealed more correlations between the variables, however this was beyond the scope of the present study.

van Nunen et al. (2007) conducted a meta-analysis of studies of HRQOL in obesity using the IWQOL-Lite, however they present their data only after transformation into a scale of 0-100 and therefore the results cannot be compared directly with data from the present study.

Fabricatore et al. (2005) studied the relationships between BMI, HRQOL and depression in surgical candidates. They did not measure self-esteem alone or use the IWQOL-lite tool to measure HRQOL. Their conclusion that HRQOL is related to depression in surgical candidates may be justified, however this level of analysis was beyond the scope of the present study. The authors conclusion that extreme obesity and depression are only weakly correlated until BMI reaches 60 kg/m² may support the lack of relationship seen in the present study, since only a small percentage of the present study subjects had a BMI above this level. However the findings of Fabricatore et al. (2005) in relation to BMI should be interpreted with caution since these authors used measured weight but self-reported height to measure BMI which is likely to reduce the accuracy of their results.

Kolotkin et al. (2008) also used the IWQOL-Lite tool to investigate gender differences in HRQOL in surgical candidates. The sample were similar to the present study in terms of mean BMI (male BMI = 50.3 kg/m²; female BMI = 46.3 kg/m²) although the proportion of men (17.8%) was lower than in the present study (22.8%). Their conclusion that female surgical candidates had reduced self-esteem compared to their male counterparts may be justified; however, once again the authors do not present their raw IWQOL-Lite scores so this study cannot be compared with the present one. These authors present their results in terms of gender and number of co-morbidities of obesity. Their findings that women have significantly greater depression than men, whereas men have significantly more medical co-morbidities such as sleep apnoea, may be another factor responsible for some of the psychosocial differences seen in men and women seeking surgery.

Stout et al. (2007) studied obese individuals with a BMI \geq 35 kg/m² who selected either a residential obesity treatment programme or bariatric surgery. Their finding that IWQOL-Lite scores were not normally distributed was also found in the present

study. This fact led the authors to exponentially transform these data before analysis and this again means their data cannot be compared with the present study. Both Stout et al. (2007) and Kolotkin et al. (2001a) report that gender differences in IWQOL-Lite self-esteem scores are not significant in surgical candidates. The former authors report these differences are significant only in subjects with severe obesity who are seeking residential obesity treatment rather than surgery, and the latter authors report these differences are significant only in people with BMIs < 35 kg/m², and neither of these groups of subjects were included in the present study. The present study however did find a significant gender difference in that women had significantly lower self-esteem than men (Figure 4). Kolotkin et al. (2001a) presented results by BMI category, however only a small percentage of their sample with a BMI ≥ 40 kg/m² were seeking surgery so their sample is not comparable with the present study. Stout et al. (2007) recognised that there may have been some overlap between their two study groups since it was not possible to ensure patients choosing residential treatment had not previously been refused surgery elsewhere. Their surgical sample was smaller than in the present study (n=76 and n=258 respectively). Factors influencing the referral of patients for surgery in Britain in the National Health Service may be different to the selection process in the USA where health insurance is required, and this may also contribute to unidentified differences between the two study groups which could have led to differences in the results seen.

Eating behaviour

The present study found no significant correlation (Table 2) between BMI and disordered eating (p=0.081) and although BITE scores for disordered thoughts and feelings relating to food were higher in females (median=14; range 1-27) than in males (median=13; range 1-27) the difference was not significant (p=0.028) (Table 3). The median BITE disordered eating score was 14 which is above the normal

