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ABSTRACT

Obesity is a medical condition that has become a worldwide problem and might affect negatively oral health state. The purpose of this study was to identify its impact on dental development, its practical considerations, dental treatments, and management of obese patients.

Obesity might produce an acceleration of tooth development that can lead to some major complications. Contrary to what has often been assumed, there is no significant relationship between caries and obesity, but a higher risk of periodontal disease is highlighted. Obesity can also be considered as a risk factor for enamel erosion and tooth loss. An excessive amount of fat might provoke oral health impairment including gingivitis and xerostomia. The presence of a disproportionate amount of adipose tissue surrounding the oral cavity might also alter the sedation process especially during troncular anaesthesia. The role of the dentist is bidirectional, and should include counselling and preventing oral affectation caused by obesity but might also include the use restricted devices to impair the bite and reduce the consumption of food. In addition, the management of the obese patient impacts the environment of the dental clinic itself, and special facilities may be needed, including bigger doors, corridors, handicap access, and larger dental chairs. Finally, obesity is a condition that might have a negative impact on the dentist-patient relationship.

This work highlights the problems dentist face when dealing with obese patients. Further studies are required to fully understand the impact of obesity in the daily dental practice.

RESUMEN

La obesidad es una condición médica que se ha convertido en un problema mundial y puede afectar negativamente el estado de salud bucal. El propósito de este estudio fue identificar su impacto en el desarrollo dental, sus consideraciones prácticas, tratamientos dentales y el manejo de pacientes obesos.

La obesidad puede producir una aceleración del desarrollo de los dientes y puede provocar complicaciones importantes. No existe una relación significativa entre caries y obesidad, pero destaca un mayor riesgo de enfermedad periodontal. La obesidad también puede considerarse como un factor de riesgo de erosión del esmalte y de pérdida dental. Una cantidad excesiva de grasa puede provocar un deterioro de la salud bucal, como gingivitis y xerostomía. La presencia de una cantidad desproporcionada de tejido adiposo que rodea la cavidad oral también puede alterar el proceso de sedación, especialmente durante anestesia troncular. El papel del odontólogo es bidireccional y debe incluir el asesoramiento y la prevención de la afectación bucal provocada por la obesidad, pero también puede incluir el uso de dispositivos restringidos para perjudicar la mordida y reducir el consumo de alimentos. Además, el manejo del paciente obeso impacta el entorno de la propia clínica dental, con instalaciones específicas como puertas más grandes, pasillos, acceso para discapacitados y sillones dentales amplos. Finalmente, la obesidad es una condición que puede tener un impacto negativo en la relación dentista-paciente.

Este trabajo destaca los problemas que enfrentan los dentistas cuando tratan a pacientes obesos. Se requieren más estudios para comprender completamente el impacto de la obesidad en la práctica dental diaria.

INTRODUCTION

Obesity has become a worldwide problem. According to the World Health Organisation, obesity is defined as “abnormal or excessive fat accumulation that may impair health”. (1) In 2016, 13% of the worldwide adult population were obese. As an example, in Spain in 1975 the prevalence of obesity was 10%, in 2016 it arises at 24%. That is to say, over the past three decades obesity rates have nearly tripled in Spain. (Figure 1).

Obesity’s aetiology is multifactorial and includes genetic, physiological, environmental, psychological, social, and economic factors. The most commonly used tool to detect obesity is the Body Mass Index, obtained by dividing the individual’s body weight by the square of their height. Three grades of obesity are defined. Grade one is from 30 to 35, grade 2 from 35 to 40 and grade three, considered as morbid obesity, over 40.

At the beginning obesity was considered as a high-income countries problem. But nowadays, it is on the rise in low- and middle-income countries, owing to industrialisation. The sedentary lifestyle caused by a change in behaviour: video games, teleworking, COVID-19, pandemic lockdown contributes to an increase in prevalence. Moreover, junk food is usually less expensive than healthy food.

In medicine, the term “Bariatrics” is the speciality associated with causes, prevention and treatment of obesity. However, “Bariatric dentistry” is not a term used in literature and in nowadays practice. Being obese may affect the access to dental services and dental management. According a previous study, the use of dental services is lower in obese patients than in non-obese as obese people may have more important health issues that require attention,

hence dental visits are not frequently a priority.(2) Furthermore, future dental practitioners have a lack of clinical and practical knowledge or protocols for the management of obese patients. Dental professionals should be concerned about health and safety aspect of treating obese patients. (3)

As obesity prevalence is increasing, it is the dentist's duty to take this disease in consideration and apply the appropriate measures to manage risks, help the patients and get rid of unsafe clinical practice.

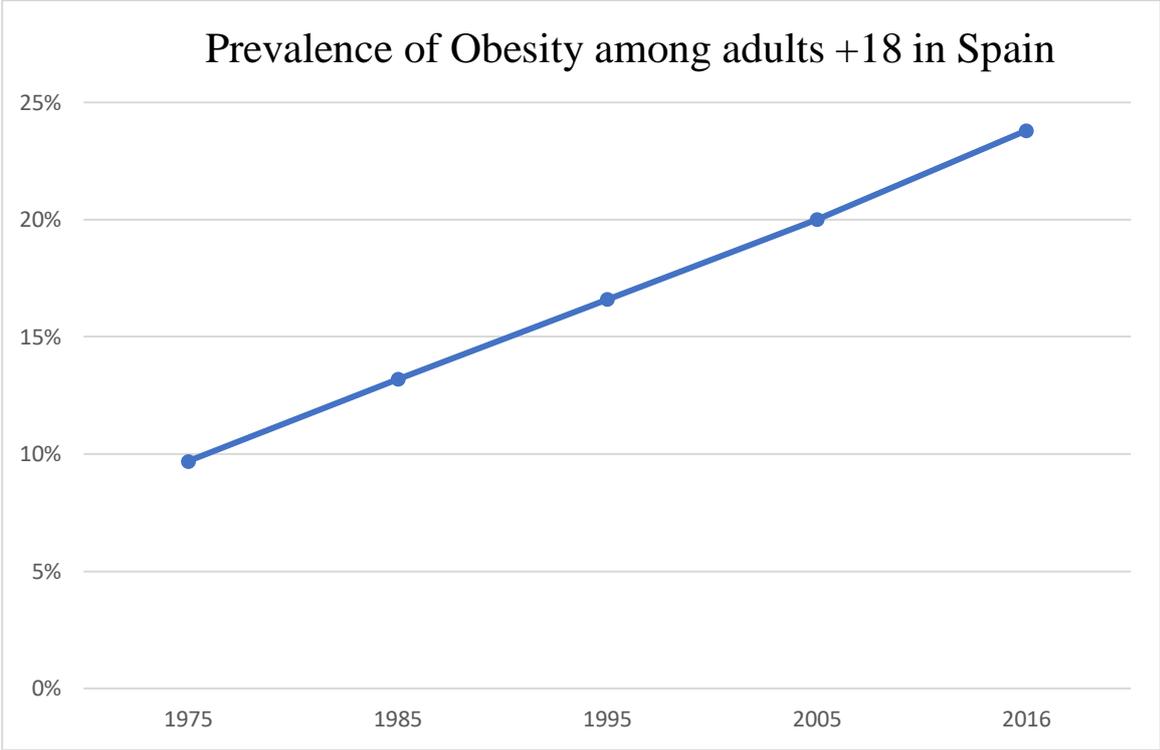


Figure 1 : Prevalence of Obesity among adults in Spain
Data from : http://gamapserver.who.int/gho/interactive_charts/ncd/risk_factors/obesity/atlas.html

OBJECTIVES

The main objective of this literature review is to understand the impact of obesity in dentistry. We also tried to identify the impact of obesity on dental development, its practical considerations, possible treatments, and dental management of obese patients.

METHODS

A literature search was made through the following database: PubMed, Google Scholar, ResearchGate, and Medline. The following keywords were used: “obesity”, “dentistry”, “comorbidities”, “dental treatment”, “obese patient management”, “oral health”, “SmartByte™”, “Jaw-wiring”.

All identified papers were considered for inclusion, references from the articles found in the first search were also used.

DISCUSSION

1. Impact of obesity on dental development:

1.1 Dental development

Tooth eruption is the movement of a tooth from its osseous crypt position into the oral cavity. Although the exact mechanism of this process is not fully understood, many factors enter into consideration. (4) Body mass index seems to be one of these factors as obesity is associated with earlier teeth eruption (4) (5).

From 7 to 10 years of age there is no significant difference about the dental age of obese and non-obese children. Although, from 11 till 14 years old, the mean dental age is higher in obese children than in non-obese. (5) Environment and race might justify, at least in part, this association.

However, a study among 6-7 years of age schoolchildren in India did not find a significant correlation between body mass index and eruption sequence. (6) This dissimilarity might be explained by ethnicity, race, and dietary habits. In any case, the eruption sequence has an individual variability and further investigations are required to assess the relation between body mass index and the tooth emergence.

The possible correlation between obesity and accelerated tooth development is relevant as changes in tooth eruption can seriously affect oral health, producing malocclusion and crowding with poor oral hygiene and even , periodontal disease. (4) In orthodontics, timing is crucial. An acceleration of tooth eruption may impair the treatment plan, and so, the results. Furthermore, the prolonged exposure of early erupted tooth in the mouth may increase the caries risk. (5)

1.2 Dental anomalies

Dental anomaly is defined as a malformation of the tooth generally caused by a disturbance during its formation. Its aetiology may be genetic and or environmental; Due to the significant increase of children obesity and the different comorbidities associated, the potential correlation between dental anomalies and obesity is investigated.

A study performed in 2019 among 186 individuals, including 83 overweight and obese highlighted the prevalence of anomalies. Orthopantomography was used as a diagnostic tool. Supernumerary tooth, agenesis, dens invaginatus, dens evaginatus, tooth impaction, taurodontism, pulp stone and root dilaceration, were assessed, independently of the body mass index of the patient. The author found that there is no significant difference of prevalence between obese and non-obese patient ($p < 0.05$) except for root dilaceration which is characterised as an abnormal angulation bend in the root of a tooth, and less frequently in the crown itself. In effect, among 16 individuals that presents root dilaceration 13 of them were overweight or obese. It was as well the most common dental anomaly in overweight and obese children and adolescents.

This anomaly may be explained by the enhanced bite force of obese patients that may apply increased and traumatic forces to tooth. Again, the higher bone density and mineral content in patients with high body mass index may provoke dilacerations in maxillary and mandibular bone. The character bidimensional of the orthopantomography does not allow a proper investigation as it only shows the root dilacerations in a mesio distal direction but dentist are not allowed to identify them in a bucco lingual direction.

Again, the sample of individuals does not represent all ethnicities that may present genetical discrepancies. For example, the prevalence of dilacerations are higher in Iranian population

compared to Jordan subjects, 15% versus 4%. (7) Further studies are required to verify this hypothesis, using three-dimensional radiographic images, and including different ethnicities. (7)

2. Oral health and Obesity

2.1 Dental caries

Junk food is usually more expensive than healthy food and prolonged exposure and consumption of carbohydrates, as well as increased sedentary habits is a common risk factor for dental caries and obesity. We may ask ourselves, does dental caries and obesity have a direct association?

Body mass index is easily integrated on different studies and into current clinical practice and has the quality to be an inexpensive method for quantifying the relation of height and weight. Dental caries is a common public health problem and is characterised by the destruction of the outer layer of the tooth. The Decayed Missing Filled Index provide us information about caries, and an association between the two indexes has been suggested. (8)

Normal weight elementary school children have a mean Decayed Missing Filled Index of 2.1 and obese ones reached 2.7. (8) In addition, the percentage of children that present caries-free dentition is lower in normal weight children. Again, studies performed in non-western countries have found different conclusions without a significant association between caries and obesity during neither childhood (9) or adulthood (10) .

Obesity and dental caries are multifactorial conditions. We cannot dissociate the discrepancies caused by genetic variation of the individuals, as well as the lifestyle, dietary habits from both diseases. Uniqueness of the population, and, moreover the individual is far

more complex and further studies are required to assess the real relationship between obesity and dental caries.

2.2 Periodontal disease

Periodontal disease is an infectious inflammatory condition affecting the teeth surrounding's tissues. A systematic review of epidemiological studies and controlled clinical trials found a positive association between obesity and periodontal disease.(11)

This association can be explained by the action of inflammatory molecules. Adipocytes and osteoblast originate from the same stem cell. Obesity may increase adipocyte differentiation at the expense of osteoblast that can result to a decrease in bone formation.

On one hand, obese patients have an increase of visceral adipose tissues, accordingly, an increase amount of adipocyte. The adipocytes contain macrophages that secrete cytokines which are signalling molecules that mediate and regulate inflammation. Among other, the Leptin is pro-inflammatory cytokine that have an increased production in obese patient, and which stimulates the production of tumour necrosis factor alfa and interleukin 6 (IL-6). Those two others inflammatory cytokine results in, respectively for Tumour necrosis factor alfa (TNF- α) an osteoclastic activity in bone, which results in bone destruction, a connective tissue degradation, including periodontium tissues. Interleukin 6 provokes for its part acute and chronic state of inflammation. In addition, obese patients have a decreased production of adiponectin, which has an anti-inflammatory role. (12)

The resultant pro-inflammatory of those cytokines contribute to periodontal disease. For this reason, obese patients have an imbalance of cytokine activity, as they have an increase amount of fat cells, and it influences their susceptibility to periodontal disease.

On the other hand, the success of periodontal therapy may be influenced negatively by those factors. The increase amount of pro-inflammatory cytokines in obese patient may inhibit the results of periodontal therapy and complicates the treatment.

Although the relationship inflammatory cytokines / obesity / periodontal disease needs further investigation, dental practitioners should be aware about the impact of obesity among periodontal tissues and inform the patients about the possible complications. The increase of the pro-inflammatory cytokines may also have an impact during dental extraction on obese patient. In effect it can affect the healing period of the socket, and cause problems during bone regeneration.

Age, sex, environmental and genetic factors are not taken into consideration systematically in all studies, and that may be the cause of some variation. Therefore, the magnitude of the association and the role of the inflammatory markers should be investigated.

Again, obese individuals may have higher risk of infection and their wound healing is delayed compared to normal weight individuals. (3) It has an unfavourable impact on extractions, implants, surgery procedures and post-surgery tissue regeneration. A strict following as well as good oral hygiene instructions must be followed to avoid further damages.

