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# Review Article:
# Oral Manifestations in Obesity and Bariatric Surgery: Narrative Review

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## ABSTRACT

Any physiologic or pathologic situation can affect oral and dental health. Obesity and bariatric surgery are associated with different signs and symptoms in the oral cavity. Soft tissue, hard tissue, oral flora, and saliva are changed in these patients, which some interventions are needed to control such changes. Our goal was to review oral manifestations in obese patients who underwent bariatric surgery to attract attention to oral care in these patients.

## 1. Introduction

Obesity is one of the global increasing noninfectious diseases, which can lead to many complicated metabolic diseases, like hypertension, cardiovascular diseases, and diabetes type 2 [1]. Obesity based on its chronicity and complex nature involves most parts of the body and even the oral cavity [2]. Oral cavity contains soft tissue, hard tissue, and saliva. Tooth caries, periodontitis, and hyposalivation are the most prevalent manifestations in obese patients [3]. It should be considered that patients may suffer from systemic diseases induced by obesity, as well [3]. Bite force, time of chewing, and frequency of eating are some ignored causes of oral manifestations. [4]. Eating habits, like binge eating disorder and some common medical problems in obese patients induce soft and hard oral tissue manifestations, such as teeth wear, periodontitis, dysgeusia, and periodontitis [5]. Quantitative and qualitative imbalance in the oral flora is introduced as dysbiosis, which can increase the pathogens causing caries or periodontitis in the oral cavity [6]. Bariatric surgery is the main method to control morbid obesity through decreasing food reser-

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voir and gastric emptying, which can induce some oral complications, like teeth caries, periodontitis, teeth wear, xerostomia, or sialorrhea [4, 5, 7-11].

## 2. Materials and Methods

Medline, Scopus, and SID databases were searched using the keywords, including "obesity", "bariatric surgery", "oral manifestations", and "saliva". After excluding duplicate papers, we found 68 papers eligible to investigate.

## 3. Results

We can categorize obesity and bariatric manifestations into four groups, which need oral examination protocols and scheduling follow-ups:

1. Systemic diseases affecting these patients;

2. Lifestyles and habits, leading to oral manifestations;

3. Chronic inflammation secondary to adipose tissue accumulation;

4. Malnutrition-induced manifestation in both obese and patients who underwent bariatric surgery.

## 4. Discussion

Improvement in inflammation pathways and decreasing insulin resistance are important factors to control most oral problems. There are some controversies about leading factors, some researchers showed that inflammation process food intake pattern can cause oral health problems [4]. Bariatric patients may suffer from deficiencies in the minerals and vitamins, like vitamin B12, A, E, and D, and zinc and calcium [4]. Some researchers showed changes in the taste and smell, which cause these deficiencies. Moreover, too much protein intake is another factor for malabsorption and even liver or kidney disorders [7]. Changes in food intake and macronutrients alter the muscular function and can affect occlusion and bite force [12, 13]. Osteoporosis is also another risk factor for oral hard tissue changes [4].

Saliva is a unique body fluid, which can moisturize, lubricate, and buffer the oral cavity. Nowadays, it is used as a diagnostic marker for physiologic and pathologic situations in our bodies. Some cytokines involved in metabolism can be detected in saliva and can be used as clinical markers. Leptin, cortisol, insulin, ghrelin, acid uric are some markers involved in metabolic and pathologic changes found in saliva. Some researchers reported different values of the markers in serum, saliva, and gingival tissue. More investigations are needed to show the diversity of each marker [8]. Obesity can activate oxidative stress. Superoxide dismutase, catalase, peroxidases, uric acids, and polyphenols are important antioxidants in saliva. Besides obesity, physical activity can decrease salivary antioxidants. Decreased levels of salivary peroxidase and polyphenol were reported in bariatric patients. In general, reduced stimulated and unstimulated saliva was reported in obese patients and bariatric surgery can only recover the unstimulated saliva. [2, 9]. Gastroesophageal reflux can occur in both obese and bariatric patients; thus, they may experience teeth erosion, which is caused by oral cavity acidity [10-12].

There are several studies indicating a link between body weight changes and oral diseases and the oral flora is not an exception. An increase in the bacterial load in the oral cavity has been reported after bariatric surgery since some species like porphyromunas gingivalis has an abrupt increase 6 months after bariatric surgery, and some new species like non-albicans candida have emerged in the oral cavity. *Tannerella* forsythia, Treponema *denticola*, and *Prevotella* intermedia are other increased periodontal pathogens in bariatric patients. It should be taken into account that changing in oral flora due to bariatric surgery can occur abruptly six months or one year after bariatric surgery [13]. It is suggested to add dental and oral examinations before and after bariatric surgery through a regular plan based on all these reports [3-5, 11, 14-16].

## 5. Conclusion

Some specific oral manifestations, like periodontitis and tooth caries, have been reported in both obese patients and patients underwent bariatric surgery; however, a comprehensive insight is needed to design studies to investigate all factors causing oral health problems, like changes in oral flora, salivation, and soft and hard oral tissue changes.

## Ethical Considerations

### Compliance with ethical guidelines

There were no ethical considerations to be considered in this research.



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## Authors' contributions

All authors equally contributed to preparing this article.

## Conflict of interest

The authors declared no conflict of interest.

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