range of 0-9 and indicates “compulsive or excessive eating rather than binge-eating behaviour” (Henderson & Freeman 1987). 26% of subjects scored above the clinical cut-off of 20 which indicates highly disordered eating behaviour (Figure 5). A further 22% scored 15-19 which may indicate sub-clinical binge-eating behaviour (Henderson & Freeman 1987). Henderson and Freeman (1987) administered the BITE in 32 normal controls (i.e. subjects not known to binge-eat) and reported that the mean symptom scale score was 2.9, with all but 1 subject scoring between 0 and 7. This contrasts with the present study in which only 30% of subjects scored in the normal range of 0-9. This suggests there is a significant difference between “normal” subjects and those in the present study, however Henderson and Freeman (1987) do not report the BMIs of their subjects and it is possible that these figures would not be representative of today’s “normal” or non-binge-eating subjects since the authors developed this tool before the onset of the current “obesity epidemic”. Compulsive or excessive eating behaviour may be more prevalent in morbidly obese people seeking surgery than in the control subjects studied by Henderson and Freeman (1987).

Analysis of the gender differences in BITE scores by clinical category (Figure 5) reveal that similar proportions of subjects scored 10-19 indicating excessive eating but not binge-eating behaviour (45.2% of females and 42.4% of males). More females (28.1%) than males (18.6%) scored in the 20-30 category indicating highly disordered or binge-eating. More males (39%) than females (26.6%) scored 0-9 indicating no disordered eating. Therefore there are clinically significant if not statistically significant gender differences in binge-eating behaviour.

Kalarchian et al. (2007) found that 29.5% of surgical candidates reported a lifetime eating disorder, (mainly binge-eating disorder (BED)) but only 16.3% had a current eating disorder. These authors did not find any significant differences between

males and females which accords with most of the findings of the present study. Subjects in the present study were asked to complete the severity scale of the BITE tool in terms of their behaviour in the last three months, however this scale was not used for the present study. Subjects may have recorded their lifetime thoughts and feelings around eating (the symptom scale used in the present study). This could explain why the present study results are similar to the lifetime rather than the current eating disorder incidence reported by Kalarchian et al. (2007). 26% of the present study subjects scored in the 20-30 BITE category indicating binge-eating behaviour, which is a similar proportion to the lifetime eating disorder incidence but significantly higher than the current incidence as reported by Kalarchian et al. (2007).

Stout et al. (2007) reported greater emotional eating in surgical candidates than in a residential obesity treatment group. Stout et al. (2007) used the Binge-Eating Scale (BES) rather than the BITE used in the present study. The Binge-Eating Scale measures binge-eating and associated feelings of guilt and distress about overeating. Since the BITE was designed to detect symptoms of bulimia nervosa it also measures frequency of binge-eating and disordered thoughts and feelings relating to food (Henderson & Freeman 1987). The BITE has a separate scale measuring binge-eating and weight control behaviours such as vomiting and laxative use, however the scores measuring frequency of these behaviours were not included in the present study. The BITE score used in the present study represents disordered thoughts and feelings associated with eating, however the questions have Yes or No responses only so the tool detects these without measuring their frequency. There are likely to be some similarities between the BITE and BES but the scores are unlikely to be directly comparable. Stout et al. (2007) report that mean scores on the BES suggest that the surgical group reported more frequent episodes of emotional and binge-eating than the residential treatment group. The

BITE scores used in the present study show slightly more disordered thoughts and feelings relating to food in women than in men seeking surgery but this does not imply more frequent disordered eating behaviour as detected by the BES in the study by Stout et al. (2007). In addition, Stout et al. (2007) compare two groups with different treatment-seeking status which is not the case in the present study. Their data cannot be compared directly with the data from the present study.

van Hout et al. (2004) state that many surgical candidates feel shame about their eating behaviours and may under-report these. The BITE tool includes a question asking whether people feel very guilty if they overeat (see Appendix) but it was beyond the scope of the present study to examine the frequency of answers to individual questions on the psychosocial tools used.

Walfish (2004) found that 40% of surgical candidates could be identified as emotional eaters but a similar proportion reported that emotional factors did not contribute significantly to their weight (38%). Although the author did not examine the relationship of these findings to BMI these results may support the views of van Hout et al. (2004) that the morbidly obese are a heterogeneous group in psychological terms. As with depression, differences in the contribution of emotional factors to obesity in surgical candidates could explain the lack of a clear relationship between BMI and disordered eating found in the present study.

