Obesity and dentistry: a growing problem

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IN BRIEF

- Reviews obesity and its consequences from a dental perspective.
- Highlights specific challenges, in particular in relation to conscious sedation, that may exist when treating obese patients and the lack of evidence based guidance in the literature.
- Makes practical recommendations for managing obese patients who require dental care.

GENERAL

Obesity has increased at an alarming rate in recent years. It is now a worldwide public health problem. The World Health Organisation (WHO) classifies obesity as a chronic disease. Affected individuals are at increased risk of hypertension, heart disease and other illnesses. There are also important social implications.

Within dentistry and particularly in the provision of conscious sedation, obesity can be a potential complicating factor. For example, the position of anatomical landmarks may be less obvious if surrounded by fatty tissue. Very obese patients may be housebound or have difficulty accessing dental surgeries. Dental chairs may not be of an appropriate design to accommodate some obese patients. However, little information or advice on this topic is available in the literature.

This article reviews obesity from a dental perspective. Challenges in providing dental care for obese patients are identified and practical recommendations made for their management.

Introduction

The World Health Organisation (WHO) defines obesity as 'Abnormal or excessive fat accumulation that may impair health'.¹ Definitions of what is considered overweight vary with time and from country to country. The current definition of overweight proposed by the WHO and the US National Institutes of Health is a BMI (Body Mass Index) of 25 kg/m² or more.² Individuals are classified as obese rather than overweight when BMI is 30 kg/m² or more.

In 1995 an expert panel associated with the National Institutes of Health (NIH) convened to assess the association between weight levels and disease risk. The panel reviewed data from approximately 394 studies, publishing its findings in Clinical Guidelines on the Identification, Evaluation and Treatment of Overweight and Obesity

in 1998.² Use of Body Mass Index (BMI) to classify obesity was recommended and the WHO adopted this classification. BMI is defined as the weight in kilograms divided by the square of the height in metres (kg/m²). International classifications of adult underweight, overweight and obesity according to BMI are shown in Table 1.

BMI is a clinically useful measure of being overweight and obesity for both male and female adults. It is easy to calculate and is considered more appropriate than simple weighing. However, the concept of BMI has significant limitations. It ignores many factors such as differences in muscle mass, bone mass and genetic make up. Thus, BMI alone may not be an entirely appropriate measure of overweight or obesity. For example, BMI may overestimate adiposity among persons who are very athletic and have a large muscle mass.³ Underestimation can occur in individuals who have lost muscle mass such as the ill or elderly.

The WHO Child Growth Standards, launched in April 2006⁴ include BMI charts for infants and young children up to the age of five. For children aged five to 14 years, there is no standard definition of obesity applied worldwide and measuring obesity proves challenging. The WHO is currently developing an international

Table 1 Body Mass Index classification

CLASSIFICATION	BMI
Underweight	<18.5
Healthy weight	18.5-24.9
Overweight	25.0-29.9
Obesity class I	30.0-34.9
Obesity class II	35.0-39.9
Obesity class III	40+

growth reference for school age and adolescent children.

Despite the inherent problems, BMI is still the most common classification used when discussing obesity. Other methods of measuring obesity include the use of skin fold callipers, bioelectrical impedance analysis, dual energy X-ray absorptiometry and hydrostatic weighing. These methods vary in reliability but most require expensive equipment and staff training.

Recent evidence has indicated that waist circumference or waist-to-hip ratio measurements may be a better disease risk predictor than BMI.⁵ Research in this area is ongoing but current NICE obesity guidelines advise using waist circumference as well as BMI to help assess disease risk in patients with a BMI less than

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35.⁶ Assessment of the health risks associated with being overweight and obesity in adults should be based on both BMI and waist circumference as shown in Table 2.

Prevalence of obesity

Adult (aged 16 or over) obesity in England has risen from 13% for men and 16% for women in 1993 to 24% for both men and women in 2007. Prevalence of obesity in childhood also increased between 1995 and 2007, from 11% in 1995 to 17% in 2007 among boys and from 12% in 1995 to 16% in 2007 among girls. Obesity rates are also increasing in Europe and in other 'westernised' and less developed countries.⁷

Incidence of obesity is particularly high in the United States: according to the Center for Disease Control, in 2005–2006, 33.3% of men and 35.3% of women were obese (BMI more than 30 kg/m²).⁸ Obesity in children and adolescents aged 2–9 for the years 2003–2006 was 16.3%.⁹

Causes of obesity

Why some people remain lean while others become obese is controversial. Explanations may be generalised into two, essentially polar views.

