Obesity and oral health
This evidence summary aims to locate and summarise evidence on how obesity affects treatment of oral diseases in adults. It does not include detailed descriptions of the studies cited nor does it include information that was not presented in the literature.

The Curious about website encourages dental professionals to raise issues where a review of the available evidence would provide a useful resource for other dental professionals.

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Contents

3 Key findings
3 Review question
3 The case for action
5 The Evidence
5 Methods
6 References
Key findings

- There is no proven, clear-cut difference in the response to treatment for periodontal disease between obese and non-obese patients.
- No evidence was located examining the effect of obesity on the treatment of any other oral condition.

Review question

How does obesity affect treatment of oral diseases in adults?

Aims

To assess the evidence on how obesity affects treatment of oral disease in obese adults.

The case for action

Obesity

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. Overweight is a chronic disease, as are its complications, with a global epidemic in both developed and third world countries.

Measuring obesity

Body mass index (BMI) is used to estimate the prevalence of obesity and its associated risks and to classify underweight, overweight and obesity in adults. While BMI is widely used, diagnostic methods such as skinfold thickness, waist circumference, waist/hip ratio and x-ray densitometry (DXA), are more accurate for identifying levels of obesity and indicating an individual’s morbidity risk but due to their complexity most are not generally used. BMI, defined as weight in kilograms divided by the square of the height in metres (kg/m²), allows adults to be grouped into the categories (Table one).

BMI does not account for variations in body fat distribution or distinguish between weight associated with muscle and weight associated with fat.

Furthermore BMI may not correspond to the same level of fitness or associated health risks between different populations. As a result these boundaries have been redefined for some populations, for example, as Asian populations develop negative health consequences at a lower BMI than Caucasians, the Japanese have defined obesity as any BMI greater than 25 kg/m². China uses a BMI of greater than 28 kg/m² while a healthy BMI range for Australian Aboriginals appears to be between 17 and 22.

Obesity in England

Two thirds of adults are overweight or obese. This is predicted to reach 70 per cent by 2034. The effects of obesity are wide spread with obese adults being less likely to be in employment and have an increased risk of hospitalisation and a reduced life expectancy. Societal impacts include reduced productivity, increased sickness and a greater demand on social care services. The annual cost of obesity to the wider economy is £27bn and costs are projected to increase by £2bn between 2010 and 2030.

Health Survey for England (2013) found obesity prevalence (26 per cent of men and 24 per cent of women) increased between 1993 and 2006 with
levels remaining similar since this point.\(^{(1)}\) Overall, 67 per cent of men and 57 per cent of women were either overweight or obese. Overweight was far more common than obesity with approximately a quarter of adults being obese. Obesity was strongly related to age rising through middle age and decreasing in the oldest age groups. In terms of health risk caused by overweight and obesity, as defined by the NICE calculation of health risk caused by overweight and obesity more than half of surveyed men and women were classified as increased, high or very high risk.\(^{(1)}\)

### Obesity and general health

There is a longstanding awareness of the association of obesity with health problems. Obesity is associated with an increased risk for a number of common causes of non-communicable disease and psychological and psychiatric morbidities.\(^{(1,7,11)}\) Significant associations between obesity and the incidence of type II diabetes, cardiovascular diseases, asthma, gallbladder disease, osteoarthritis and chronic back pain have been found.\(^{(12)}\) For example every additional 5 kg/m\(^2\) in BMI increases the risk of oesophageal cancer in men by 52 per cent and endometrial cancer in women by 59 per cent.\(^{(13)}\) Variables including mean age at baseline had little effect on the association between increased BMI and cancer and in some cases may be population dependant.

### Obesity and dental health

Evidence suggests an association between obesity and periodontal disease in adults\(^{(14,15)}\) and possibly in children.\(^{(16)}\) Dental caries in children have exhibited an association with obesity\(^{(13)}\) but the evidence is not conclusive.\(^{(14,18,19)}\) The relationship between obesity and traumatic dental injuries and erosive tooth wear in children has been investigated but no significant relationships were noted.\(^{(20,21)}\) In adults, an association with edentulism has been suggested\(^{(22)}\) and a link with the hastened progression of periodontal disease.\(^{(23)}\) While not strictly related to oral health, obesity does negatively affect wound healing\(^{(24)}\) and this may have impact in situations such as extractions and surgical interventions.