Fabricatore et al. (2006) used the Questionnaire on Eating and Weight Patterns (QEWP) to study the self-reported eating behaviours of surgical candidates. Unlike the BITE tool which was designed to assess symptoms of bulimia, this tool is designed to assess symptoms of binge-eating disorder (BED), an eating disorder which is more likely to be seen in the morbidly obese and therefore in surgical candidates (Allison et al. 2006). However there are several similarities between the two disorders which both involve binge-eating (eating an unusually large amount of

food compared to the amount another person would eat in the same situation) (American Psychiatric Association 1994). The difference between the two is that people with bulimia use purging behaviour such as vomiting and laxative use to rid themselves of excess calories eaten, whereas people with BED do not. Fabricatore et al. (2006) report no significant gender or BMI differences between those who met BED criteria and those who did not, which supports the lack of relationship or significant gender differences found for disordered eating in the present study.

Fabricatore et al. (2006) found that 45% of their sample had no binge-eating symptoms, 23% reported eating unusually large amounts of food but with no loss of control whilst eating, and 27% met full criteria for binge-eating disorder (BED). The present study found that 29.5% had no compulsive or binge-eating, 44.6% showed compulsive or excessive eating and 26% had a highly disordered eating pattern indicating binge-eating behaviour. Since the BITE symptom scale used for the present study does not include the questions about purging behaviour these two sets of data can be compared in broad terms. There are significant differences in the percentages of subjects reporting no binge-eating or a moderate level of binge-eating symptoms between the two studies, however the figures for prevalence of clinically significant binge-eating behaviour are similar for the present study and that by Fabricatore et al. (2006). It is not clear what factors might explain the differences in results seen for the different categories. The BITE tool does not give subjects an exact definition of a “binge” so some of the differences in results could be due to subjects’ different interpretations of the questions asked about binge-eating on each tool. However the prevalence of clinically significant binge-eating behaviour reported by Fabricatore et al. (2006) might support the validity of the findings of the present study. This might also suggest that the QEWP and BITE tools record similar data about disordered eating, especially if the severity scale on the BITE is excluded as in the present study. The prevalence of binge-eating detected in the present study is

significantly higher than the 30.1% BED prevalence detected among subjects attending hospital-affiliated weight control programmes (Spitzer et al. 1992) which supports the findings of Stout et al. (2007) reported earlier.

Fabricatore et al. (2006) found more substantial relationships between eating behaviour and the psychosocial variables which again supports the theory of Markowitz et al. (2008) that the relationships between BMI and depression are mediated by other psychosocial factors which may differ between men and women.

Limitations and statistical issues

There are a number of limitations of the present study. The study sample was as large as was practical, however the relatively small number of males may be insufficient to make the gender differences meaningful.

The psychosocial tools used give a snapshot at the time of pre-assessment for surgery only. Since denial of problems is common in surgical candidates, brief psychiatric screening by a surgeon or use of brief questionnaires may not give an accurate measure of psychopathology and involving mental health professionals trained in clinical interviewing techniques may produce more valid data (Glinski et al. 2001). However, it is possible that a health professional experienced in forming a good helping relationship at pre-assessment (such as was used in the present study) can partly overcome the problem of surgical candidates denying psychological problems they believe may prevent them from being offered surgery. None of the tools used were designed for use in bariatric surgery candidates and only the IWQOL-Lite was designed specifically for use in obesity. They may not accurately indicate true psychological status as this relates to suitability for surgery. When administering the HADS tool (see Appendix), using the explanation for morbidly obese subjects that for Question 8, "I feel slowed down" relates to mental rather than physical state may reduce the score given for depression. If anxiety is

artificially high at pre-assessment (Kalarchian et al. 2007) the scores for anxiety might be lower if the tool was administered after a patient had been accepted for surgery. Subjects high anxiety levels may have affected their scores on the other psychosocial tools, given the inter-relationships that exist between many of these variables (Markowitz et al. 2008). This may explain why some of the present study results indicate greater psychosocial distress than in some of the other studies used for comparison.