One view suggests obesity results from a fundamental lack of discipline on the part of the affected individual. The alternative view suggests that body fat composition is physiologically controlled and that any deviation from the baseline triggers a potent homeostatic response to resist that change. In recent years the latter hypothesis has received experimental support.¹⁰ A number of genes have also been identified that contribute to animal and human obesity,¹¹ so the evidence that obesity is not simply a personal failing is persuasive.

Consequences of obesity

Each year obesity costs the UK economy £3.5 billion, results in 30,000 deaths and 18 million working days lost through sickness.¹²

The WHO's World Health Report 2002¹³ estimates that over 7% of all disease burden in developed countries is caused by a raised BMI. WHO concluded that around a third of coronary heart disease and ischaemic stroke, and almost 60% of hypertensive disease in developed countries is associated with a BMI in excess of 25.

Table 2 BMI, waist circumference and disease risk

BMI classification	Waist circumference		
	Low	High	Very high
Overweight	No increased risk	Increased risk	High risk
Obesity I	Increased risk	High risk	Very high risk

For men, waist circumference of less than 94 cm is low, 94–102 cm is high and more than 102 cm is very high.
For women, waist circumference of less than 80 cm is low, 80–88 cm is high and more than 88 cm is very high.

Definition of bariatrics

Bariatrics is the branch of medicine that deals with the causes, prevention and treatment of obesity.¹⁴ The term 'bariatric' is widely used throughout the literature referring to obese patients. 'Bariatric dentistry' does not yet appear to be a term used in the literature but may be an appropriate way of referring to dentistry for this group of patients.

Physiological effects

Increasing body adiposity is accompanied by profound changes in physiological function. These changes vary depending on the distribution pattern of body fat. Generalised obesity alters the total blood volume and cardiac function, whereas the distribution of fat around the thoracic cage and abdomen restricts respiratory function. Intra-abdominal fat deposits are a major contributor to the development of hypertension, elevated plasma insulin concentrations, insulin resistance, diabetes mellitus and hyperlipidaemia.¹⁵

Immune function

Obese individuals may have a higher incidence of infection and delayed wound healing. Obesity impairs the cell-mediated immune responses and decreases lymphocyte immune function and natural killer T-cell activity.¹⁶

Leptin, a hormone produced by adipocytes, stimulates pro-inflammatory responses.¹⁷ Hyperleptinaemia is common in most obese individuals and causes generalised sympathetic activation, stimulation of vascular inflammation and oxidative stress. These contribute to the pathogenesis of hypertension, atherosclerosis and left ventricular hypertrophy.¹⁸

Haematological function

Platelet hyperactivity is associated with increased von Willebrand factor in obesity.

Obese patients also have increased fibrinogen, factor VII and factor VIII.¹⁹ Thus, a hypercoagulable state exists alongside obesity. In addition, obese individuals have increased levels of plasminogen activator inhibitor-1 resulting in a state of hypofibrinolysis. The net result of these haemostatic and fibrinolytic disturbances is that obese patients are at elevated risk of developing cardiovascular disease.²⁰

Specific medical conditions associated with obesity

Hypertension

Hypertension is the most common obesity-related disease. For each 10 kg in weight, systolic arterial blood pressure increases by 3–5 mmHg and diastolic pressure by 2 mmHg.²¹

Cardiovascular disease

Cardiovascular disease is already the world's number one cause of death. For each unit increase in BMI, the risk of heart failure increases by 5% for men and 7% for women.²²

Diabetes mellitus

Diabetes has rapidly become a global epidemic with the WHO projecting that deaths resulting from this disease will increase by 50% worldwide in the next ten years.²³ Prospective population studies confirm a close association between increasing body fatness and type II diabetes.²⁴

Sleep breathing disorder

Large amounts of fat in the chest and abdomen may compromise respiratory function. This is exaggerated when an obese subject lies flat. Sleep breathing disorder is common among obese individuals. In the Swedish Obese Subjects Study which examined 3,034 subjects with BMI above 35, over 50% of

men and one third of women reported snoring and apnoea.²¹ As a comparison, only 15.5% of Swedish men of comparable age were self-reported snorers.