### Obesity and dental care

#### Technique

Obesity can influence patient treatment. For example, treatment time for extracting impacted third molar increases as BMI increases.\(^{(25)}\) Obesity, and associated comorbidity, influences pharmacokinetics and pharmacodynamics and the function of organs involved in drug elimination can be affected making pharmacokinetics more complex.\(^{(26)}\) Anaesthetic agents, including Midazolam, as well as some antimicrobials and anti-coagulants are influenced by obesity.\(^{(26-28)}\)

Sedation and general anaesthesia are associated with increased risks in obese patients predominantly due to airway and breathing restrictions. Affected patients are frequently referred to specialist centres.\(^{(29)}\) Fat around the chest and stomach in the obese can restrict respiratory function and this can lead to shortness of breath, and lack of comfort when fully reclined and may predispose to airway obstruction, hypoxemia and fainting or dizziness.\(^{(29,30)}\) Excess soft tissues can be problematic to manage during dental treatment and may mask anatomical landmarks making administering local anaesthetic difficult.\(^{(29)}\) Furthermore limited oral opening, visibility and access to anatomical landmarks may hamper intra and extraoral examination.\(^{(30,31)}\)

#### Physical environment

Physical barriers to care include difficult access to the clinic from a car park, narrow doorways or corridors, waiting room chairs and cramped toilet facilities.\(^{(32)}\) A further consideration is the cost implications of providing equipment, such as chairs, to enable treatment of obese patients. Standard dental chairs have a safe working load of approximately 23 stone\(^{(32)}\) and may not be suitable for obese patients. Specially designed chairs, for general dentistry and oral and maxillofacial surgery, can accommodate patients up to 71 stone.\(^{(33)}\) Dental indemnity companies have advised against the use of a conventional dental chair to treat patients who exceed its maximum load.\(^{(32)}\)

### The Equality Act

Obesity itself is not always considered a disability but if a person’s obesity, or comorbidity attributable to obesity, has lasted for at least 12 months and has a substantially adverse effect on their ability to perform everyday activities then it could be classed as a disability.\(^{(34)}\) The Equality Act defines a person to have a disability “… if he has a physical or mental impairment which has a substantial and long term adverse effect on his ability to carry out normal day to day activities”. Indemnity companies acknowledge that if patients are refused treatment because of their weight they might be able make a formal complaint that may be valid on the basis of discrimination. For example if a clinician refuses to treat a patient based on the safe weight limit of the dental chair this refusal would be upheld as justified.\(^{(32)}\)
The evidence

**Periodontal disease**

No significant association was found between patient weight and response to periodontal treatment of systematically healthy or diabetic patients. A meta-analysis/systematic review found the evidence is not consistent. For many comparisons there were no significant associations while for some comparisons there was a significant association. No difference was found, post-treatment, in clinical periodontal parameters but significant differences in inflammatory or metabolic parameters were found between systemically healthy overweight/obese and normal-weight patients. In diabetic patients overweight/obesity was associated with increased levels of leptin and adiponectin post-treatment.

Evidence generated since this meta-analysis is equally inconsistent. For non-surgical periodontal surgery, BMI and obesity were found to be independent predictors of poor treatment response while obese individuals with type II diabetes experienced greater mean reductions in periodontal disease over their non-obese counterparts. One study confirmed a linear association across increasing values of BMI and severity and extent of periodontitis that was independent of differences in age, gender, smoking status and dental plaque levels. Having a BMI of ≥30 was an independent predictor of poorer periodontal treatment outcome at two months with obese patients having on average 3.2 per cent more sites (approximately one tooth) with probing pocket depths >4 mm than those with a BMI within the normal range. Obese diabetic individuals experienced a 0.10 mm greater reduction in probing depth than their non-obese counterparts. When periodontitis was severe, the effect of obesity on response to treatment was nearly that of smoking (smokers had 3.9 per cent more sites with PPD >4 mm than did non-smokers).

**Other oral conditions**

No publications were found examining how obesity affects oral surgery or treatment of any other oral issue.