The fact that none of these tools were designed for use with surgical candidates may partly explain the lack of other studies found which used these tools with surgical candidates. No other authors studying surgical candidates have used the HADS or the BITE and those that have used the IWQOL-Lite have generally not presented the raw scores but have transformed these or presented them in terms of other variables such as co-morbidities, so the data is not directly comparable with the present study. Many authors have used more sophisticated statistical analyses and some have presented their results in terms of inter-relationships between the variables, both of which were beyond the scope of the present study. Although the raw scores presented in figures 2-5 may not be directly comparable with other studies they do show the clinical interpretation of the results of the tests for gender differences. Most surgical candidates score above the “normal” ranges for all psychosocial variables in the present study, indicating a level of distress which may be clinically significant and may affect outcomes of surgery, even where the data are not statistically significant.

van Hout et al. (2004) list disordered eating behaviours seen in surgical candidates including compulsive or binge-eating, grazing continuously throughout the day, mindless eating or frequent snacking on high calorie foods or drinks. Not all of these would be seen in bulimia therefore not all are investigated by the BITE. This tool

may not adequately reflect the eating problems seen in this patient group. The HADS avoids detecting somatic complaints which is a strength when studying surgical candidates (Munoz et al. 2007), however since it was designed for general medical outpatients this tool may not accurately reflect the anxieties or factors contributing to low mood in this group. Although the IWQOL-Lite was designed for use in obesity, the fact that such a high percentage of subjects' scores indicate the lowest possible self-esteem may suggest that this tool is not a sufficiently sensitive measure of the factors contributing to low self-esteem in these subjects.

Statistical limitations may include the fact that most of the samples were not normally distributed. This would be expected for BMI since the present study included only those with a BMI of 35-40 kg/m² or above who may be eligible for surgery (NICE 2006). However this extended to the psychosocial scores, in that only the values for depression scores in females and those for BMI, anxiety and disordered eating in males were normally distributed. There is no relationship between normal distribution and larger sample size since only one female sample was normally distributed compared to three male samples, even though the female sample was over three times the size of the male sample. The abnormal distribution may partly explain why most samples except the self-esteem scores failed to meet the assumption of homogeneity of variance. In addition, although each tool has a numerical score, it could be argued that many of the items are measured on a scale that does not involve equal units. For example there is not an equal distance between answers such as "never", "rarely", "sometimes", "usually" or "always" true which is the scale used on the IWQOL-Lite. A similar scale is used on the HADS tool. Non-parametric tests (Spearman's correlation and Mann-Whitney U tests) were more suitable for this study since they require fewer assumptions to be met; however, use of inferential statistics requires samples to be randomly selected (Williams & Wragg 2004). This would have led to smaller sample numbers and the

strong likelihood that there would have been insufficient data collected for males for this to be meaningful. It was therefore decided to use all data available, which is a further statistical limitation of the present study.

Although significant results were identified by $p \leq 0.05$, this was reduced to $p \leq 0.01$ to indicate significance, given that 5 tests of difference between males and females (values for BMI as well as the four psychosocial variables) were carried out. The aim of this alteration (a Bonferroni adjustment) was to avoid the risk of declaring a result significant where this is not the case or rejecting a null hypothesis inappropriately (a type 1 error) (Williams & Wragg 2004).