2.3 Tooth loss

Obese individuals having higher risk of developing periodontal disease and caries may lead to premature tooth loss. A study conducted in Brazil has found a positive correlation between obesity and tooth loss. Being obese nearly increases by two the chance of losing prematurely a tooth. (13). Another study highlighted the negative impact of central obesity

measured by waist-to-hip ratio and waist circumference, an important predictor for tooth loss in obese and non-obese individuals. (14)

However, the association between obesity and dental loss is unclear. Cross-sectional design does not allow to prove the causal relation and it is difficult to assess the veracity of this hypothesis. Weight is influenced by several factors including diet, physical activity, and other habits... that may cause early tooth loss, independently from body mass index. Further clinical research should be made to quantify this association.

2.4 Dental erosion

Dental erosion is a process that provokes demineralization of hard tissues, enamel and dentin, by non-bacterial acidic substances. Obesity and dental erosion have cofounding factors including diet, lifestyle and a higher consumption of soft drinks. However, some investigations state the possible relationship between weight and erosion.

The association may be partially explained by the increased prevalence of gastroesophageal reflux disease in obese patients. The amount of adipose tissue located in the abdominal region provokes an increased pressure in the cavity and thereby, a relaxation of the lower oesophageal sphincter. It provokes acidic reflux in the oral cavity by the exposition of gastric content, and cause intrinsic dental erosion. (15)

On one hand, a study conducted in adults shows that body mass index is not related to an increase of prevalence in tooth wear but is associated with the number of surfaces affected. In effective, among obese individuals that presents tooth wear, they have 1.7 times more surfaces affected compared to normal body mass index persons. (15)

On the other hand, an investigation among children and adolescent shows a significant increased prevalence of tooth wear in obese patients, 9% versus 3%. Moreover, when contracting the disease, its severity is higher in children with high body mass index. (16) Soft drinks consumption is generally increased in obese patients. It has both acidogenic and cariogenic potential that may lead to enamel erosion.

The dissimilarities found in studies might be due to the individual variability, as well as environmental factors. As a study is conducted in America (15) and the other in Saudi Arabia (16) culture dissimilarities might be an issue. Again, the cross-sectional design can not assess the causal relationship between obesity and dental erosion. Longitudinal studies are required to identify the real association.

2.5 Saliva

Xerostomia, more commonly known as dry mouth, is a consequence of a diminution of salivary flow. Saliva plays a protective role over dental surfaces, helps the formation of the bolus, and regulates the pH of the oral cavity. When having xerostomia, it potentiates the severity of periodontal disease and may increase the caries risk prevalence.

A cross-sectional study, found that childhood obesity is associated with reduced flow rate, that obese children presented 1.2ml/min of saliva versus 2.0 ml for normal-weight children.(17) Saliva collection is under stimulation by the mastication of a paraffin block. This information is a key to the relationship obesity, caries, and erosion. In effect, having a decreased salivary flow impair its buffer capacity. So, when an obese individual drinks soft drinks, or eat acidic food, there is not enough saliva to act as a protective barrier for the tooth.

According to what was said previously, the increase of proinflammatory cytokines, not only act on the periodontium, but also may have a negative impact on the function of salivary glands due to low grade chronic inflammation. (18)

However, not only the flow is crucial on saliva capacities, but its composition may also impair the oral state of individuals. On another investigation, no relation between salivary flow and obesity was found: on one hand in obese sample, the concentration of phosphate and peroxidase activity were decreased, on the other hand, an increased free sialic acid and protein concentration were observed. (19) These variations may explain the relationship between caries and obesity.

The limited reports and studies about obesity and saliva do not allow a clear view of the relationship and its impact on buccal estate. Does obesity change the saliva composition or does the salivary composition may be a risk factor for developing obesity?

In addition, dentists should be aware that some anti-obesity drugs, as sympathomimetic drugs like phentermine or cannabinoid-1 receptors antagonist as sibutramine may provoke dry mouth, and so a decrease of the salivary flow. (20)

Oral health disease	Articles	Significant association
CARIES	<i>Willershausen (8)</i>	Yes (Children)
	<i>Zúñiga-manríquez (9)</i>	No (Children)
	<i>Idrees. (10)</i>	No (Adults)
PERIODONTAL DISEASE	<i>Martinez-Herrera. (10)</i>	Yes
	<i>Tolle, (11)</i>	Yes
TOOTH LOSS	<i>Pilotto (12)</i>	Yes
	<i>Kang J (13)</i>	Yes
DENTAL EROSION	<i>Kamal Y (14)</i>	Yes (severity) (Adults)
	<i>Nahla Jastaniyah (15)</i>	Yes (prevalence + severity) (Children)
SALIVA	<i>Modéer T (16)</i>	Yes (xerostomia)
	<i>Roa I (17)</i>	Yes (salivary glands function)
	<i>O'Sullivan EA (18)</i>	Yes (salivary components)
	<i>Kang JG (19)</i>	Yes (medication)

*Table 1 : Potential associations between obesity and oral state.
Data from (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (17), (18), (19)*

3. Prevention and treatments

3.1 Prevention

Oral Cancer

Head and neck cancer is defined as the abnormal cell division and growth that invade and cause damage to oral tissue. It includes lips, tongue, cheeks, floor of the mouth, palate, throat. On clinical anamnesis it is recommended for dentist to perform cervical lymph node palpation to detect any lump or abnormal mass. On obese patients it may be compromised due to an excessive amount of soft tissue in the neck area. (21)

Obesity is considered as a major risk factor for many cancer, however its impact the prevalence of oral cancer is not clearly established. A study conducted in Seoul found out that there is no overall significant evidence of a positive association between obesity and oral cancer. However, in female under 50 years old with a body mass index over 25 a correlation was found. (22)

The dentist duty is to identify suspicious growth or abnormal looking area and having further information about the impact of obesity on oral cancer is necessary to be aware of all the signs and symptoms that may impair patient's life, especially when obese patient are subjected to many other comorbidities.

Comorbidities

Obese individuals have more risk to develop hypertension. It necessitates special attention as any stressful treatment may increase blood pressure. In this kind of patient, a supine position is not recommended especially when they are obese.

On another hand, diabetes type II is closely related to obese patient due to the increase of fat tissue located around cells causing the insulin resistance syndrome. Early on, the

relationship between caries and obesity was assessed. In obese patients with diabetes of type II, dental caries risk is increased, and it requires special attention from the dentist's part and more generally from dental staff.

Finally, obese patient may suffer from respiratory disorders that may provoke problems during conscious anaesthesia. Again, during dental procedures the large amount of fat present in chest and abdomen may impair their respiratory function, thus, enhance their stress and increase their blood pressure. (3)

3.2 Treatments

Obesity screening and counselling

Diet counselling is a useful component of dentist services, although it is not commonly done in daily dental practice. In effect, an investigation among 8000 dental practitioners showed that only 3% of general dentist and 6% of paediatric dentist offer counselling services. Even if paediatrician dentists are willing to offer some diet advices, and general practitioner are not interested due to the lack of studies who relate the relationship between obesity and oral impairment. The other problem that face dentists are the lack of information and acknowledge about the nutrition status. Interprofessional education among dentists and doctors may be required. (23)

However, adding nutrition counselling in the dental practice may not be easily achievable. In effect, it is time consuming and dental procedures are generally preferred among prevention. Counselling is based on the idea of treating not only the mouth but also the individual. The first step is to learn about the habits of the obese patient : collecting data about the eating frequency, the variety in the diet and the quantities, the physical activity and screen

time. Then an evaluation of the data is made and recommendations can be provided to the patient. It involves the patient cooperation and develops patient's interest.

There are two types of diet counselling: direct and non direct. On one hand, the direct approach involves dentists' authority and he sets the dietary rule and instructions. It is less time consuming but does not involve patients in the dietary plan so it may fail due to the lack of patient's cooperation. On the other hand, the non direct counselling encourages the patient's involvement in the treatment plan and a focus is made according to patient's objectives. It helps cooperation and increase the success of the therapy. (24)

It can be easily incorporated in the dental practice by collecting the information at each appointment, measurement of height and weight and body mass index calculation and adding discussion about the diet. Obviously, it will require schedule adjustments and larger appointments that not all dentist is willing to do. The reduction of fatty food, carbohydrates and sugary drinks not only help the reduction of caries may also help to reduce the weight of the obese patient and his body mass index with the help of physical activity. Positive reinforcement as well as encouragements and following will reinforce patients' trust and cooperation.

A contact with a dietician and a medical doctor may be useful for the dental practitioner as it will help the acknowledgement of the new dietary approach and it facilitates referrals from dentist when a patient requests something more specific about its will to lose weight.

The dentist should be aware of treating the obese patient as a whole, and he should see the counselling as a way to achieve an optimal level of care, helping reducing the comorbidities and increasing the oral health state by reducing the risk of dental erosion, tooth loss and periodontal disease.

Food intake restriction

Oral jaw wiring or maxilla- mandibular fixation is one of the most controverse treatment for obese patients. The requirements for this type of treatment are obese patients that presents grade 2 or more obesity, with a body mass index superior to 35, and under 50 years of age. Jaw wiring is considered as potentially useful when patients cannot go under bariatric surgery. Again, individuals should not present any periodontal disease, to avoid excessive periodontal and bone damages as that was mentioned earlier. Patients should be motivated to lose weight as it is a long and demanding treatment. The consultation with their physician, dietician, and general physician is required to make the best treatment plan possible with the best results. Jaw wiring can be executed by dentists, orthodontists, and oral surgeons. (25)

The objective of jaw wiring is to restrict the bite and limit the masticatory function of the individuals in order to decrease the amount of food swallowed by the obese patient. It impairs the consumption of solid foods and requires a strict liquid diet, avoiding sugary drinks.

The conventional jaw wiring was described first in 1977 and the use of 0.009 inch stainless steel wires was mandatory. It consists of introducing the wire between interdental spaces of both maxillary and mandibular molars.

Nowadays, the orthodontic jaw wiring is recommended as it is less aggressive than the conventional one. It consists of placing orthodontics brackets on buccal surface of maxillary and mandibular canines and premolar. Then a wire of 0.012 inch of stainless steel is laced between upper and lower teeth, starting from distal to mesial. Different type of brackets can be used like beg brackets, ceramic brackets to achieve aesthetic in the upper canine area, but brackets with hooks are the best option as it is easier to tie the wire. (Figure 2) Elastics should

be avoided in this type of treatment as they may provoke tooth's extrusion, buccal inclination, and open bite.

Those two techniques imply a wire removal for about 48 hours every month to allow jaw exercises. Jaw immobility is completely prohibited and 2mm of free movement in protrusive, retrusive and lateral pathways should be achieved.

The orthodontic jaw wiring technique allows obese patient to rewire himself his device after a complete training with his dental practitioner. Again, it is less time consuming for the obese patient, but the fact is that it relies on the individual's cooperation and compliance.

The most dangerous complication that may occur is the aspiration of vomitus. In effective patient can not properly open the mouth and it may lead to asphyxia, aspiration pneumonia, which correspond to a lung infection due to a large amount of stomach compound entering in the lungs, and death. Keep a cutter on hand is recommended in case of this emergency. Temporomandibular joint dysfunction may occur as well as teeth decalcification around brackets, gingival inflammation, and cuts or injuries on soft tissues, especially buccal mucosa, and lips. Strict patient's supervision is required as well as good oral hygiene techniques (25).

A study conducted in 1981 among 16 obese women showed a weight loss of more than 30kg after 6-12 months of jaw wiring. It also highlighted the fact that when the jaw wires are removed, patients tend to regain weight. In effective, after the jaw wiring removal, 7 women that had a cord attached to their waist for 9 months had a regain of 5.6 +/- 2.1 kg versus 17.8 +/- 6.4kg gained for women without the waist cord. Again, it calls attention to the psychological impact patients may suffer during the treatment of obesity and dental practitioners should be aware and be able to recognise the warning signs of any relapse. (26)

The lack of information and studies about weight loss and benefices of this type of food restriction devices, jaw wiring, impairs its use and planification in the daily dental practice for the treatment of obesity. Further reports are required.



*Figure 2 : Orthodontic Jaw wiring.
Image taken from reference (24)*

The SmartByte™ System is a retainer-like device that can be use as a treatment of obesity. It is a non-invasive, custom-made removable apparatus placed inside the patient's mouth, on the upper maxilla while eating. Its objective is to decrease the eating rate by reducing the volume of food that can enter in the oral cavity. Thereby, eating is more difficult, and it allows the patient to reach the body's physiological satiety response with less calories consumed. An explanatory video is available for all patients to understand the outcomes, requirements, and the diet plan for this apparatus. (21)

The first step is to make a complete anamnesis of the patient, including its height, weight, degree of obesity. Dentist need to check if this patient has any previous prostheses, allergy, braces or already a removable appliance. Then an impression of the upper maxilla is made, pouring with plaster and the device is finally made out of biocompatible material.

A sensor data is placed on the middle of the device and it is able to record, measure precisely the time, frequency and duration of meal, on the condition that the patients are compliant and cooperant. The dental practitioner is able to download the data to discuss later on with the patient about his diet habits.

A study conducted among 40 obese patients showed that at week 16, by using SmartByte™ (figure 3), 12 individuals of the initial population achieved less than 5% weight loss, 16 patients less than 4% and 21 people inferior at 3% weight loss. Some adverse event may occur as hard palate abrasion due to food infiltration under the device and tongue lacerations, both are considered as non-serious and moderate in severity and do not require any professional intervention. (27)

As the jaw-wiring technique, this device allows patients to avoid bariatric surgery, and it allows lower grade of obesity, 1 or 2 for example to have safer treatment unlike surgery or medication. Lower risk approaches are required as well as non-invasive treatment. Again, this device seems to have less side effects than jaw wiring and less dangerous for the oral cavity and the patient's security. However, if the patient is not compliant, cooperative and does not wear the device during meals, the outcome is not relevant. Both of these treatments require proper communication with the obese individual and seem to have good results. Those type of treatments may help individuals to learn how to eat properly, with good proportions and it satisfies their will to lose weight. It is qualified as gradual behaviour modification system.

However, longer duration studies are required to access the sustainability of weight loss for obese patients. The lack of data does not allow dental professionals to confirm the success of this type of alternative therapy.