Several groups have reported an increased risk of myocardial infarction and stroke in sleep apnoea. Snoring is a strong risk factor for sleep-related strokes, and symptoms of sleep apnoea increase the risk of cerebral infarction.²⁵

Cancer

Large prospective studies indicate a causal link between obesity and cancer of the colon, endometrium, kidney and oesophagus.²⁶ This suggests that overeating may be the largest avoidable cause of cancer in non-smokers.²⁶

Fatty liver disease

Excessive fat accumulation in the liver can lead to liver cirrhosis as the capacity of the liver to safely store potentially hepatotoxic fatty acids is overwhelmed.²⁷

Gallbladder disease

Due to higher cholesterol levels in the gall bladder, overweight and obese individuals are more likely to develop gallstones.²⁸

Gastro-Oesophageal Reflux Disease (GORD)

Obesity may cause the communication between the lower oesophageal sphincter and the stomach to become impaired. Consequently, stomach contents can reflux into the oesophagus.²⁹

Osteoarthritis

Extra weight puts additional load on joints. The cartilage that cushions the joints can wear prematurely, causing pain and stiffness. The lower back, knees and hips are particularly affected. The risk of knee arthritis, for example, increases by 35% for every 5 kg in weight gain.³⁰

Reproductive problems

Women who are overweight may have irregular menstrual periods and difficulties conceiving.³¹ Impotence may also be linked to obesity.³²

Treatment of obesity

Established obesity is difficult to treat. Approaches include dietary therapy, increasing physical activity and cognitive

behavioural therapy. Pharmacotherapy is also an important method of treatment for some obese patients.

Drugs which promote weight loss should only be used as part of a comprehensive treatment program in selected patients because of concerns about their adverse effects and long-term safety. Two categories of drugs may be used: appetite suppressants and drugs that decrease absorption.²

Surgical procedures such as gastric banding or gastric bypass can offer an effective treatment for obesity. However, reducing the capacity of the stomach in this manner is associated with increased levels of acid in the oral cavity. This directly contributes to caries and tooth erosion.³³

Implications of obesity for dentistry

Dentistry for obese patients can pose challenges: some of these are well-documented such as the increased likelihood of periodontal disease in obese patients.³⁴ Other potential complications, including those associated with conscious sedation, are less well described. Specific examples of the possible implications of obesity for patients and the dental team that care for them are considered below.

Physical environment

Obese patients must be able to access dental treatment centres. Barriers to care may include difficult access from a car park, narrow doorways or corridors and cramped toilet facilities. In the waiting room obese patients may be concerned where they can safely sit. Chairs of predefined 'normal' dimensions will often not accommodate moderate or severely obese patients: armless chairs are less restrictive.

Dental chair

Enquiries made to a number of manufacturers of dental chairs, suggest that the maximum lifting weight for modern chairs is approximately 140 kg (23 stones). This is considerably lower than the weight of many obese patients.

Alternatives to the conventional dental chair

One option is to refer the patient to the hospital environment where the patient may be treated on an operating table or trolley. Another possible solution for obese

patients is a custom-made chair such as the DIACO³⁵ dental chair. Although originally designed for treating wheelchair users, the manufacturers also promote the chair as suitable for obese patients. Unlike conventional dental chairs which change position by electric motors, the DIACO mechanism is hydraulic. It has a safe working load of 500 kg (79 stones). However, the retail cost of this chair (approximately £30,000) largely prohibits its use outside a specialist and well-funded treatment centre.

Weighing scales

Height and weight measurements may be important for a dentist considering providing treatment for obese patients. Weighing scales should have a wide base to allow the patient to securely balance, a nearby handle rail for support and a high maximum limit. The scales should be located in a non-public area away from the gaze of other patients, staff and anyone accompanying the patient.

Blood pressure cuffs

Large adult blood pressure cuffs should be available. Using a cuff that is too small will overestimate the systemic arterial blood pressure. To avoid errors, bladder width should be 40–50% of the upper arm circumference.³⁶

Legal perspective

Advice was sought from dental indemnity companies on managing patients who exceed the documented maximum lifting weight of a conventional dental chair. These organisations advised against the use of a conventional dental chair to treat such patients. It was acknowledged that if patients are refused treatment because of their weight, they might be able to invoke the Disability Discrimination Act (2005) and make a formal complaint. This complaint may be valid on the basis of discrimination through no fault of the patient. It was advised that a formal complaint should be accepted and managed appropriately. However, the action of the clinician in refusing a patient treatment, based on the safe weight limit of the dental chair, would be upheld as justified.