The correlations between BMI and the psychosocial values were all low or very low negative values. It might have been expected that people with higher BMIs would be more anxious or depressed, with lower self-esteem and more disordered eating, but the results indicate that if there is any relationship this tends towards less psychosocial distress as BMI increases. The reasons for this are not clear. Some people with morbid obesity may have spent several years at a high BMI and have adapted to a chronic condition which they are unable to change and accepted society's attitude to their size. Delahanty et al. (2002) found that heavier subjects had the least motivation to lose weight as measured by the stages of change for weight-loss (Prochaska & DiClemente 1986, cited in Campbell & Haslam 2005) which may support the theory that some morbidly obese people have accepted their condition. This could partly explain why higher BMI is weakly correlated with less depression, anxiety, self-esteem and disordered eating scores in the present study. These psychological problems can be both a cause and an effect of morbid obesity, and the above theory may apply to people who have developed psychological problems as a consequence of obesity, but have subsequently learned to cope with their condition such that their psychological state has improved even though their

weight may have continued to rise. People with morbid obesity are not all the same shape and some people with BMIs of 40 kg/m² may find it harder to manage their size than others with higher BMIs, due to different body fat distribution or other health problems such as arthritis. The fact that all four correlations were low or very low negative values might suggest these are more likely to be true values rather than chance findings. However, overall the limitations of this study might imply that the results are not an accurate measure of the psychosocial factors in this very specific group of subjects. The present study is therefore a preliminary investigation whose main value is to highlight more specific areas for future research.

Conclusion and recommendations

The present study results support the findings of van Hout et al. (2004) that surgical candidates are depressed, anxious, and have low self-esteem and disordered eating behaviour. Although many of the results seen were not statistically significant there are clinical differences in the prevalence of psychological problems between this study population and people of normal weight (Onyike et al. 2003) or obese people of lower treatment seeking status (Wadden et al. 2006).

The lack of statistically significant relationships detected between BMI and the psychosocial factors may be due to the limitations of the tools used or small sample size. However it is also possible that there is no simple linear relationship between BMI and a single psychosocial variable. The low or very low negative correlations seen may be a true clinical finding, even though they were not statistically significant, and may indicate that some people adapt better to the condition of morbid obesity than others independent of their BMI (van Hout et al. 2004; Vallis et al. 2001), and/or that the relationships between obesity and depression operate in both directions and are mediated by other factors such as body image and self-esteem (Markowitz et al. 2008).

It was beyond the scope of the present study to investigate these possibilities, however future investigations could examine the relationships between the psychosocial factors in greater depth and with a randomly selected larger sample size. Some authors have found a stronger relationship between eating behaviour and psychosocial variables than between eating behaviour and BMI, age or gender (Fabricatore et al. (2006), and that impaired HRQOL is more strongly related to depression than is BMI (Fabricatore et al. 2005), in people seeking surgery. A larger study could also investigate use of alternative tools for measuring psychosocial variables; for example use of a tool designed to detect BED such as the QEWP rather than the BITE which is designed to detect bulimia, or use of a bariatric surgery specific quality of life tool such as the Moorhead-Ardelt tool rather than the IWQOL-Lite (Duval et al. 2006). Future research could examine the answers to individual questions on the tools which may be particularly relevant to this population; for example, the question on the BITE tool which asks if people feel very guilty if they overeat (see Appendix for copies of the tools). A preliminary study could compare these measurements with the results of a clinical interview carried out by a psychiatrist or psychologist, to determine which tools most successfully detected the specific psychosocial problems seen in this group.

The present study results indicated statistically significant gender differences for two of the psychosocial variables, suggesting that females seeking surgery have more anxiety and lower self-esteem than males. The finding that females have more depression and disordered eating behaviour was not statistically significant but may be clinically significant. The results for gender differences accord with some previous studies (Kolotkin et al. 2008, Kolotkin et al. 2001a, Onyike et al. 2003). Future studies could be undertaken to confirm these results using a larger randomly selected sample size with more specific tools as outlined above. Subsequent studies could investigate some of the reasons for these gender differences, for

example by investigating the effect of body image dissatisfaction on these variables (Markowitz et al. 2008). It would also be valuable to study the effect of non-psychosocial factors such as medical co-morbidities or financial or work-related problems as potential mediators of poor psychological state, as these may be more relevant than BMI, particularly in men.