Figure 3 : SmartByte™
Image taken from reference (26)

An individual approach with a case-by-case patient's selection should be chosen by the dental practitioner according to the degree of obesity, the relative risks, as well as the presence of periodontal disease, temporomandibular disorders... Again, it should never be a personal choice of the dentist but should be a multidisciplinary decision. It is not the dentist duty to diagnose obesity, but participation in its treatment is possible, in agreement with other health professionals. The dentist role is to provide the appliance and periodically check the oral state of the patient. Dentists should be aware of all the comorbidities that may be a brake for this type of oral devices. (21)

4. Managing the obese patient

4.1 Facilities, equipment, and services

Obesity is a challenge for dental practitioners. In effect, obese patients have to face many obstacles accessing to dental clinic. First, the parking should be as close as the clinic as possible, with a special spot for handicapped person. (28) Then, the waiting area should be fully equipped with suitable armless weight bearing chair. Again, toilet facilities are required. Narrow corridors impair the good circulation in dental clinic for the plus size patient and the presence of stairs and not lift when the clinic is located in higher floors impede the correct access for bariatric patients.

Dentist practitioner must understand the practical and physiological necessities of this type of patient in order to treat them correctly. The dental chair may be a brake for obese patient to access to dental care. In effective, an average dental chair can generally bear 140kg. If a patient exceeds this weight, an explication without offending should be given to the patient. If a dentist decides to treat an overweight patient that exceed the bear loading of its dental chair, it may provoke breach health and safety legislation. Dental staff should also have a list of dental clinics that may receive this plus size patients and properly refer them in case of not having the adequate facilities.

If the patient does not know their weight, it is recommended to send the patient to a special centre where they have specific scales for obese patients. An up-to-date and accurate weight ensures safety and avoid further risks as well as the proper handling of conscious sedation and the posology and maximum dosage of certain type of pharmaceuticals.

Different type of dental chairs are found in the market. Generally, the maximum load is about 500kg. It is the best choice for patients and staff safety. Some type of chairs are

multifactorial and they are designed for the use from the patient's entry in the clinic until the end of the treatment. In effective it is a special dental chair that have four wheels, the headset is fixed, and it allows the dentist to tilt back the patient, to have a better suitable position to work. It is a good solution for patients who have an altered mobility. (Figure 4).

Again, a bariatric treatment chair allows the treatment of both bariatric and normal weight, adults, and children. It seems like a comprehensive solution. This chair offers a larger seat and allows a 100% supine position. However, normal weight patients may be uncomfortable, and it seems that they are not able to have access to the armrest. In addition, they may move more during the dental treatment as they have more space in the chair that can provoke dental accidents. (Figure 4) Also a dental wheelchair recliner can be used for patient that have mobility impairment and in which they are not able to transfer themselves from a chair to another. (Figure 4)

A bariatric dental chair is considered as the safest way to treat obese patient. However, its is an investment, it requires the proper facilities and equipment that not every clinic is able to afford. (29) Wider cuff blood pressure monitors are required, especially for hypertensive obese patients that require a measurement before starting any type of treatment.

In case of emergency, the bariatric dental chair does not able to get patient rapidly into supine/recovery position or physically move the patient. Dentist should be aware of any signs or symptoms to be able to react as fast as possible and prevent damages. In case of resuscitation the identification of landmarks for chest compressions may be difficult so additional formation should be assessed by dental practitioner when he plans to treat plus size individuals.(28)



*Figure 4 : Multifactorial bariatric dental chair, Bariatric treatment chair, Dental wheelchair recliner
Image taken from reference (28)*

On another hand, dental appointments should be longer for obese people compared to normal weight individuals. As explained before, obese patients need extra time to move around the dental clinic, stand up and sit down may be difficult. Then, during dental treatment the excess of fat in the head and neck area may impair the correct progress of the treatment, and therefore, increase the operating time. Again, during anamnesis, it may require extra time as patients generally come with comorbidities, previous treatments, and medications.

To sum up, treating obese patient requires full investment from the dental staff, facilities, equipment, and space. It is time consuming; the operating time increases it reduces clinic efficiency and this actively demonstrates a decreased income for the clinic. Some authors say that attending obese patient may provoke some physical strains due to the malposition during practice in order to reach the oral cavity with a decent vision. Again, it is stressful as patients normally comes with other diseases that requires full attention from professional's part.

(30)

4.2 Anaesthesia

The higher proportion of soft tissues in obese patients have consequences in the handling of anaesthesia techniques. In effect, the increased amount of fat tissue surrounding the cheeks may impair the proper recognition of anatomical landmarks, especially during inferior alveolar nerve block. Again, the pterygomandibular raphe can be uneasy to distinguish as well as the palpation of the coronoid notch. In this type of figure, the use of tongue retractor may be useful. (21) Excessive fat located in soft tissue may also affect the pharmacological effect and absorption of a medicine and anaesthetic. (29)

A prospective cohort study conducted on 93 children did not find an association between mandibular nerve block anaesthesia and body mass index. Two groups were made, low normal-weight individuals and overweight. It was found that an anaesthetic was achieved in 89.4% of low-normal weight and 91.3% of obese children. (31)

Conscious sedation is sometimes required in dentistry. However, the practitioner should be fully aware about the potential difficulties in airway management, especially for those who present obstructive sleep apnea.

4.3 Orthodontics

The possible malocclusion caused by an increased body mass index during childhood, leads to a need for orthodontics. A study conducted among adolescents shows that the treatment duration in orthodontics for an obese patient took generally a larger amount of time compared to normal weight individual. In effect, a normal weight patient will have a mean of 21 appointments versus 24 for obese patients for a comparable pre-treatment malocclusion severity. Although the study highlights the fact that the lack of cooperation can partly explain

this discrepancy, the changes in the bone metabolism of obese patients may cause this difference. The increase amount of adipose tissue can influence the orthodontic tooth movement as well as the increased bone density. As it was previously stated, the increase of adipocytes imply an increase of the leptin hormone that inhibit bone formation. It could be the source of a slower tooth movement due to the slower bone regeneration and an increased density. (32)

Again, another literature study highlighted the fact that there is no direct connection between obesity and orthodontic treatment and there is no statistically significant difference in tooth movement between an obese and a normal weight patient, even though some articles highlight the fact that during the first week there is an increase in the rate of tooth movement in high body mass index patients. (33)

Finally, the management of obese patients in orthodontics do not requires any special protocols during the treatment or adopt any extra measures except those previously stated.

4.4 Cooperation of obese patient

Patient cooperation is primordial for any dental treatment, although it is not always achieved. A study of the impact of body mass index on oral health during orthodontic treatment highlight the fact that overweight or obese patients do not cooperate as much as normal weight patients. In effect, only 21% of the obese patients were reported having a good cooperation, versus 43% in normal body mass index individual. In the investigation, it is shown that this lack of compliance may be the cause of a longer treatment duration. Again, the correlation between the socio-economic status and the obesity may influence the patient's compliance. Lower incomes and socio-economic status may imply a lack of family support and a medication non-adherence. (32)

4.5 Psycho-emotional functioning

The implications of obesity in the delivery and acceptance of dental care is important. The Dental Fear Survey (DFS), is a questionnaire that measure the dental anxiety from 1 (no fear) to 5 (extreme fear). According to some studies, obese patients have significantly more dental anxiety compared to normal weight. Again, patients with an higher body mass index have a decreased dental attendance even though their perception of their oral health state is lowered compared to non-obese patients. (30)

A favourable attitude towards obese patients from professional part is important. As it was stated before, dental practitioner can assess nutrition counselling practice. The problem might result in the absence of provided counsel. Paediatric dentists seem more confident about their abilities to calculate and interpret body mass index of children and provide the adequate advices, 53% are interested in offering these services while only 9% really do it. It seems to be due to the extra education about nutritional counselling and behaviour modifications they received compared to general dentists. Again, paediatric dentists perceive that dentists play an important role in helping obese patients compared to general dentists that perceived obesity as a lack of willpower from patient's part and are not interested in providing advices about wight management until more studies highlight the real relationship between oral health and obesity.

However, some barriers impair dental practitioner offering those services. In effect, the fear of offending the patient, appearing judgemental, the time-consuming appointments and lack of adequate knowledge act directly on the willingness of the professional. (23)

The lack of data and studies about obesity management provokes an absence of inclusion in education during dental school curriculum. A study conducted in Pakistan assessed

knowledge, perceptions, and attitudes of dental students towards obesity. A total of 79% of participants have received between 0 and 1 hour of obesity-related education during their degree. The average score for the total time allocated was 1.3 hours +/- 0.2. It appears that the majority of the students are unable to define obesity and determine its relationship with oral health problems. As obesity is an emergent disease it is becoming a huge problem that the new generation is not well prepared. Again, half of the students are not interested in making special accommodations in their future dental offices. (34)

Obesity is a stigmatized condition. Obese patients need considerable psychosocial support from their healthcare providers. Their cooperation and willingness rely on treatment cost, therapy availability and mostly on healthcare provider motivation. Dentist's job is to treat obese patient with respect, without implicit or explicit discrimination. Professionals are more likely to project negative psychological symptoms on patients. Obese patients are evaluated more negatively according to the compliance of treatments recommendations and diet counselling. Again, negative attitudes towards overweight patients may lead them to lower-self acceptance and self-confidence that can result in treatment avoidance. It creates inequity and may explain why obese patients have more tooth loss. High body mass index patients may have less choices and opportunities to access to dental clinics according to the facilities that is why (35)

CONCLUSION

Obesity has a major impact on oral health, not only in tooth development or diseases but also have a major impact on how we must treat our patients. The prevalence of obesity keeps increasing and dentists should be prepared to deal with these patients.

Diet counselling should be a part of or daily practice, especially with obese population. However, some treatments proposed to treat obesity may be controversial.

Obesity may impede patients to access to correct dental care due to the absence of facilities and the unwillingness of professionals to make investments. The psychological aspect plays an important role as well as the benevolence of the oral health care practitioner. Obesity in dentistry is not an easy subject to deal with. Indeed, the lack of information and studies may impair the future generations of dentist to manage properly this new type of patients.

RESPONSIBILITY

This final degree project makes it possible to improve the service provided to overweight people. In effect, as much for health professionals as for patients, it enables the possibility to realize the effects of obesity on oral health, to increase the knowledge of this subject, the protocols, and the possible treatments.

Developing access to healthcare for obese people can drastically reduce costs in the long term. Patients who come to the dental clinic on a regular basis significantly reduce their risk of complications and heavier treatments. For example, a decay treated in time can prevent endodontics or worse, tooth extraction that requires replacement through prosthesis.

By reading this final degree project, dentists can have an overall idea of the arrangements necessary to treat an obese patient in terms of the dental chair, the arrangements of the premises and other access facilities : this greatly improves the patient's quality of life (less stress, less shame) within the clinic. However, the necessary arrangements as well as the material required have a negative impact on the environment, more resources are needed (space required, construction materials...) this therefore has an economic impact for the dentist.

Again, it allows us to reflect on the social problems that overweight people face. Some dentists refuse to treat them and do not adapt their clinical protocols, either through ignorance of the treatment, the disease and or a lack of suitable equipment.

However, we dentists are ethically bound to provide the necessary care and assistance to each individual without discrimination.

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ANNEXES



Obesity and overweight

1 April 2020

Key facts

- Worldwide obesity has nearly tripled since 1975.
 - In 2016, more than 1.9 billion adults, 18 years and older, were overweight. Of these over 650 million were obese.
 - 39% of adults aged 18 years and over were overweight in 2016, and 13% were obese.
 - Most of the world's population live in countries where overweight and obesity kills more people than underweight.
 - 38 million children under the age of 5 were overweight or obese in 2019.
 - Over 340 million children and adolescents aged 5-19 were overweight or obese in 2016.
 - Obesity is preventable.
-

What are obesity and overweight

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health.

Body mass index (BMI) is a simple index of weight-for-height that is commonly used to classify overweight and obesity in adults. It is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m²).

Adults

For adults, WHO defines overweight and obesity as follows:

COVID-19 is an emerging, rapidly evolving situation.

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Get the latest research from NIH: <https://www.nih.gov/coronavirus>.

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[BMC Oral Health](#). 2012 Nov 20;12:50. doi: 10.1186/1472-6831-12-50.

Oral health and obesity indicators

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Affiliations

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Abstract

Background: In western Sweden, the aim was to study the associations between oral health variables and total and central adiposity, respectively, and to investigate the influence of socio-economic factors (SES), lifestyle, dental anxiety and co-morbidity.

Methods: The subjects constituted a randomised sample from the 1992 data collection in the Prospective Population Study of Women in Gothenburg, Sweden (n = 999, 38- > =78 yrs). The study comprised a clinical and radiographic examination, together with a self-administered questionnaire. Obesity was defined as body mass index (BMI) > =30 kg/m(2), waist-hip ratio (WHR) > =0.80, and waist circumference >0.88 m. Associations were estimated using logistic regression including adjustments for possible confounders.

Results: The mean BMI value was 25.96 kg/m(2), the mean WHR 0.83, and the mean waist circumference 0.83 m. The number of teeth, the number of restored teeth, xerostomia, dental visiting habits and self-perceived health were associated with both total and central adiposity, independent of age and SES. For instance, there were statistically significant associations between a small number of teeth (<20) and obesity: BMI (OR 1.95; 95% CI 1.40-2.73), WHR (1.67; 1.28-2.19) and waist circumference (1.94; 1.47-2.55), respectively. The number of carious lesions and masticatory function showed no associations with obesity. The obesity measure was of significance, particularly with regard to behaviour, such as irregular dental visits, with a greater risk associated with BMI (1.83; 1.23-2.71) and waist circumference (1.96; 1.39-2.75), but not with WHR (1.29; 0.90-1.85).

Conclusions: Associations were found between oral health and obesity. The choice of obesity measure in oral health studies should be carefully considered.

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Published: 22 August 2009

Obesity and dentistry: a growing problem

D. Reilly, C. A. Boyle  & D. C. Craig

British Dental Journal **207**, 171–175(2009)

1517 Accesses | 28 Citations | 0 Altmetric | [Metrics](#)

Key Points

- 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.