Managing medical emergencies

It has been demonstrated that obese patients frequently report shortness of breath and

chest discomfort. While this is in part due to alteration in respiratory mechanics and lung volumes, it is important to be aware that an acute medical condition may be present such as atypical angina, myocardial infarction, or pulmonary embolism.

Difficulty or inability to establish intravenous access has been well-documented in the obese population.³⁷ Airway management for obese patients is also potentially more complicated than for the non-obese.³⁸ 'Intramuscular' injections in an obese patient's thigh or buttock are more likely to be into fat, which has a relatively poor blood supply, leading to unpredictable therapeutic effects. Also, dosages for many drugs are weight-based. Standard doses of emergency drugs, based on pharmacokinetics obtained in people of average weight, may not be appropriate for obese patients.³⁹ Considering these factors, obese patients are at potentially greater risk in the event of a medical emergency.

Practical considerations

It can be difficult carrying out dental care for an obese patient: the landmarks for placement of an inferior alveolar nerve block can be impossible to palpate through excess soft tissue. It may be impossible to palpate cervical lymph nodes in a large neck. Soft tissues can also make retraction with a normal sized mirror unsafe: a 'lax' tongue retractor can be useful.

Conscious sedation

When thinking about conscious sedation for obese patients the potential difficulties in airway management and intravenous cannulation should be considered. The provision of inhalation sedation with nitrous oxide during which oxygen levels are maintained at or above 30% may be more appropriate. If intravenous sedation with midazolam is proposed, the overall benefit to the patient must be carefully weighed up against the increased likelihood of significant respiratory depression and the difficulties in managing a respiratory complication.

Manual handling

Despite a projection that almost one third of the UK population is likely to be obese (BMI >greater than or equal to 30) by 2010, 40-70% of NHS Trusts did not have a bariatric policy in place in 2007.⁴⁰ Among

ambulance service staff that had received manual handling training, 64.7% reported no additional training relating to bariatric patients. These findings have prompted recommendations from the Health and Safety Executive that strategic policies need to be put in place for the rapidly growing obese population in England. These policies should address not only manual handling but also building design, equipment and training needs. Dental staff, particularly those who may treat obese patients on a domiciliary basis, also require specific training to avoid injury to themselves.

Practical recommendations

Obesity is a multifaceted subject. It has many causes and many health and practical implications, which must be factored into dental treatment planning.

Before the patient enters the surgery

Practice staff should be sensitive to the needs of obese patients. Potential difficulties with access, stairs, mobility and seating should be identified and appropriate assistance offered. Armless waiting room chairs should be available. Suitable weighing scales and a height scale to calculate BMI ought to be available as well as an appropriately sized blood pressure cuff.

In the surgery

BMI should be calculated as this provides some indication of the likely level of disease risk and airway management risk. However, be aware of the limitations of BMI. It is a useful guide but should be used in combination with other information about the patient to determine an appropriate treatment plan. Know the safe working limit of the dental chair and be prepared to refer patients elsewhere if this limit is exceeded.

Ask targeted medical history questions. Obese patients are more likely to have additional health problems, which must be explored. In addition to a full medical history, ask questions which may highlight problems with airway management:

- Are you aware of a snoring habit when asleep?
- Do you regularly wake up during the course of a night's sleep?
- Do you often feel tired during the day?

Positive responses suggest the possibility of obstructive sleep apnoea.

Check arterial blood pressure. Be aware that hypertension is the most common obesity-related disease and may be undiagnosed. If diastolic pressure is over 100 mmHg, referral to the patient's general medical practitioner may be appropriate for investigation to reduce the risk of cerebrovascular accident.

Give diet advice on the consumption of high calorie foods and drinks which are a major contributor to obesity and dental decay. Although evidence for a direct association between dental caries and obesity is limited⁴¹ a dental professional is suitably qualified to offer basic nutritional advice.

Conclusions

Being overweight increases the likelihood of a patient having associated health and social problems, which may affect access to dental services and dental management. There is a widespread lack of knowledge or protocols for managing the clinical and practical implications of obesity.

Potentially, litigation may act as a catalyst for changing practice. Bariatric policies, supported by an appropriate evidence-base, need to be put in place to reduce the likelihood of patient complaints and unsafe clinical practice.

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