The finding that a high percentage of subjects had the maximum possible scores for self-esteem on the IWQOL-Lite tool may indicate that this tool is not a sufficiently sensitive measure of self-esteem in this population. Investigating the use of alternative tools to measure quality of life which are designed for those seeking surgery could improve clinical practice. Similarly, the use of alternative tools to the BITE for investigating the particular type of over-eating seen in these patients may also be warranted. A substantial minority of Gujarati Hindus live in Leicester, although relatively few seek surgery at present. Should the numbers increase, it may be necessary to investigate more culturally appropriate methods of measuring psychosocial distress than the tools used in this study, which assume that subjects have the culture and lifestyle of the indigenous British population. There were distinct gender differences in all the psychosocial factors investigated in the present study, and since females seeking surgery outnumber their male counterparts by 4:1, standard clinical practice is likely to be more appropriate for females than males. This could be improved by investigating the particular needs of men seeking surgery; for example, by using focus groups or a patient satisfaction questionnaire. Liaison with the Clinical Psychology Department, to examine the different characteristics of males and females attending for psychology treatment as preparation for surgery, could suggest further areas for service improvement in respect of gender.

This study provides preliminary data on the relationships between BMI and gender and a range of psychosocial variables in people seeking bariatric surgery. The results suggest that there is no strong relationship between BMI and depression, anxiety, self-esteem or disordered eating, however there are significant gender differences suggesting that women are more likely to be anxious or depressed, and may have lower self-esteem or more disordered eating than men. Further study is warranted to investigate these relationships in greater depth, in order to make recommendations for improving the assessment and selection of suitable candidates for bariatric surgery.

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Appendices

Glossary of abbreviations and BMI classification

Hospital Anxiety and Depression Scale

Impact of Weight on Quality of Life-Lite (two pages)

Bulimic Investigatory Test, Edinburgh (two pages)

Example data collection sheet

Letter granting ethical approval (two pages)

Glossary of abbreviations and BMI classification

BDI - Beck Depression Inventory

BED - binge-eating disorder

BES - Binge-Eating Scale

BID - body image dissatisfaction

BITE - Bulimic Investigatory Test, Edinburgh

BMI - Body Mass Index - weight (kg) divided by height (m) ²:

underweight - BMI less than 18.5 kg/m²;

normal weight - BMI 18.5-24.9 kg/m²;

overweight - BMI - 25-29.9 kg/m²;

obesity class I - BMI 30-34.9 kg/m²;

obesity class II - BMI 35-39.9 kg/m²;

obesity class III - BMI 40 kg/m² or more (morbid or extreme obesity)

DIS - Diagnostic Interview Schedule

DSM - Diagnostic and Statistical Manual of Mental Disorders

HADS - Hospital Anxiety and Depression Scale

HRQOL - health related quality of life

IWQOL-Lite - Impact of Weight on Quality of Life-Lite tool

NHANES III - third National Health and Nutrition Examination Survey

NICE - National Institute for Health and Clinical Excellence

QEWP - Questionnaire on Eating and Weight Patterns

QOL - quality of life

SCID - Structured Clinical Interview for DSM-IV

SF-36 - Medical Outcomes Study 36 item short-form health survey

SOS - Swedish Obese Subjects study

SPSS - Statistical Package for the Social Sciences

WALI - Weight and Lifestyle Inventory

Hospital Anxiety and Depression Scale (HADS)



Name: _____ Date: _____

Impact of Weight on Quality of Life (IWQOL-Lite)

The Bite

*This questionnaire will take about 10 minutes to complete.
It would be helpful to find a quiet time to think about each question before answering.
Please circle the most appropriate response for you.*

1. Do you have a regular eating pattern? YES NO
2. Are you a strict dieter? YES NO
3. Do you feel a failure if you break your diet once? YES NO
4. Do you count the calories of everything you eat, even when not on a diet? YES NO
5. Do you ever fast for a whole day? YES NO
- 6.* . . . If yes, how often is this?