Abstract

The Association Between Childhood Obesity and Tooth Eruption

Aviva Must¹, Sarah M. Phillips¹, David J. Tybor¹, Keith Lividini² and Catherine Hayes³

Obesity is a growth-promoting process as evidenced by its effect on the timing of puberty. Although studies are limited, obesity has been shown to affect the timing of tooth eruption. Both the timing and sequence of tooth eruption are important to overall oral health. The purpose of this study was to examine the association between obesity and tooth eruption. Data were combined from three consecutive cycles (2001–2006) of the National Health and Nutrition Examination Survey (NHANES) and analyzed to examine associations between the number of teeth erupted (NET) and obesity status (BMI z-score >95th percentile BMI relative to the Centers for Disease Control and Prevention (CDC) growth reference) among children 5 up to 14 years of age, controlling for potential confounding by age, gender, race, and socioeconomic status (SES). Obesity is significantly associated with having a higher average NET during the mixed dentition period. On average, teeth of obese children erupted earlier than nonobese children with obese children having on average 1.44 more teeth erupted than nonobese children, after adjusting for age, gender, and race/ethnicity ($P < 0.0001$). SES was not a confounder of the observed associations. Obese children, on average, have significantly more teeth erupted than nonobese children after adjusting for gender, age, and race. These findings may have clinical importance in the area of dental and orthodontic medicine both in terms of risk for dental caries due to extended length of time exposed in the oral cavity and sequencing which may increase the likelihood of malocclusions.

Obesity (2012) **20**, 2070–2074. doi:10.1038/oby.2012.23

INTRODUCTION

Childhood obesity is increasingly recognized as a public health concern in the United States and globally. Data from the 2007–2008 NHANES show that the prevalence of obesity in the United States is 16.9% among all children ages 2–19, and the prevalence has been reported as high as 29% among certain racial/ethnic groups (1). Obesity in childhood is associated with an increased risk for many adverse physical and psychosocial health outcomes (2). As a growth-promoting process that affects almost every organ system in the human body (3), obesity has been shown to affect the timing of puberty in boys and girls (4). Before puberty, overweight children are significantly taller than their age-matched peers (5). Given its association with accelerations in growth and maturation it is reasonable to hypothesize that obesity affects the timing of tooth eruption.

Tooth eruption is the movement of a tooth from its position in the osseous crypt into the oral cavity. Although the exact mechanisms underlying this process are not entirely known, many factors appear to play a role. Demographic factors, such as race, sex, and age may influence the process (6). Physiologic factors thought to be involved include molecular signaling (7)

and several hormones and mediators that affect growth (8). Growth of the mandible is known to be influenced by pubertal timing (9). Deciduous tooth eruption may be altered in conjunction with certain systemic disorders, such as diabetes mellitus and congenital abnormalities (10,11). Alterations in the timing of tooth eruption can significantly impact oral health due to its potential to cause malocclusion (the improper positioning of the teeth and jaws) and/or crowding, which may in turn lead to poor oral hygiene and periodontal disease (12,13). In addition, the length of time a tooth is present in the oral cavity affects its risk for dental caries. Furthermore, sequencing of eruption may impact occlusion which may have consequences for periodontal and temporomandibular joint disorders.

A relationship between the timing of a child's primary teeth and both postnatal growth (14,15) and nutritional status (16–18) has been observed; however, few studies have been conducted to examine the effects of obesity on the timing of permanent tooth eruption. One longitudinal study conducted in Mexico City found that among 110 children, obese children had more erupted teeth than nonobese children, after accounting for sex and age at baseline (19). A US study of 104 children found that obesity was associated with accelerated dental development

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Childhood Obesity and Dental Development

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Abstract

Purpose: The purpose of this study was to determine if increased body mass index (BMI) is associated with accelerated dental development in children ages 8 to 15.

Methods: The dental development ages of 104 children were determined using the Demirjian method and panoramic radiographs. Using the system developed by the International Obesity Task Force, BMI status was determined for each subject (63 normal weight, 23 overweight, and 18 obese subjects). The difference between chronologic age and dental age was analyzed against BMI, age, and gender using 3-way analysis of variance.

Results: Dental development was significantly accelerated with increased BMI, even after adjusting for age and gender ($P < .01$). The mean difference between chronologic and dental age among all subjects was 0.68 ± 1.31 years. The mean dental age acceleration for overweight and obese subjects was 1.51 ± 1.22 years and 1.53 ± 1.28 years, respectively.

Conclusions: Children who were overweight or obese had accelerated dental development, even after adjusting for age and gender. Accelerated dental development in obese children is an important variable to consider in pediatric dental and orthodontic treatment planning where timing is crucial. (*Pediatr Dent* 2006;28:18-22)

KEYWORDS: DENTAL DEVELOPMENT, CHILDHOOD OBESITY, PEDIATRICS

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Due to more sedentary lifestyles and inadequate dietary habits, obesity has become an increasing problem in pediatrics.¹⁻³ The escalating obesity problem is so severe that the Surgeon General anticipates future obesity-related health care costs and morbidity and mortality rates may exceed those associated with cigarette smoking.^{4,5}

Aside from the physical consequences of obesity, mental status is often adversely affected. In fact, many children who are obese suffer from depression and low self-esteem. Unfortunately, treatment of the depression often requires medication, which precipitates further weight gain and may worsen an already low sense of self-esteem.^{6,7}

Beyond the immediate health risks such as noninsulin dependent diabetes mellitus, hyperlipidemia, high blood pressure/cardiovascular disease, and obstructive sleep apnea,⁸ obesity has been associated with accelerated linear growth and the early onset of puberty in females.⁸ In males, the effects of obesity cause considerable variation in the timing of puberty (accelerated or delayed).⁸ Both the early

onset of puberty (as seen in obese and African American females)⁹ and hyperinsulinemia have been associated with increased risk of breast cancer¹⁰⁻¹² and polycystic ovary disease⁸ in adulthood. Obese children have also been shown to have decreased levels of growth hormone¹³ while sustaining increased levels of free IgF-1 (a main circulating growth factor).¹⁴ Studies suggest that the IgF-1 causes the accelerated growth and suppresses the pituitary hypothalamus, which results in continued low levels of growth hormone and other varied effects.^{8,14}

Although obese children may be taller in childhood,¹⁵ they are of normal height in adolescence and adulthood.^{16,17} Recent studies also suggest that obese adolescents have early craniofacial growth, which may alter their diagnoses and timing of orthodontic treatment.^{18,19} In fact, when incorporating orthodontic therapies such as growth modification^{20,21} or serial extractions, the timing of intervention may require recalculation to consider not only gender and race, but also body mass index (BMI [obesity]) of the patient. Unfortunately, no study has evaluated the effect of obesity on dental development. Therefore, the purpose of this study was to determine if obesity affects the dental age/chronologic age relationship.

Methods

This study comprised a chart review of new patients between 7 and 15 years of age who were seen between January 1, 2004, and December 31, 2004, in the Department of Orthodontics and Pediatric Dentistry at the University of Louisville School

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Does Body Mass Index affect Tooth Eruption Sequence? A Study among 6–7 Years Old Schoolchildren in Chennai, India

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ABSTRACT

Background

Changes in eruption pattern cause malocclusion and crowding, which lead to poor oral hygiene as well as periodontal disorders. Hence, it is important for the dentist to know the exact tooth eruption sequence to educate the parents. Tooth eruption sequence we follow is based on the Western population.

Aim

As Indian population differs from the Western population in ethnicity, racially, and dietary habits, etc., an attempt was undertaken to compare eruption sequence of Indian children in accordance with the Western population and also to correlate whether body mass index (BMI) affects tooth eruption.

Materials and methods

Body mass index and eruption status of permanent mandibular central incisors and first molars were recorded among 529 schoolchildren in Chennai. Eruption status was examined with the help of mouth mirrors and illumination under natural light. The recorded data were entered into Microsoft Excel 2007 and were analyzed using Chi-square test, z test, and Spearman's correlation test. Level of significance was set as 0.05.

Relationship between obesity and prevalence of dental anomalies: Does body mass index play a role?



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Abstract

Aim The aim of this study was to investigate the prevalence of dental anomalies in different body mass index (BMI) percentile child and adolescent subjects.

Materials and methods Panoramic radiographs of 186 subjects (68 males and 118 females) were evaluated. The subjects were divided into three groups according to BMI percentile: Normal-weight (93), overweight (40), and obese (43) subjects. Supernumerary tooth, tooth agenesis, dens invaginatus, dens evaginatus, tooth impaction, taurodontism, pulp stone, and root dilaceration were assessed.

Results Root dilaceration was found in 11.3% of the obese subjects and 17.5% of the overweight subjects. There was a statistically significant difference in the root dilaceration prevalence among the groups ($p=0.015$). However, other dental anomalies did not display statistically significant differences among the groups ($p>0.05$). While there was no statistically significant difference in the dental anomalies prevalence among different BMI percentile groups in males ($p>0.05$), a statistically significant difference in the root dilaceration prevalence was detected among different BMI percentile groups in females ($p=0.036$). The data were analysed using chi-square and Fisher's exact tests.

Conclusions The prevalence of root dilaceration was significantly greater in obese and overweight subjects than in normal-weight subjects.

Introduction

Disturbances during the tooth formation result in dental anomaly formation (Gupta et al., 2011). Dental anomalies result not only in aesthetic, but also in functional and occlusal problems. They may lead to malocclusion through irregularities in arch formation and also complicate the course of dental treatment. Thus, early diagnosis of dental abnormalities is crucial to prevent orthodontic and maxillofacial deformities (Ardakani et al., 2007). Radiographic evaluation is essential as well as clinical examination to make a correct diagnosis of these anomalies (Küchler et al., 2008). Disturbances during the initiation or proliferation stages of dental development result in tooth number anomalies, while disturbances during the morphodifferentiation stage of dental development result in tooth shape and size anomalies (Lehtonen et al., 2015). Developmental disturbances in the eruption pattern of the permanent dentition lead to impaction and ectopic eruption of teeth. Depending on the timing of these interruptions, deciduous or permanent teeth are affected (Bondemark et al., 2007).

The prevalence of dental anomalies was found to range between 5.46% and 74.7% (Uslu et al., 2009). The etiologic factors of developmental abnormalities can be genetic, environmental or a combination of both of these factors (Brook, 1984).

Dental anomalies of number comprise hypodontia (agenesis of 1 or more teeth except the third molars) and hyperdontia (an enhancement in the number of teeth, known as supernumerary teeth), while dental anomalies of size can be classified as microdontia (smaller teeth than normal) and macrodontia (larger teeth than normal). Anomalies of shape contain fusion, gemination, concrescence, talon cusp, root dilacerations, dens invaginatus, dens evaginatus and taurodontism. The invagination of the surface of a tooth crown or more rarely the root that is lined by enamel and dentin is defined as dens invaginatus (dens in dente), whereas dens evaginatus is described as an extra cusp or tubercle from the occlusal or lingual surface of an affected tooth [Neville et al., 1991]. Pulp stones are discrete calcifications occurring in the pulp; their etiological factors are not fully understood,

KEYWORD Body mass index percentile, Dental anomalies, Obesity, Overweight, Panoramic radiograph.

CORRELATION BETWEEN ORAL HEALTH AND BODY MASS INDEX (BMI) IN 2071 PRIMARY SCHOOL PUPILS

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Abstract

High weight and obesity represent risk factors for numerous diseases. Correlations between body mass index (BMI) and carious lesions have also been described. In the present study, a possible association between caries prevalence and high weight ranges were examined in 2071 primary school pupils (51.8 % girls, 48.2 % boys), aged 6 to 10 years. A dental examination including the assessment of carious lesions (df-t + DF-T) was followed by measurements of height and weight in order to determine the BMI.

The evaluation showed that 6.8 % of the elementary school children were underweight, 76.4 % had a normal weight, and 10.5 % were overweight and 6.3 % obese.

Underweight children showed healthy teeth in 50 % of the cases, 47.4 % with normal weight showed naturally healthy teeth, while overweight and obese children displayed naturally healthy teeth in 41.5 % and 38.3 % of the cases, respectively.

In primary school pupils, a significant association between the caries frequency and the BMI was found. A low BMI showed a correlation with the absence of carious lesions ($p < 0.0001$), and a high BMI was linked to a high number of caries lesions (df-t + DF-T values; $p = 0.0021$). However, no gender-related differences, regarding the prevalence rates for high weight and obesity, could be established.

The significant correlation between the BMI and caries frequency persisted even after adjustment to the age of the children.

Key words: adiposity, body mass index, caries prevalence

INTRODUCTION

Within the last 20 years, a significant increase in the number of obese children, adolescents and adults could be observed in industrialized countries as well as in countries with a rising economy.

Decreased physical activity, a sedentary life style, the great popularity of computer games / TV as well as changes in the dietary and consumption habits have to be regarded as the initial factors for the strong rise in obesity [8]. In most of the countries, the prevalence for obesity experienced a growth of 10-50 % over the last 10 years. According to the WHO report (1998), 10 to 20 % of the male population, and up to 30 % of

the female population are obese. An ever-increasing number of the population prefers fast food products to a balanced and healthy diet [9]. There are many reasons for the obesity epidemic. Fast food contributes to a high-energy consumption, and a sedentary lifestyle reduces energy expenditure. Indeed, many of the foods, including soft drinks and refined-wheat breads, are low in micronutrients. Bes-Rastrollo et al. [2] reported of the need for societal changes in diet; however, attention to physical activity is also required. Astrup et al. [1] asked what makes fast food fattening. Considering the convenience, low price, and high-energy format of fast food he said "Human beings have only a weak innate ability to recognize foods with high energy density and to down regulate the bulk eaten to meet energy requirements appropriately." Cupples et al. [5] stated that body weight is closely regulated under most conditions; a failure in energy balance can have severe consequences for the organism.

A large amount of literature for dietary recommendations and guidelines for a healthy diet is freely accessible; however, the food that is presently available in fast food chains does not take these recommendations into account. In a study that was carried out with preschool children, living in Aachen, the German Society of Child - and Adolescent Psychiatry (DGKJP) was able to document an impressive increase in the children's weight over the last 30 years. While in 1969 only 10 % of the children were overweight, this figure rose to 33.1 % in the boys and to 27 % in the girls [11]. This study was able to prove that every third boy and every fourth girl is overweight. In 1969, only 3 % of the children were obese when entering school while in 1999 15.7 % of the boys and 11.3 % of the girls were obese. This equals an increase by 350 %.

However the study by Flegal et al. [9] that was carried out in the USA and is based on data from the "National Health and Nutrition Examination Survey (NHANES)" (National Center for Health Statistics, Centers for Disease Control and Prevention) shows a relatively stable percentage in the prevalence of overweight and obesity in a time span between 1960 and 1980. The percentage of obese children (aged: 6-11 years) in the USA with a BMI larger than P95 has more than doubled (from 6.5 to 15.8 %) over the last 20 years (time span: 1980 to 2002) while that of adolescents has more than tripled (from 5.0 to 16.1%).