**Discussion**

It may not be surprising that evidence was only located covering the effect of obesity on periodontitis given its infective and inflammatory nature. Obesity is thought to affect the immune response leading to increased susceptibility to infections. Evidence suggest that obese people are more likely than those of a normal weight to develop infections and some associated complications. Adipokines, cytokines released by adipocytes, can be pro-inflammatory or anti-inflammatory with pro-inflammatory mediators often overproduced as adiposity increases in contrast to anti-inflammatory mediators whose production decreases.

Periodontitis is an infectious disease process that begins with bacteria and their products interacting with the junctional epithelium and stimulating the release of inflammatory mediators.

Though circumstantial evidence exists for an association between periodontitis and obesity and studies were located examining the effect of obesity on the response to treatment of periodontal disease, the studies failed to find a clear-cut answer. This may be related to the nature of the included studies, for example the way in which periodontitis was diagnosed or measured, and possibly its complex underlying biological mechanisms. While there is no conclusive evidence this does not mean that there is no evidence.

**Methods**

**Search strategy**

Initial scoping identified oral conditions associated with or affected by obesity and specific searches were carried out for each condition as well as for the overarching key term stomatognathic diseases and based on the retrieved information it was decided that focus should be adults and the effect that obesity has on treating oral disease or on aspects of oral disease such as how obesity affects denture wearing. Controlled vocabulary terms and free text were used for searching. Search strings consisted of three sections: terms covering obesity, terms covering publication type (identical for each search) and terms covering the oral disease of interest, for example, caries, periodontal diseases, halitosis, traumatic injury etc. In relation to periodontitis a recently published meta-analysis/systematic review, current until June 2013, was identified and used as a starting point for this oral condition. No limits were employed for any other search. For publication type (MEDLINE only) Ovid Expert Searches for observational studies, randomised controlled trials, economic studies and systematic reviews and the Cochrane Highly Sensitive Search Strategy for RCTs were employed. Grey literature was searched and a snowballing strategy was employed once publications relating to the questions were located.

Papers were included if they met the following criteria:

- Adult patients
- Patients receiving any kind of dental treatment for one of the oral health issues of interest
- Comparison of obese to overweight treated patients to normal-weight treated patients
- Any outcome regarding the intervention of interest
- Randomised or non-randomised controlled trial,
Prospective or retrospective non-randomised controlled studies in any clinical setting.

Papers were excluded if patent groups were not compared according to weight or if studies were animal or in vitro studies or had no fixed outcome.

For consistency the resources searched in the meta-analysis/systematic review were employed for all oral diseases examined. Databases searched are:

- Ovid Medline
- PubMed Medline
- Cochrane
- DOAJ
- BBO
- IndMed
- Conference paper index
- German National Library of Medicine
- OpenSIGLE
- WHO ICTRP
- The UK Clinical Trials Gateway

**Results**

Over 1900 publications were located. Following sifting 10 publications were deemed to be of relevance and after examination of their full text three were included in this summary.[35-37] All were related to periodontal disease in obesity. One was a meta-analysis and systematic review[35] and the remaining two were clinical trials.[36,37] The meta-analysis and systematic review covered whether the response to periodontal treatment differs among obese, overweight or normal-weight patients and included 15 papers, covering 86 patients. The assessed evidence was judged to be weak.[35] Some of the clinical studies included in the meta-analysis had uneven samples of overweight/obese and normal-weight patients and adopted different definitions of periodontal disease while the absence of publication bias diagnostics and sensitivity analyses could threaten to the validity of the publication. A number of outcomes reported in the studies included in the systematic review were not included in the meta-analysis as these outcomes were only examined in one study.[35]

The authors of the study assessing BMI as a predictive factor of periodontal therapy outcome recognise that the evidence produced is not of a high level.[36] The trial had significantly uneven samples of overweight and obese patients who were predominantly male and non-Caucasian with unequal numbers distributed among BMI categories. The follow up period for this study was short, two months, and as such the clinical relevance of the results are not clear.

The study assessing patient-based characteristics associated with the clinical response to nonsurgical therapy has limitations, for example, the inclusion criteria (moderate to poorly controlled type II diabetes and moderate to advanced periodontal disease) rendered more than two thirds of screened individuals ineligible for the study questioning how applicable the results might be.[37] The same study saw a significant clinical-centre effect on treatment response that could not be explained.

**References**