EVERY SECOND DAY	5
2-3 TIMES A WEEK	4
ONCE A WEEK	3
NOW AND THEN	2
HAVE ONCE	1
- 7.* Do you do any of the following to help you lose weight? (Circle number)

	Never	Occasionally	Once A Week	2-3 Times A Week	Daily	2-3 Times A Day	5+ Times A Day
TAKE DIET PILLS	0	2	3	4	5	6	7
TAKE DIURETICS	0	2	3	4	5	6	7
TAKE LAXATIVES	0	2	3	4	5	6	7
MAKE YOURSELF VOMIT	0	2	3	4	5	6	7
8. Does your pattern of eating severely disrupt your life? YES NO
9. Would you say that food dominated your life? YES NO
10. Do you ever eat and eat until you are stopped by physical discomfort? YES NO
11. Are there times when all you can think about is food? YES NO
12. Do you eat sensibly in front of others and make up in private? YES NO
13. Can you always stop eating when you want to? YES NO
14. Do you ever experience *overpowering* urges to eat and eat and eat? YES NO

Please continue to answer the questions on the other side

P.T.O.

The Bite - 2

- | | | | | | | | | | | | | | | | |
|------------------|---|---|----|-------------|---|--------------|---|-------------|---|------------------|---|-------|---|-----------------|---|
| 15. | When you are feeling anxious do you tend to eat a lot? | YES | NO | | | | | | | | | | | | |
| 16. | Does the thought of becoming fat <i>terrify</i> you? | YES | NO | | | | | | | | | | | | |
| 17. | Do you ever eat large amounts of food rapidly (not a meal)? | YES | NO | | | | | | | | | | | | |
| 18. | Are you ashamed of your eating habits? | YES | NO | | | | | | | | | | | | |
| 19. | Do you worry that you have no control over how much you eat? | YES | NO | | | | | | | | | | | | |
| 20. | Do you turn to food for comfort? | YES | NO | | | | | | | | | | | | |
| <u>21.</u> | Are you able to leave food on the plate at the end of a meal? | YES | NO | | | | | | | | | | | | |
| 22. | Do you deceive other people about how much you eat? | YES | NO | | | | | | | | | | | | |
| <u>23.</u> | Does how hungry you feel determine how much you eat? | YES | NO | | | | | | | | | | | | |
| 24. | Do you ever binge on large amounts of food? | YES | NO | | | | | | | | | | | | |
| 25. | . . . If yes, do such binges leave you feeling miserable? | YES | NO | | | | | | | | | | | | |
| 26. | If you do binge, is this only when you are alone? | YES | NO | | | | | | | | | | | | |
| 27.* | If you do binge, how often is this? | <table style="margin-left: auto; margin-right: auto; border: none;"> <tbody> <tr> <td style="padding-right: 10px;">HARDLY EVER</td> <td style="text-align: right;">1</td> </tr> <tr> <td>ONCE A MONTH</td> <td style="text-align: right;">2</td> </tr> <tr> <td>ONCE A WEEK</td> <td style="text-align: right;">3</td> </tr> <tr> <td>2-3 TIMES A WEEK</td> <td style="text-align: right;">4</td> </tr> <tr> <td>DAILY</td> <td style="text-align: right;">5</td> </tr> <tr> <td>2-3 TIMES A DAY</td> <td style="text-align: right;">6</td> </tr> </tbody> </table> | | HARDLY EVER | 1 | ONCE A MONTH | 2 | ONCE A WEEK | 3 | 2-3 TIMES A WEEK | 4 | DAILY | 5 | 2-3 TIMES A DAY | 6 |
| HARDLY EVER | 1 | | | | | | | | | | | | | | |
| ONCE A MONTH | 2 | | | | | | | | | | | | | | |
| ONCE A WEEK | 3 | | | | | | | | | | | | | | |
| 2-3 TIMES A WEEK | 4 | | | | | | | | | | | | | | |
| DAILY | 5 | | | | | | | | | | | | | | |
| 2-3 TIMES A DAY | 6 | | | | | | | | | | | | | | |
| 28. | Would you go to great lengths to satisfy an urge to binge? | YES | NO | | | | | | | | | | | | |
| 29. | If you overeat do you feel <i>very</i> guilty? | YES | NO | | | | | | | | | | | | |
| 30. | Do you ever eat in secret? | YES | NO | | | | | | | | | | | | |
| <u>31.</u> | Are your eating habits what you would consider to be normal? | YES | NO | | | | | | | | | | | | |
| 32. | Would you consider yourself to be a compulsive eater? | YES | NO | | | | | | | | | | | | |
| 33. | Does your weight fluctuate by more than 5 pounds in a week? | YES | NO | | | | | | | | | | | | |