Obese children, and especially girls, are at a very high risk of suffering from severe obesity in adult-

Experiencia, prevalencia y severidad de caries dental asociada con el estado nutricional en infantes mexicanos de 17 a 47 meses de edad

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Experience, prevalence and severity of dental caries and its association with nutritional status in Mexican infants 17-47 months

ABSTRACT

Objective. To determine the experience, prevalence and severity of dental caries and its relationship with nutritional status in nursery infants 17 to 47 months of age. **Material and methods.** A cross-sectional study in 152 infants 17 to 47 months of age attending one of five day care centers of the city of Pachuca, Hidalgo was performed. Clinical examinations were performed using the methods recommended by the World Health Organization for epidemiologic studies on dental caries. We calculated the caries index (dmft), the significant caries index (SiC) as well as the treatment needs index (TNI) and the care index (CI). Nutritional status was determined using the weight and height for age, in Federico Gomez's scale. In the statistical analysis nonparametric tests were used. **Results.** Mean age was 2.52 ± 0.76 years; 51.3% were boys. With regard to nutritional status, 19.1% were classified as malnourished and 19.1% were overweight/obese. The dmft index was 1.53 ± 2.52 . The SiC index was 4.14, the TNI 86.3% and the CI 13.7%. Caries prevalence was 48.0%. It was observed that 33.5% of children had 1 to 3 teeth with caries experience and 14.5% had 4 or more teeth affected. Statistically significant differences for tooth decay were identified ($p < 0.05$) by age, height and weight but not ($p > 0.05$) by sex and nutritional status. **Conclusions.** This study shows that nearly half of children examined had caries experience. High treatment needs for dental caries were observed. A correlation was found between dmft index and age, weight and height. No association was identified between

RESUMEN

Objetivo. Determinar la experiencia, prevalencia y severidad de caries dental y su asociación con el estado nutricional en infantes mexicanos. **Material y métodos.** Se llevó a cabo un estudio transversal en 152 infantes de 17 a 47 meses de edad inscritos en una de cinco estancias infantiles de la ciudad de Pachuca, Hidalgo. Se realizó una exploración clínica a cada uno de los infantes con los métodos que marca la Organización Mundial de la Salud para estudios epidemiológicos de caries dental. Con los datos se calcularon los índices de caries (ceod), el de caries significativa (SiC), así como el índice de necesidades de tratamiento (INT) y el índice de cuidados (IC). El estado de nutrición (IEN) se determinó empleando el peso y la talla para la edad propuesto por Federico Gómez. En el análisis estadístico se emplearon pruebas no paramétricas. **Resultados.** La edad media fue de 2.52 ± 0.76 años; 51.3% fueron varones. En cuanto al estado nutricional, 19.1% fueron clasificados como desnutridos, y 19.1% tenía sobrepeso/obesidad. El índice ceod fue de 1.53 ± 2.52 . La prevalencia de caries fue de 48.0%. El 33.5% de los niños tenían de uno a tres dientes con experiencia de caries y 14.5% tenía cuatro o más dientes afectados. El SiC fue de 4.14, el INT de 86.3% y el IC de 13.7%. Se observaron diferencias estadísticamente significativas ($p < 0.05$) para caries dental según la edad, la altura y el peso, pero no por sexo ($p > 0.05$) e IEN. **Conclusiones.** Casi la mitad de los niños examinados tuvo experiencia de caries. En un entorno con altas necesidades de tratamiento para caries dental hubo una correlación entre el índice ceod y la edad, el peso y la altura. No se identificó asociación entre la experiencia, prevalencia y severidad de caries dental y el IEN. Es necesario mejorar las medidas preventivas de salud bucal en estos infantes.



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Influence of body mass index on severity of dental caries: cross-sectional study in healthy adults

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Abstract

BACKGROUND

The relationship between body mass index (BMI) and dental caries is still undetermined.

OBJECTIVE

This study aimed to assess the relationship between the dental status by decayed, missed, filled teeth index (DMFT), and BMI by age and gender among healthy adults.

DESIGN

Analytical, cross-sectional study.

SETTINGS

University dental hospital in Riyadh.

SUBJECTS AND METHODS

Healthy adults aged between 18 and 35 years were recruited during the 10-month period from March 2015 to December 2015. Dental caries severity was estimated using the DMFT index.

MAIN OUTCOME MEASURE

The prevalence of overweight/obesity and the association of BMI category with the DMFT index.



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Association between obesity and periodontal disease. A systematic review of epidemiological studies and controlled clinical trials

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Abstract

Background

Obesity is a very prevalent chronic disease worldwide and has been suggested to increase susceptibility of periodontitis. The aim of this paper was to provide a systematic review of the association between obesity and periodontal disease, and to determine the possible mechanisms underlying in this relationship.

Material and Methods

A literature search was carried out in the databases PubMed-Medline and Embase. Controlled clinical trials and observational studies identifying periodontal and body composition parameters were selected. Each article was subjected to data extraction and quality assessment.

Results

Obesity and periodontal disease

CHRISTINE SEEL RITCHIE

Definition and current prevalence

Classification

Obesity is an excess amount of body fat in proportion to lean body mass, to the extent that health is impaired (3). The most commonly used measure of body fat is the body mass index, which is defined as a person's weight, in kilograms, divided by the square of his/her height in meters. The World Health Organization and the National Heart, Lung and Blood Institute (NHLBI) define overweight as a body mass index of 25–29.9 and obesity as a body mass index of ≥ 30 (50, 80). Childhood obesity is defined as a body mass index for age and gender that is greater than the 95th percentile (6). The full classification for overweight and obesity, developed by the National Institutes of Health through an expert panel that reviewed data from approximately 394 studies, is shown in Table 1.

Waist circumference is also an important indicator of visceral abdominal fat. Evidence suggests that abdominal fat carries a higher health risk than peripheral fat, and that the visceral fat component has the strongest correlation with increased risk. A high-risk waist circumference is considered to be ≥ 88 cm for women and ≥ 102 cm for men (50).

Prevalence and trends

Over the period 1960–1980, the prevalence of overweight and obesity among adults, and of overweight among children, was relatively constant. About 13% of adults were obese and 5% of children were overweight. However, data from the National Health and Nutrition Examination Survey III (1988–1991) showed that obesity in adults and overweight in children had markedly increased from the previous survey (38, 74). Those trends continued such that approximately 31% (59 million) of American adults now meet the criterion for obesity. More than 65% of the United States adult population have a body mass index of ≥ 25 kg/m²; and 15.8% of children aged 6–11 years,

and 16.1% of adolescents aged 12–19 years, are overweight (49). Thus, in a relatively short time period, the prevalence of obesity among adults has doubled, and the prevalence of overweight among children and adolescents has tripled.

With the exception of sub-Saharan Africa, trends internationally have mirrored those seen in the U.S.A. The International Obesity Task Force estimates that over 1 billion adults are overweight, including 312 million who are obese. Because Asians experience obesity-related disease complications at lower body mass indices, new criteria for Asians delineate overweight as a body mass index of ≥ 23 . Using this criteria, the number of adults globally who are overweight is closer to 1.7 billion (34).

Twin studies (71), and other longitudinal data (8, 19), clearly demonstrate a genetic component in human obesity. However, recent increases in obesity prevalence cannot be solely explained by changes in the gene pool. Predisposition to obesity is probably influenced by numerous susceptibility genes, accounting for variations in energy needs, fuel utilization, metabolic characteristics, and taste preferences. Although influenced by genetic variability, the three factors believed to contribute most to the etiology of obesity are metabolic factors, diet, and physical inactivity. Metabolic factors, such as resting energy expenditure (the number of calories burned at rest) and the thermic effect of food (energy expended during digestion, transport, metabolism and storage of food), vary among individuals but do not appear to be a major component in explaining risk for developing obesity (68). Large portion sizes, high fat intakes, and easy access to calorically sweetened beverages, all play a role in the development of obesity (25, 30). Longitudinal data suggests a particularly important role of reduced physical activity. In a 5-year prospective study of over 12,000 Finnish adults, sedentary individuals were almost twice as likely to experience substantial weight gain as physically active men and women (66). For children, decreased participation in organized sports, changes in

Association between tooth loss and overweight/obesity among Brazilian adults: the Pró-Saúde Study

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Abstract: The aim of this study was to evaluate the association between tooth loss and overweight/obesity in an adult Brazilian population. It is a cross-sectional study comprising 3,930 adults [1,744 men and 2,186 women; median age of 40 y (ranging 20-59); 16.9% obese; 7.3% almost all or all teeth missing]. Data were collected using a self-administered questionnaire for tooth loss (4 categories), diet, access and use of health services, socioeconomic factors, health habits and behaviors, demographics and anthropometric measurements. Multiple ordinal logistic regressions were performed. In comparison with adults with BMI < 25 kg/m², the overweight (BMI ≥ 25 and < 30kg/m²) and obese individuals (BMI ≥ 30 kg/m²) showed a greater odds of tooth loss (OR = 1.6, 95% CI 1.4-1.9 and OR = 2.1, 95% CI 1.8-2.5, respectively). After adjusting for potential confounders, overweight and obesity showed no statistically significant associations with tooth loss, with OR = 0.8 and OR = 0.9, respectively. The results of this study are consistent with the hypothesis that the association between overweight/obesity and tooth loss can be explained by known, common risk factors.

Keywords: Tooth Loss; Obesity; Adult; Risk Factors.

Declaration of Interests: The authors certify that they have no commercial or associative interest that represents a conflict of interest in connection with the manuscript.

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Introduction

Obesity and dental caries are chronic diseases. Both conditions are important public health problems worldwide, and both cause adverse health outcomes.^{1,2} In 2008, almost two-thirds of deaths worldwide were due to chronic diseases, and these diseases have shown worrisome trends, since they affect a large percentage of the world population, and are appearing earlier in life.³ Dental caries is a major cause of tooth loss followed by periodontal disease.⁴

Unhealthy diets are a major cause of chronic non-communicable diseases, such as obesity and dental caries.¹ The consumption of processed foods rich in sugars and fats constitutes an important risk factor for obesity.³ A diet rich in refined sugars is the most important risk factor for dental caries.⁵ Some authors have suggested that eating habits might be a common risk factor for dental caries and obesity, thus explaining their coexistence.^{6,7} Other authors, after controlling for confounding factors, such as socioeconomic status, found no association between these problems.⁸ Yet others found that obese people have more dental caries and tooth loss.² Inverse associations were also found. These indicated that overweight chil-



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Obesity and tooth wear among American adults: the role of sugar-sweetened acidic drinks

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Abstract

Background To explore the association between obesity and tooth wear among American adults and the role of sugar-sweetened acidic drinks consumption in explaining that association.

Methods We analyzed data from 3541 adult participants in the National Health and Nutrition Examination Survey. Obesity was determined using the body mass index and tooth wear was assessed using the modified tooth wear index. Daily intake of four categories of drinks was estimated as the average (drinks/day) of two consecutive 24-h dietary recalls. The association between obesity and number of surfaces with moderate-to-severe tooth wear was assessed in hurdle models adjusting for sociodemographic factors, acid reflux medication, and dental insurance.

Results Overweight and obese adults had more surfaces with moderate-to-severe tooth wear than those with normal body size, after adjusting for confounders. The consumption of sugar-sweetened acidic drinks explained part, but not all the above association. More specifically, the estimate for obesity was fully attenuated, whereas the estimate for overweight was slightly attenuated but remained significant.

Conclusion Obesity was positively associated with tooth wear in American adults. This association was only partially accounted for by the consumption of sugar-sweetened acidic drinks, a common risk factor for both conditions.

Practical implications Dentists must be aware of the health consequences of sugar-sweetened acidic drinks and advocate for reduction in consumption and/or substitution with healthier alternatives.

Keywords Tooth wear · Obesity · Carbonated beverages · Acidic drinks · Adult · Public health dentistry

Introduction

Tooth wear is the loss of dental hard tissues resulting of the interaction between teeth and other materials (abrasion), tooth-to-tooth contact (attrition), or dissolution of hard tissues by acidic substances not caused by bacteria (erosion) [1, 2]. As the prevalence of tooth wear is raising [3, 4], a focus on prevention may prolong the health of the dentition. At the

same time, obesity is increasing at an alarming rate globally to the point it is now considered a global pandemic [5, 6].

A few studies have investigated the association between obesity and tooth wear [7–10], with most evidence coming from studies in children [7–9]. However, results are still contradicting as one study in England showed that obese children were more likely to have erosive tooth wear than normal weight children [8], whereas studies in the USA [7] and Brazil [9] reported no association between the two conditions. A study among Swedish young adults found that overweight and obesity were more common among participants with dental erosion than among those with no erosion. However, results were merely descriptive since estimates were not adjusted for potential confounders [10].

There are several potential reasons why obese individuals may be more likely to have tooth wear. First and foremost is the confounding role of factors associated with both obesity and tooth wear. One of those factors is the increased consumption of soft drinks, which is associated with both obesity [11,

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The Relationship between Overweight/Obesity and Dental Erosion among a Group of Saudi Children and Adolescents

Abstract

Background: As childhood obesity is emerging in Saudi children and adolescents with high prevalence, it is considered as one of the major public health concerns. Therefore, it has been studied in relation to other diseases as a cause factor. **Aim:** The aim of this study is to investigate whether childhood obesity is a risk indicator for dental erosion and to obtain information on dietary habits that are related to dental erosion in overweight/obesity in a group of Saudi children and adolescents. **Study Design:** The study involved 370 children of both genders aged 4-18 years. The convenient sample included 190 overweight/obese children attending obesity clinic and 180 controls. **Materials and Methods:** Body mass index (BMI) (kg/m^2) was calculated and BMI percentile obtained based on the age- and sex-specific according to the Centers for Disease Control chart (normal 5th to <85th percentile, overweight 85th to <95th percentile, and obese $\geq 95^{\text{th}}$ percentile). Dental examination and questionnaire were carried out by one calibrated and trained examiner on these children using the UK Children's Dental Health Survey Classification for dental erosion. **Results:** The prevalence of dental erosion was more significant in the study group (8.42%) than the normal group (2.78%). Its severity was higher in the form of loss of enamel surface characterization in the study group (86.36%) compared to controls (13.64%). Carbonated drinks that were taken at night and drinks that were taken at night and drunk without a straw showed higher prevalence of dental erosion (33.3% and 10.3%) in overweight/obese participants. **Conclusions:** Dental erosion can be regarded as a risk indicator of childhood obesity in the form of loss of enamel surface characterization. Efforts should be taken to reduce carbonated drinks intake and to change the method of drinking erosive potential drinks among overweight/obese children.

Keywords: Adolescents, children, dental erosion, obesity, overweight

Introduction

Childhood overweight and obesity are accurately defined by age- and gender-specific body mass index (BMI) $\geq 85^{\text{th}}$ to <95th percentile and BMI $\geq 95^{\text{th}}$ percentile, respectively.^[1] The prevalence of overweight and obese children and adolescents is rapidly increasing in many countries around the world.^[2] The American Academy of Pediatrics, Committee on Nutrition,^[3] indicated that overweight and obesity are currently the most common medical conditions of childhood.

Recently, many developing countries have shown rapid economic developments and massive changes in dietary intake and habitual physical activity. Accordingly, these lifestyle-related changes contributed

significantly to the increased prevalence of obesity^[2] by influencing the quality and quantity of food intake and predisposing people to sedentary life.^[4] One of these countries which have witnessed these massive changes during the last two decades is Saudi Arabia (SA).^[5] Several studies on the prevalence of obesity among Saudi children and adolescents have been published and results revealed increasing ratios.^[4-6] A nationwide study from SA included a sample of 12,701 children and adolescents 1-18 years of age (6281 boys and 6420 girls) concluded that the overall prevalence of overweight was 10.7% and 12.7% and that of obesity was about 6% and 6.8% in the boys and girls, respectively.^[4]

Dental erosion has been defined as the irremovable loss of dental hard tissue caused by chemical process that does not involve bacteria.^[7] The associated factors that

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Association Between Obesity, Flow Rate of Whole Saliva, and Dental Caries in Adolescents

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In a cross-sectional study design, we test the hypothesis whether childhood obesity is associated with reduced flow rate of stimulated whole saliva and dental caries. Obese adolescents ($n = 65$) with a mean age of 14.5 years and normal weight subjects ($n = 65$) with a mean age of 14.2 years were clinically examined with respect to dental caries, visible plaque accumulation (visible plaque index (VPI%)), gingival inflammation in terms of bleeding on probing (BOP%) as well as answered a questionnaire concerning medical history, medication, oral hygiene habits, smoking habits, and sociodemographic background. The flow rate of stimulated whole saliva (ml/min) was determined. BMI was calculated and adjusted for age and gender (BMI-sds). The obese subjects exhibited higher number of decayed surfaces (DS), 0.7 vs. 0.1 ($P = 0.008$) and lower flow rate of stimulated whole saliva 1.2 vs. 2.0 ml/min ($P < 0.001$). Of obese patients, 17 subjects had VPI% >25 and 21 had BOP% >25 , both compared to only 5 subjects of the normal weight with P values of 0.005 and <0.001 , respectively. In a multivariate logistic regression model BMI-sds was significantly associated with the flow rate of stimulated whole saliva less than the median value 1.5 ml/min ($P < 0.001$; odds ratio (OR) 1.36) as well as with DS (DS >0) ($P = 0.002$; OR 1.31) and the associations were not found to be confounded by any of the studied variables. The results indicate that childhood obesity is associated with reduced flow rate of stimulated whole saliva and dental caries and further strengthens obesity's negative effect on children's oral health.

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INTRODUCTION

An increasing prevalence of obesity is well documented in all ages and ethnicities worldwide (1–3). Obesity and in particular abdominal obesity, commonly accompanied by elements of the metabolic syndrome, including insulin resistance, hypertension, and dyslipidemia, is associated with increased risk of chronic inflammatory diseases such as type 2 diabetes, atherosclerosis, cancer, and respiratory disorders (4–6). In addition, several cross-sectional studies have demonstrated that obesity is associated with chronic periodontitis in adults (7–9) and we recently reported that the link between childhood obesity and periodontal disease is demonstrated already during adolescence (10).

Both dental caries and obesity are diseases with multifactor etiology related to dietary habits but also closely correlated with sociodemographic background of the individuals. Most of the studies regarding association between obesity and dental caries are based on clinical data expressing caries experience reflecting not only the actual caries situation but also previous accumulation of caries and filled surfaces. Although there are clinical studies demonstrating a relationship between

obesity and dental caries (11–15) contradictory results are present (16,17). Recently, however, it was demonstrated that the number of proximal caries lesions were more frequently diagnosed in teenagers of 15 years with overweight (ISO-BMI >25) compared to normal-weight individuals (11).

Although very low saliva flow rate has been demonstrated to be associated with BMI >25 in a cohort of adults <50 years of age (18) there is limited knowledge concerning saliva flow rate in obese subjects in relation to healthy controls. Some studies based on limited number of obese subjects report normal salivary pattern compared with normal-weight individuals (19,20).

Obesity is linked to chronic inflammation and a number of adipose-related proinflammatory cytokines, so called adipokines, are enhanced in plasma from obese subjects contributing to enhanced inflammatory response in many body organs (21). The immune system modulates central nervous system function particular by cytokines and the hypothalamic–pituitary–adrenal axis is reported to be dysregulated in subjects with abdominal obesity (22). Altered function of the hypothalamic–pituitary–adrenal axis may affect the neuroendocrine regulation of salivary

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Review

Obesity, salivary glands and oral pathology

Obesidad, glándulas salivares y patología oral

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Abstract

Obesity has reached pandemic proportions in recent years. Not only adults suffer from the disease, but increasingly children and young people. One of the main causes of overweight and obesity is excessive food intake, in particular heavily processed carbohydrates. Obesity alters multiple organs, including the salivary glands, bringing functional alterations with it. Among researchers, the relation between obesity and tooth decay, periodontal disease and xerostomia is being debated. More and more scientific reports are drawing attention to the changes in the microflora of the oral cavity during obesity. All changes are closely related to the morphological and functional alterations of the salivary glands. This article review presents the current points of view regarding the impact of obesity on the health of the salivary glands, and how changes their functions influence other structures in the oral cavity.

Resumen

La obesidad ha alcanzado proporciones pandémicas en los últimos años. No solo los adultos padecen la enfermedad, sino también cada vez más niños y jóvenes. Una de las principales causas del sobrepeso y la obesidad es la ingesta excesiva de alimentos, en particular los carbohidratos altamente procesados. La obesidad altera múltiples órganos, incluidas las glándulas salivales, y trae consigo alteraciones funcionales. Entre los investigadores, se está debatiendo la relación entre la obesidad y la caries dental, la enfermedad periodontal y la xerostomía. Cada vez más informes científicos están llamando la atención sobre los cambios en la microflora de la cavidad oral durante la obesidad. Todos los cambios están estrechamente relacionados con las alteraciones morfológicas y funcionales de las glándulas salivales. Esta revisión del artículo presenta los puntos de vista actuales sobre el impacto de la obesidad en la salud de las glándulas salivales, y cómo los cambios en sus funciones influyen en otras estructuras de la cavidad oral.

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ANALYSIS OF THE STIMULATED WHOLE SALIVA IN OVERWEIGHT AND OBESE SCHOOL CHILDREN

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Trabalho realizado no Departamento de Pediatria da Universidade Federal de São Paulo UNIFESP, São Paulo, SP

SUMMARY

OBJECTIVE. To determine if some stimulated whole saliva parameters are influenced by an increase of Body Mass Index.

METHODS. Controlled cross-sectional study involving 90 school children of both genders between 7 and 10 years of age, from Bragança Paulista - SP. Three groups were formed: overweight, obese and control. Body Mass Index and diet intake by the Food Register method were evaluated. The salivary pH, flow rate, buffer capacity, protein, phosphate, calcium, fluoride, total and free sialic acid, and peroxidase activity were determined.

RESULTS. The overweight and obese groups showed greater energy and lipid intake ($P < 0.001$) than the control group. There was no difference in the saliva flow rate between groups, however only the control group showed a mean value considered normal. In the overweight and obese groups a decrease in both the concentration of phosphate ($P < 0.001$) and peroxidase activity ($P < 0.001$) was observed. In the obese group an increase in the concentrations of free sialic acid ($P = 0.004$) and protein ($P = 0.003$) occurred.

CONCLUSION. Overweight and obese children show alterations in the concentrations of phosphate, free sialic acid and proteins, and in the peroxidase activity that are favorable conditions for dental caries.

KEY WORDS: Saliva. Obesity. Child.

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INTRODUCTION

Saliva plays an important role in oral health. Based upon its constituents, saliva adopts properties such as a lubricant, clearance of unwanted substances, digestion, neutralization of acids or bases, protection against demineralization and anti-microbial role. For relative protection against dental cavities, flow rate, buffer capacity, calcium, phosphate and fluoride concentrations are essentials¹. Metabolic alterations may influence synthesis, composition and secretion of saliva. Thus, hypofunction of the salivary glands, and a consequent reduced flow rate, may be present in some situations such as irradiation², Down syndrome³, and diabetes mellitus⁴. Obesity, currently a rapidly growing form of malnutrition, is common in children, adolescents and adults and is a challenging, contemporary health problem. Its prevalence is rapidly increasing throughout the world⁵.

Excess body fat mass arises from energy imbalance caused by taking in too much energy and expending too little. The increase in body fat mass during childhood and adolescence is frequently associated with the cardiovascular, respiratory, skeletal, gastrointestinal, and endocrine systems⁶. Adipocytes do not merely store fat, acting upon the cells when they secrete or bring about the secretion of hormones while at the same time being a target⁷. Hormone alterations are present in obese children and adolescents.

For these reasons, it is valid to surmise that inadequate nutritional status may influence saliva composition, which in turn will have a greater or lesser effective participation, in the process of dental demineralization, by altering the protective role of mouth structures. For treatment of obesity, it is clear that all repercussions should be considered including odontological issues, all of which play a role in overall health.

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Anti-Obesity Drugs: A Review about Their Effects and Safety

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Abstract

The current recommendations for the treatment of obese people include increased physical activity and reduced calories intake. When the behavioral approach is not sufficient, a pharmacologic treatment is recommended. In past years, numerous drugs have been approved for the treatment of obesity; however, most of them have been withdrawn from the market because of their adverse effects. In fact, amphetamine, rimonabant and sibutramine licenses have been withdrawn due to an increased risk of psychiatric disorders and non-fatal myocardial infarction or stroke. Even if orlistat is not as effective as other drugs in reducing body weight, orlistat is presently the only available choice for the treatment of obesity because of its safety for cardiovascular events and positive effects on diabetic control. Hopefully, more effective and better tolerated anti-obesity drugs will be developed through an improved understanding of the multiple mechanisms and complex physiological systems targeting appetite.

Keywords: Anti-obesity agents, Obesity, Safety

INTRODUCTION

Obesity is now a global problem [1] and is associated with a number of chronic conditions including osteoarthritis, obstructive sleep apnea, gallstones, fatty liver disease, reproductive and gastrointestinal cancers, dyslipidemia, hypertension, type 2 diabetes, heart failure, coronary artery disease, and stroke [2,3]. Lifestyle modifications such as diet and exercise intervention are essential for both prevention and management of obesity, and pharmacotherapy may be considered if the interventions are ineffective for individuals with a body mass index [BMI] ≥ 30 kg/m² or for those with a BMI ≥ 27



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Are dentists involved in the treatment of obesity?

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Abstract

The morbidity and mortality associated with being overweight or obese have been known to the medical profession to be related with an increased risk of associated diseases. This article provides an overview of obesity and addresses possible strategies for the management of this important public health concern. This narrative review sheds light on the problem of obesity and the necessity of professional oral health care to work in partnership with the medical team for managing obesity. In this regard, general dental practitioners should at least reinforce their knowledge regarding obesity and understand their potential role in the treatment and management of obese patients.

Keywords: *Dentist, jaw wiring, obesity, overweight*

INTRODUCTION

Obesity is a complex disorder involving a multifactorial disease which is now considered to be a major public health concern around the world. Obesity is defined as a medical condition in which excess body fat accumulates with a negative effect on health;^[1] this may be the result of imbalance between energy intake and expenditure along with different factors such as genetic, environmental, and psychosocial factors.^[1]

Body mass index (BMI) is proposed by the World Health Organization to measure the weight status. It is the ratio of an individual's weight in kilogram divided by the square of his height in meters; a BMI of 18.5–24.99 kg/m² is classified as normal, 25–29.99 kg/m² as overweight, and over 30 kg/m² as obese.^[1]

PREVALENCE OF OBESITY



Association of Body Mass Index with Oral Cancer Risk

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Abstract

Purpose: Although obesity is a well-established risk factor for many cancers, the effect of body mass index (BMI) on oral cancer risk remains controversial. We therefore investigated the effect of BMI on oral cancer risk in a case-control study in Korea.

Methods: Overall, 364 patients with oral cancer and 439 community controls were enrolled. Odds ratios (OR) and 95% confidence intervals (CI) were estimated using logistic regression models, adjusted for age, smoking status and alcohol consumption.

Results: We found no overall significant evidence of an association between oral cancer risk and BMI in either gender. However, when the relationship between BMI and oral cancer risk was examined according to female age groups (<50 and ≥50 years), there was a significant association between oral cancer risk and high BMI in female subjects younger than 50 years of age (OR=3.92, 95% CI 1.03~14.9, *P* for trend=0.04), but not in older (≥50 years) female subjects (OR=1.11, 95% CI 0.55~2.24, *P* for trend=0.76). There was no significant relationship between BMI and oral cancer risk in any of the male age subgroups.

Conclusion: Our study provides the first epidemiological evidence supporting an association between obesity and an increased risk of oral cancer.

Key words: Oral cancer, Obesity, Body mass index

Introduction

Obesity has become one of the major risk factors for cancer and one of the leading causes of death in Western and Asian countries[1-4].

World Cancer Research Fund (WCRF) and the International Agency for Research on Cancer provided evidence that obesity is causally linked to cancer of the colorectum, breast, pancreas, endometrium, kidney, and esoph-

agus[5,6].

However, little evidence regarding the relationship between obesity and oral cancer (including precancerous lesions) is available, and the study results have thus far been inconsistent. Although some populations exhibit inverse relationships between body mass index (BMI) and oral cancer risk as well as the premalignancy of oral cancer, other populations do not show correlation between BMI and oral cancer risk because the prevalence and degree

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Addressing obesity in the dental setting: What can be learned from oral health care professionals' efforts to screen for medical conditions

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chairside medical screening; obesity screening; oral health care providers.

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Abstract

Purpose: This scoping review focused on what can be learned from oral health professionals' (OHCPs) efforts to provide screenings for medical conditions in the dental setting that could guide strategies for addressing childhood obesity.