Thank you for your time and co-operation in filling out the questionnaire. Please return to:

DIETITIAN:

LOCATION:

TELEPHONE No.:

Example data collection sheet

Date	Subject	Hospital no.	BMI	HADS Anxiety	HADS Depression	Self-esteem	BITE	Age
	M1							
	M2							
	M3							
	M4							
	M5							
	M6							
	M7							
	M8							
	M9							
	M10							
	M11							
	M12							
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	M49							
	M50							



University of
Chester

09 October 2008

Dear Jane

Study title: *Psychosocial characteristics of patients seeking weight loss surgery*
FREC reference: 261/08/JC/CENS
Version number: 1

The above application was considered by the Faculty Research Ethics Committee at the meeting held on 24th September 2008.

Provisional opinion

The Committee would be content to give a favourable ethical opinion of the research, subject to receiving a complete response to the request for further information set out below.

Authority to consider your response and to confirm the Committee's opinion has been delegated to Cynthia Burek (Lead Reviewer) and Mohammed Saeed (Chair of the Faculty Research Ethics Committee).

The Committee was grateful for the inclusion of extracts from the University Hospitals of Leicester Clinical Audit and Healthcare Evaluation Policy, and wished to convey this.

Further information or clarification

- There were no matters of ethical concern to prevent the study from proceeding. However, the Committee felt that the proposal could benefit from an additional research aim – prediction of lifestyle change and outcomes after surgery.
- Complaints should be addressed to Prof. Sarah Andrew, Dean of Applied and Health Sciences, in the first instance. Sarah's contact details should be provided.

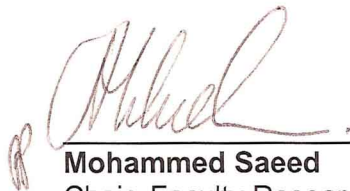
When submitting a response to the Committee, please send **three copies** of your revised documentation, where appropriate, underlining or otherwise highlighting the changes you have made and giving revised version numbers and dates where appropriate. **Responses should be submitted within three months of the date of this letter.** You do not need to resubmit your application. Please send your response to Mrs. Jess Hitchcock, FREC Secretary, Centre for Public Health Research, University of Chester, Parkgate Road, Chester CH1 4BJ.

The Committee will confirm the final ethical opinion on the application within a maximum of 15 working days from receipt of an appropriate and acceptable response.

Membership of the Committee

The members of the Faculty Research Ethics Committee who were present at the meeting are listed on the attached sheet.

Yours sincerely,



Mohammed Saeed
Chair, Faculty Research Ethics Committee

Enclosures: * List of names of members who were present at the meeting and those who submitted written comments
* Statistician's comments, where applicable
* Response to FREC template

c.c.: Supervisor
FREC Departmental/Centre Representative