Methods: PubMed, Embase, Cochrane, Grey Literature, and CINAHL were searched (limitation English language). Search terms covered OHCPs and various oral systemic conditions of interest (details provided in the paper. Nineteen unduplicated, relevant articles were categorized based on relationship to question.

Results: Screening for diabetes and heart disease risk in the dental setting has been shown to be effective and patients and providers are willing to participate, although not yet routinely implemented. Screening/counseling for tobacco cessation has been shown to be effective, but few (<10 percent) OHCPs provided this activity or received tobacco cessation training. For obesity screening/counseling, the majority of dentists (82 percent) reported they would be more willing to offer this service if obesity were directly related to oral disease. The one healthy weight intervention pilot study was well received by caregivers/patients and resulted in improved food choices. Successful implementation included a dedicated staff member, the dental hygienist. Lack of adequate training was a commonly reported barrier for all of these conditions; in addition, for obesity screening/counseling fear of appearing judgmental, and fear of patient rejection were also commonly reported.

Conclusions: Systematic studies are needed building on existing literature and exploring best implementation practices. Enhanced training is needed on relationship of oral health and systemic health and OHCPs' role.

Introduction

Since passage of the Patient Protection and Affordable Care Act (ACA), there has been increased emphasis on prevention and on integrated health care delivery (1). This is likely to focus greater attention on screening and interprofessional approaches to disease prevention and control. It has been suggested that the oral health care provider (OHCP) could be an additional resource in public health strategies to control major epidemics such as diabetes and heart disease, which are among the leading causes of morbidity and mortality (2,3).

There are a number of published studies on the efficacy of screening for risk of medical conditions such as diabetes and heart disease in the dental setting. Screening for risk of medical conditions or common risk factors in the dental setting can facilitate early identification of individuals at increased risk for disease yet unaware of their increased risk and can promote early entry into the medical system when medical and or behavioral interventions can impact the risk of developing disease (2). This will be referred to as screening for medical conditions going forward in this review. Individuals who are found to be at increased risk would be referred to a primary care provider for confirmatory diagnosis and

The Scope of Nutritional Counseling in the Dental Practice Setting

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Inside Dental Hygiene

Abstract

Nutritional counseling is an integral component to the practice of dentistry. This article will review basic techniques that can be incorporated to enhance the standard of care in the practice of dentistry. Prochaska's Transtheoretical Model of Change is the most popular patient education technique, which takes into account a patient's individual stage of readiness. Direct and nondirect counseling will be reviewed. Techniques for setting and monitoring goals, establishing a reward system, and creating methods for follow-up will be discussed. The article also will provide an overview of the various stages of change and emphasize nutritional counseling techniques that can be an important aspect of the dental hygiene process of care.

The American Dental Association's 1996 Preventive Health Statement on Nutrition and Oral Health "encourages dentists to maintain current knowledge of nutrition recommendation such as the Dietary Guidelines for Americans as they relate to general and oral health and disease." This statement also encourages dentists "to effectively educate and counsel their patients about proper nutrition and oral health."¹ According to the Commission on Dental Accreditation's Accreditation Standards for Dental Hygiene Education Programs, effective January 1, 2000, graduates must be competent in providing the dental hygiene process of care. This includes the implementation of health education, preventive and nutritional counseling, reevaluation, and continuing care.^{2,3} All dentists take at least one course containing nutrition information during their education. However, most dental professionals do not incorporate nutritional counseling as a service in their practices. The reasons most commonly given for not including nutrition counseling in the dental practice setting are: time constraints, questions concerning dental insurance coverage, greater prioritization placed on dental procedures, and last, but perhaps the most important, is inadequate knowledge of the importance of nutrition as it relates to the dental patient. Many patients also do not realize that the dentist and dental professionals are resources for nutrition information.⁴

Oral health practitioners, however, are in a unique position to provide nutritional screening, assessment, and basic counseling, which can promote oral health and encourage healthier lifestyles. And the benefits can directly affect treatment outcomes—poor dietary practices can increase the risk of developing dental caries, increase susceptibility to periodontal disease, and delay tissue healing. Behavior changes to modify these practices can be implemented by working with the patient to establish goals during regular oral healthcare visits. From a dental perspective, diet and nutrition may affect the development and progression of disease of the oral cavity, and oral infectious diseases, in turn, can affect nutritional status.

Dietary counseling in a dental practice can be as simplistic as emphasizing the importance of fluoride, encouraging the use of dental sealants, discussing the frequency and types of foods eaten, and discussing the length of time that foods and beverages are retained in the mouth. Nutrition needs throughout the life cycle vary according to the age of the patient. It is often necessary to discuss with parents about establishing in their children good eating habits and oral hygiene skills at an early age. Baby bottle tooth decay/early childhood caries can



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REVIEW ARTICLE

The role of dentistry in treatment of obesity – Review



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KEYWORDS

Obesity;
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Jaw Wiring;
Orthodontics;
Brackets

Abstract *Introduction/objective:* Jaw Wiring (JW) is one of the controversial treatment modalities for obese individuals. It aims at limiting the food intake of the patient resulting in weight loss. The authors conducted a literature review to explore the historical development, effectiveness, indications, advantages and disadvantages of Jaw Wiring (JW) as treatment modality for obese individuals.

Data sources: PubMed, Scopus, Medline and Google Scholar have been searched for papers that addressed the effectiveness of JW in the treatment of obesity since 1979 till present. No restriction regarding the type of the articles has been considered.

Results: JW as a method of obesity management is a highly controversial issue. Almost all papers are retrospective, uncontrolled trials with a small sample size or anecdotal opinions. However, current data indicate that although JW is efficient in weight loss relatively faster than other treatment modalities, weight regaining is a constant finding in approximately all patients after JW discontinuation. Aspiration of vomit, gingival diseases, teeth decalcification and temporomandibular disorders are potential side effects. Such extreme treatment method should be approached carefully in a properly selected category of obese patients.

Conclusion: JW is an efficient way in terms of weight control in properly selected obese patients and usually no serious complications could be encountered through the treatment course.

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Maintenance of weight loss in obese patients after jaw wiring

J S GARROW, G T GARDINER

Abstract

In treatment of obesity restriction of food intake is necessary to achieve good results. Various operations have been devised to prevent patients overeating, but in this study jaw wiring was used to limit food intake. This procedure produces weight loss in obese patients but when the wires are removed the weight is usually regained. This report studied a group of patients whose weight loss was maintained after the wires were removed. A nylon cord fastened round the waist of the patient after weight reduction was found to act as a psychological barrier to weight gain. Seven patients were followed for 4-14 months after removal of jaw wires and regained a mean of only 5.6 kg of the 31.8 kg lost while their jaws were wired.

This procedure compares favourably with other treatments for severe obesity.

Introduction

Severe obesity carries a high mortality and morbidity.^{1, 2} To lose 40 kg of adipose tissue the obese patient must achieve an energy deficit of about 280 Mcal (1200 MJ).³ This requires an intake about 1000 kcal (4.2 MJ) less than maintenance requirements every day for nine months. Few can achieve such self-denial without help. Various operations have been devised to prevent such patients from overeating, either by reducing the capacity of the stomach⁴ or by inducing malabsorption by jejunoileal bypass.⁵ It is now clear that the weight loss after jejunoileal bypass is caused by decreased food intake and not directly by the malabsorption.⁶

Since obese patients are bad operative risks we have preferred to limit food intake by jaw wiring,⁷ which is much safer and less expensive. This procedure, however, has been condemned on the grounds that weight is almost inevitably regained when the wires are removed.⁸ For this reason we have followed jaw wiring by a gastric reduction procedure.⁹ We report here a small series of patients in whom weight loss was well maintained after release of jaw wiring without any surgical procedure: we found that a nylon cord fastened round the waist of the patient after weight reduction provided a psychological barrier to weight gain.

Patients and methods

All patients were referred to JG for treatment of obesity and underwent the inpatient investigations previously described.¹⁰ These have been approved by the Northwick Park Hospital ethical committee. The decision to offer jaw wiring was limited to patients under the age of 50 years, who had a resting metabolic rate of over 240 ml O₂/min, an obesity index (W/H²) over 35, and suitable dentition. A full explanation of the jaw wiring and (where applicable) waist cord procedure was given to the patients and their spouses, and patients

had an opportunity to discuss the advantages and disadvantages with other patients who had had experience of the procedure. Written consent was then obtained from both patient and spouse.

Nine patients were treated for obesity by jaw wiring and were followed for at least 10 months after the wires were removed. These patients were part of a series already reported⁹ and were used as the control group.

In view of the poor long-term results of the control group, all patients qualifying for jaw wiring since April 1979 were offered a programme in which, after a period of jaw wiring to attain the necessary weight loss, a nylon cord was fixed round the waist to give warning of weight regain. Fourteen patients were offered this programme, and all accepted. This report concerns the seven patients who have been followed for 4-14 months since their jaws were unwired and the waist cord was fitted. Of the other seven patients, four still have their jaws wired, one has had a surgical operation which required removal of wires, and two have had a waist cord fitted for less than two months.

For the jaw wiring 0.5 mm stainless steel eyelet wires were placed around posterior teeth only. Intermaxillary fixation was effected by two tie wires on either side but varied to suit individual dentitions. This stainless steel is heavier than is usually used to immobilise fractures of the jaws. This is because the period of fixation is so much longer and because patients with intact jaws, unlike those with fractured jaws, can exert immediately strong bursting forces during yawning or sneezing.

Only local anaesthesia was used during the wiring procedure and no provision was made for releasing the wiring either to prevent stiffening of the temporomandibular joint¹¹ or to enable the patient to clear the air passages in the event of vomiting,⁸ since we have not found this to be necessary. Patients were given diazepam, 20 mg orally, immediately they returned to the ward after wiring; this prevented spasm of the masseter and enabled the patient to sleep while tenderness in the teeth and gums subsided.

After wiring, the patients were advised to take two pints (1200 ml) of whole cows' milk daily as the sole energy source. This was supplemented with 200 mg ferrous sulphate and one multivitamin capsule *BPC* daily. Usually it was possible to pass the tablets, crushed if necessary, through a gap in the teeth. Acaloric fluids were allowed ad libitum, and patients were encouraged to maintain a high fluid intake. They were warned to avoid drinks containing sugar, since they would delay weight loss and predispose to bacterial growth in the mouth. Oral hygiene was maintained by brushing the outer aspect of the teeth and by using a mouthwash. Patients were seen monthly during the jaw wiring period to check, and if necessary repair, the jaw fixation and to monitor the progress of weight loss. When adequate weight loss had been achieved (usually after 6-12 months) an appointment was made for the patient to come into hospital for repeat measurement of metabolic rate and body composition, for removal of the jaw wires, and (where applicable) for fitting of the waist cord.

Initially cord 5 mm in diameter was used for the waist cord, but this was too bulky and showed through light clothing, so 2 mm cord was subsequently used. It was applied with the patient supine and tied at a circumference of about 700 mm. The next day it was checked for tightness: ideally it had to produce no indentation of the skin with the patient supine but make a white (not red) line on the skin when the patient was seated. The length of the cord was adjusted until this tension was achieved, and the knot was then sealed by melting the ends of the cord gently, taking care not to burn the patient.

Results

The weight change during the period of jaw wiring, and after the wires were removed, is shown in table I for the group who were fitted with a waist cord and in table II for the control group. The two groups did not differ significantly in initial weight, height, or age. The control group had their jaws wired for a slightly shorter period and lost slightly less weight, but the rate of weight loss of the two groups was similar.

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ORIGINAL ARTICLE

Efficacy and safety of an oral device to reduce food intake and promote weight loss

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Summary

Objective

Minimal risk weight loss tools are needed. This study's objective was to confirm Food and Drug Administration submissions of the SmartByte™ System's safety and efficacy.

Methods

This 16-week, prospective, single-arm, four-centre, observational study assessed the oral device in combination with a video-delivered lifestyle programme in adults aged 18–49 years with body mass index 27 to <35 kg m⁻².

Results

Seventy-six subjects received the device and video lifestyle instruction. The prespecified per protocol (PP) population ($N = 40$) required sensor-verified use of the device ≥ 7 times per week for 14 of 16 weeks, overall device usage rate of $\geq 33\%$ and study completion. At week 16, 12 (30%) achieved $\geq 5\%$ weight loss, 16 (40%) achieved $\geq 4\%$ and 21 (52.5%) achieved $\geq 3\%$. Week 16 mean loss for the PP population was 2.93%, and among 36 participants who did not meet PP criteria, it was 1.45%. Among 76 intent-to-treat subjects, two subjects reported three mild to moderate device-related adverse events, resolving spontaneously (one hard palate abrasion and two tongue lacerations).

Conclusion

The System, a minimal risk tool, can help individuals achieve meaningful weight loss, when used with a lifestyle video. More frequent device use was associated with more weight loss, on average, and greater chance of achieving $\geq 4\%$ or $\geq 5\%$ weight loss.

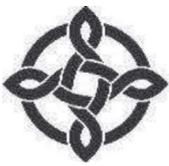
Keywords: SmartByte device, weight loss device.

Introduction

The epidemic of obesity and its health consequences (1–3) and the difficulty of achieving and sustaining weight loss (4,5) mandate a need for effective, low risk, low cost tools that can be applied in primary care settings to help patients safely achieve meaningful weight loss. A new device takes advantage of the physiologic and biologic changes that occur when the oral cavity is limited in size, resulting in smaller bites, more oral processing and slower rate of food intake. As evidenced in the literature, individuals who eat their meals quickly tend to consume larger meals (6,7), which can disassociate satiety from the amount of food consumed (8,9), which often leads

to over-eating (10) and higher body mass index (BMI) (11,12). Conversely, slowing food consumption has been shown to reduce food intake, hasten satiety and support weight loss in individuals with overweight and obesity (9,13,14).

The SmartByte™ system (Scientific Intake, Inc., Atlanta, GA [Lawrence, MA], USA) is a non-invasive, clinically validated, removable medical device (only placed when eating) designed to slow the eating rate by reducing the volume of the oral cavity and support mindful eating, with the goal of reducing calorie intake to achieve sustained weight loss. It is fitted to each individual and worn in the upper palate while eating. The device is derived from an earlier prototype, Sensor



INTEGRATED CARE PATHWAY MANAGEMENT OF THE BARIATRIC DENTAL PATIENT

DEFINITION

A bariatric person is an individual of any age (child to adult) who has limitations in health and social care due to physical size, health, mobility and environmental access

CRITERIA FOR USE

This pathway is intended as a **guide** to managing patients over **22stone/140kg** in the dental services. 22stone is usually the safe working limit for a regular dental chair. The pathway has a multidisciplinary element. The guide refers only to issues which may arise due to the patient's size. Professionals are encouraged to exercise their own professional judgement and consider patient management as a whole.

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Bariatric dentistry: managing the plus-size patient

Abstract

The British Society for Disability and Oral Health (BSDH) organised a one-day conference at the Royal College of Obstetricians and Gynaecologists in London. The programme was entitled 'Bariatric dentistry: managing the plus size patient in special care dentistry'. This paper is a distillation of that conference and discusses obesity as a public health priority. The paper elucidates difficulties that these patients face as a result of their condition, particularly when seeking dental treatment.

Keywords: Obesity, obstructive sleep apnea (OSA), special care patients, bariatric dentistry, conscious sedation, general anaesthesia.

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Introduction

Bariatric dentistry is the dental management of the 'plus-size' patient. It falls under the remit of special care dentistry, although general dental practitioner colleagues may find themselves treating these patients. The British Society for Disability and Oral Health (BSDH) conference (December 2, 2016) pointed out best practice, and that best practice is pertinent worldwide.

Obesity: a public health priority

The increasing prevalence of obesity is a worldwide health concern. Excess weight among populations is associated with an increased disease burden, most notably cardiovascular disease, diabetes and cancer.¹ Public health exists to protect and improve the nation's health and well-being, and to reduce health inequalities. Governments instigate public health campaigns and tackling obesity is commonly the number one priority. Obesity is mainly a behavioural problem, involving a spectrum of self-regulatory control difficulties.² The UK Scientific Advisory Committee on Nutrition (SACN) issued recommendations on sugar consumption levels for children and adults to help modify behaviour.³ The SACN advised action at a population level, leading to the development of The Eatwell Guide. This is a resource that defines the UK government's advice on healthy eating and may facilitate planning and potentially reduce sugar intake.⁴

Additionally, the UK National Institute for Health and Care Excellence (NICE) recommended action at the level of secondary prevention by supporting local weight management services, regulating the location of fast food outlets and the cost of leisure facilities, and the creation of safer cycle routes.⁵ Place-based and community service interventions using system-wide prevention approaches are also advised,⁵ for example, helping local authorities and their communities to design long-term plans to facilitate healthier choices for people whether at home, work or play.

General anaesthesia and sedation for bariatric patients – medical considerations

Obesity is one component of the metabolic syndrome. It is most commonly classified by the World Health Organisation (WHO) using the body mass index (BMI)⁶ (Table 1). Obese individuals are at an increased risk of various medical conditions including hypertension, cardiovascular disease, diabetes, sleep breathing disorder, gastro-oesophageal reflux disease (GORD) and liver disease.⁶ The 4th National Audit Project of the Royal College of Anaesthetists reported that obese patients were twice as likely to develop serious airway problems during a general anaesthetic than the non-obese.⁷

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A Scoping Review of the Implications of Adult Obesity in the Delivery and Acceptance of Dental Care.

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Abstract:

Background: Due to the increasing prevalence of obesity within the general population it is presumed that the prevalence of overweight and obese adults accessing dental services will also increase. For this reason dentists need to be aware of implications of managing such patients.

Methods: A scoping review was carried out. Both Medline via OVID and Scopus databases were searched along with grey literature databases and the websites of key organisations. Inclusion and exclusion criteria were established. The data were collected on a purpose-made data collection form and analysed descriptively.

Results: The review identified 28 relevant published articles and 2 relevant items of grey literature. Following review of this literature three themes relating to adult obesity in the delivery and acceptance of dental care emerged; clinical, service delivery and patient implications. The majority of the papers focused on the clinical implications.

Conclusion: On the topic of adult obesity and dental care, the majority of published and grey literature focuses on the clinical implications. Further research is needed on both the patient's perspectives of being overweight or obese and the delivery and acceptance of dental care and the service delivery implications.

Key words: Obese, Obesity, Overweight, Dental

Background

Obesity is defined as an abnormal or excessive fat accumulation that may impair health¹ and it is most commonly measured by calculating an individual's body mass index (BMI)²:

BMI = $\frac{\text{Weight (kg)}}{\text{Height (m)}^2}$

Relationship between Mandibular Nerve Block Anesthesia and Body Mass Index in Children

Relación entre la Anestesia del Nervio Mandibular y el Índice de Masa Corporal en Niños

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CASTILLO, V.; CERÓN, A.; CARTES-VELÁQUEZ, R. & ARAVENA, P. Relationship between mandibular nerve block anesthesia and body mass index in children. *Int. J. Odontostomat.*, 6(1):71-75, 2012.

ABSTRACT: The aim of this study was to observe the relationship between the anesthetic block success (ABS) of mandibular nerve, by injecting 1.8 ml of lidocaine 2% with epinephrine 1:100,000, in children and their body mass index (BMI). A prospective cohort study was designed. A sample of 93 6-13 years children attended in JUNAEB Dental Module of Frutillar between April and July 2011. We recorded age, gender, reason for tooth extraction and tooth type (permanent or deciduous). BMI was calculated for each child and categorized into two cohorts of study according to WHO criteria: those with a BMI < p85 were defined as "low - normal weight" (LNW) and those with a BMI equal or > p85 as "over weight - obese" (OWO). After applying the anesthetic technique, effect was evaluated at 10 minutes recording its effectiveness. We analyzed statistically significant relationship between ABS and BMI using Fisher's exact test with ($p < 0.05$). Anesthetic effect was achieved in 84 children (90.3%) with a 89.36% in LNW group and 91.30% in OWO group. There was no statistically significant relationship between ABS and BMI ($p=1.0$). There is no relationship between anesthetic effectiveness of mandibular nerve and body mass index in children.

KEY WORDS: local anesthesia, body mass index, children, mandibular nerve.

INTRODUCTION

Anesthetic block of mandibular nerve and its branches (ABMN) in children is used for rehabilitation treatment, endodontics and dental extractions (Escobar, 2004). It has a failure rate between 15% and 20% (Malamed, 2006), that may be due to the anesthetic solution, expiration or more frequently by a technical (anatomic) error; may be a failure due to biological reasons, such as local inflammation that determine a low pH (Escobar) or anatomic variations such as accessory sensory innervation of mandibular teeth by the accessory cervical and mylohyoid nerves (Malamed). On the other hand, we must consider the pharmacokinetics of drugs, given that there are factors that may affect its distribution, like: binding to plasma proteins, body composition and regional blood flow (Passannante & Rock, 2005).

Although it has not been studied at length, the plasma protein binding does not appear to be

significantly different in obese individuals given that blood volume increases directly with body weight and that many patients have an increased cardiac output. This point has implications regarding anesthetic, both injected and inhaled. Still, the obesity pandemic has not led to an increase in pharmacokinetic studies in obese patients (Passannante & Rock).

Currently there are no published studies who report the association between obesity, measured through Body Mass Index (BMI), and local anesthesia, considering BMI as the best anthropometric indicator for diagnose overweight and obesity in children between 2 and 18 years old (Burrow *et al.*, 2004). In addition, the variability of success rates for ABMN reported between 10% to 39% (Fernandez *et al.*, 2005) highlights the importance to observe whether the different levels of BMI in children could affect the effectiveness of local anesthesia in dental procedures.

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Original article

Impact of body mass index on oral health during orthodontic treatment: an explorative pilot study

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Summary

Aim: To answer the question: is there a correlation between body mass index (BMI), oral health, and patient cooperation during multibracket (MB) appliance therapy?

Materials and methods: All adolescent MB patients started and finished between 2007 and 2012 were analysed. According to their pre-treatment BMI, patients were divided into one of the following groups: normal weight, overweight, or obese. Using the patients' records, the cooperation during treatment was classified as good, bad, or poor and the treatment duration was calculated. Using pre- and post-treatment photographs, white spot lesion (WSL) formation and gingivitis before and after MB therapy were assessed.

Results: Of the 175 subjects, 138 had a normal BMI (79 per cent), 22 were overweight (12.5 per cent), and 15 obese (8.5 per cent). Whereas 42.8 per cent of the normal weight patients showed a good cooperation, only 22.7 per cent of the overweight and 20.9 per cent of the obese patients cooperated sufficiently. On average, normal weight patients were treated for 22.2 months, overweight patients for 23.0 months, and obese patients for 27.7 months. Normal weight patients developed less WSL (41.3 per cent) during MB treatment than overweight (50 per cent) or obese (66.7 per cent) patients. Furthermore, patients with a normal weight or overweight had less gingival inflammation (79.5 per cent) after treatment than obese individuals (93.3 per cent).

Conclusion: An increased BMI appears to be a risk factor for less cooperation, a longer treatment duration, and more oral health-related problems during MB treatment, indicating that these patients require special attention during orthodontic therapy.

Introduction

Over the last decades, overweight and obesity has become a problem in the economically developed world. The increasing number of overweight adults is alarming but also children and adolescents are affected to a dramatic extent (1–4). The World Health Organization (WHO) states that the number of obese has almost doubled since 1980 and that in 2011 more than 40 million children under the age of five were overweight (5). Consequently, the WHO regards childhood overweight and obesity as one of the 'most serious public health challenges of the 21st century' (6), especially because the affected children are likely to stay overweight into adulthood.

Furthermore, overweight is associated with a number of secondary health problems. For children with an increased body mass index (BMI), a dramatic increase of pathological processes is described, which normally had only affected adults (4, 7). Besides an increase of type II diabetes and cardiovascular diseases, also an alarming number of joint abnormalities and psychological problems are described (4, 5, 8). Therefore, in general medicine, childhood obesity is already a big issue and these children receive special attention. Concerning oral health, some evidence exists that there might be an association between overweight and an increased caries risk in children (9), but this relationship is not unambiguous (10).

Obesity and orthodontic treatment: is there any direct relationship?

Alberto Consolaro¹

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Obesity is a wide-spread condition directly or indirectly connected with an increase in the prevalence of a variety of human diseases. It affects over 50% of the western overall population. In 2017, a thorough analysis of 204 studies on obesity and cancer revealed that the condition increases the risk of the following types of cancer: stomach, colon, rectal, bile duct, pancreatic, esophagus, breast, endometrial, ovarian, kidney and multiple myeloma. The first study aiming at establishing a connection between obesity and the rate of induced orthodontic tooth movement was conducted by Saloom et al; however, it could not effectively nor significantly reveal any direct influence or effect. Despite being identified during the first week, differences could not be explained and treatment time remained unchanged. In spite of lack of studies in the literature on the connection between obesity and the rate of induced tooth movement, in clinical practice, courses or specialized training, we should not have protocols changed nor adopt any measures or expect significant differences between normal-weight and obese individuals. It should be emphasized that unsuccessful cases or cases of root resorption associated with treatment should not be assigned to obesity, since scientific data is insufficient to do so.

Keywords: Obesity. Orthodontic movement. Induced tooth movement. Orthodontics.

A obesidade representa uma epidemia que afeta mais de 50% da população ocidental e está, direta ou indiretamente, relacionada com o aumento na prevalência de algumas doenças humanas. Em 2017, em uma análise minuciosa de 204 trabalhos sobre a obesidade e o câncer, observou-se que ela aumenta os riscos de câncer de estômago, cólon, reto, vias biliares, pâncreas, esôfago, mama, endométrio, ovário, rim e mieloma múltiplo. O primeiro trabalho que procurou relacionar a obesidade com a velocidade de movimentação dentária ortodôntica foi apresentado por Saloom et al., mas não conseguiu demonstrar, de forma efetiva e significativa uma influência ou efeito direto. As diferenças ocorreram apenas na primeira semana, e sem explicação, mas o tempo total do tratamento não foi alterado. Na prática clínica, em aulas ou nos treinamentos de especialistas, não devemos — tendo em vista a ausência na literatura que correlacione a obesidade e a velocidade da movimentação dentária induzida — mudar protocolos, adotar medidas ou ter expectativas de diferenças significativas entre pessoas com peso normal e obesas. Ressalta-se, ainda, que casos de insucesso e/ou de reabsorções radiculares associadas ao tratamento nesses pacientes não devem ser atribuídos à obesidade, pois não há base científica para isso.

Palavras-chave: Obesidade. Movimento ortodôntico. Movimento dentário induzido. Ortodontia.

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Knowledge, perceptions, and attitudes of dental students towards obesity

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Abstract

Aims

Obesity is a chronic medical condition associated with various oral health problems. The aim of this study was to assess the knowledge, perceptions, and attitudes of dental students towards obesity.

Material and methods

Second-, third-, and fourth-year dental students completed a self-administered questionnaire. An ethics committee approved the study. Participants were asked questions focused on three areas: (i) knowledge, (ii) perceptions, and (iii) attitudes about obesity. Data analyses were carried out using SPSS version 20.

Results

Among the dental students, 78.9% received 0–1 h of formal education about obesity. The mean score of the total time allocated for obesity-related education was 1.31 ± 0.23 h. Eighty-nine percent of the dental students agreed that obesity is a chronic medical condition, 30% agreed that they would modify their equipment and office furniture to accommodate obese patients, and 46.8% were interested in learning more about obesity in dental school.

Conclusion

Obesity-related education should be implemented as a formal component of dental student training. Oral health practitioners should also provide their patients with information about how weight loss is beneficial to both general and oral health.

Keywords: Obesity, Dental students, Knowledge, Questionnaire study

1. Introduction



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Patients' and professionals' experiences and perspectives of obesity in health-care settings: a synthesis of current research

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Abstract

Background Obesity-related stigma likely influences how obese people interact with health-care professionals and access health care.

Aim To undertake a synthesis of studies examining the views and experiences of both obese people in relation to their health-care provision and health-care professionals in providing care to obese patients.

Search strategy A systematic search of key electronic databases relating to professional or patient experiences of, or perspectives on, obesity was performed in 2008 and updated in 2010. Reference lists of article bibliographies were searched, along with hand searches of relevant journals.

Inclusion Criteria Studies were screened against explicit inclusion criteria and published between 1990 and 2010. Findings were examined and organized thematically.

Data Extraction Data were extracted focusing on obesity, stigma and access to health-care services. All included studies were subject to critical appraisal to assess the quality of the research.

Findings Thirty studies were identified. All the studies reported obesity impacting on health-care interactions. Key themes identified were experiences of stigma and feelings of powerlessness, treatment avoidance, psycho-emotional functioning, professional attitudes, confidence and training, variations in health contact time and finally, differences in treatment options and preventative measures.