A Study on t he Relationship Between Number of Missing Teeth And Obesity in Istanbul

ÖZET

Amaç: Obezite tüm dünyada artan bir problem olmasına karşın diş sağlığı ile obezite arasındaki ilişki henüz tamamen anlaşılamamıştır. Bu çalışmada, eksik diş sayısı ve bununla ilişkili olarak çiğneme etkinliğinin azalmasının obezite için bir etken olup olmadığını anlamak istedik.

Hastalar ve Yöntem: Marmara Üniversitesi Pendik Eğitim ve Araştırma Hastanesi Spor Fizyolojisi polikiniğine obezite nedeniyle başvuran 18-65 yaş arası kadın hastalar çalışmaya alındı. Boy uzunlukları ölçüldükten sonra bioimpedans analiz (Tanita BC418) yöntemi kullanılarak kilo, VKİ (vücut kitle indeksi), yağ yüzdesi, yağ ağırlığı, yağsız ağırlık saptandı. Diş eksikliği var mı, varsa kaç tane diye sorularak bilgi alındı. Veriler SPSS (16) programına yerleştirilip istatistiksel analiz yapıldı.

Bulgular: Obesite göstergeleri için dişli grup (n=132), dişsiz grup (n=294) ile karşılaştırıldığında dişli grupun dişsiz gruba göre önemli derecede daha zayıf olduğu saptandı (p=0.035). Bu iki grubun yağsız ağırlıkları da önemli derecede farklı idi (p=0.022). Kayıp diş sayısına göre karşılaştırıldıklarında, beşden daha az dişi eksik kişilerin, beş ve daha fazla dişi eksik kişilere göre daha genç, daha uzun boylu ve daha düşük BKİ'ye sahip oldukları saptandı (p<0.05).

Sonuç: Bu bulgular diş kaybının obezite için önemli bir faktör olduğunu göstermektedir. Diş kaybı olanların daha yumuşak gıdaları tercih ettikleri, daha hızlı yemek yedikleri varsayılabilir. Bu şekilde, dişi eksik kişilerin ağız içi reseptörlerini uyarmayı azalttıklarından dolayı doygunluk hissini daha geç aldıkları ve doygunluğa ulaşabilmek için daha çok yedikleri ve bu şekilde obeziteyi tetikledikleri düşünülebilir.

Anahtar kelimeler: Obezite, çiğneme etkinliği, diş eksikliği, çiğneme

ABSTRACT

Aim: Although obesity is a growing problem for the entire world, its relationship with the dental health has not been fully appreciated. We have attempted to determine whether the number of missing teeth and hence the reduced chewing efficiency is a factor for obesity.

Materials and methods: This study has taken place in the Sports Physiology Clinic of the Marmara University Pendik Training and Research Hospital, Istanbul, Turkey. The subjects were the female outpatients of the clinic aged between 18 and 65 years old. Obesity variables, i.e., the heights, weights, BMI (body mass index) and body fat content of the patients were determined using a bio-impedance device (Tanita-BC418). Number of missing teeth was noted and the data were analyzed using SPSS software. Subjects were divided into two groups.

Results: Comparison of the Teethed Group (n=132) and the Teeth-Missing Group (n=294) for the obesity variables indicated that the body weight of the Teethed Group was significantly lower compared with the Teeth-Missing Group (p=0.035). The fat-free mass also indicated a significant difference between the two groups (p=0.022). When the individuals were compared according to the number of missing teeth, the individuals with less than 5 teeth missing were younger, taller and had lower BMI index compared with the individuals with 5 or more teeth missing (p<0.05).

Conclusion: These findings indicate the importance of the dental health and hence loss of teeth as a significant factor for obesity. It is likely that the individuals with missing teeth would prefer softer food. Softer food does not require vigorous mastication and hence the degree of oral stimulation would be reduced in these individuals. Since the oral stimulation is one of the key factors for satiety, these individuals would have to eat larger portions for satisfaction, leading to obesity.

Key words: Obesity, number of missing teeth, chewing efficiency, mastication.

Uzm.Dr. Serpil Çeçen, Uzm. Dr. Şule Bulur, Prof. Dr. Kemal Sıtkı Türker
Marmara University Pendik Training and Research Hospital
Email: drserce@gmail.com

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INTRODUCTION

Obesity is a worldwide health problem and its prevalence is increasing continuously[1]. Obesity related health problems becoming so frequent that it is replacing the classical health problems such as infectious diseases.[2] According to the World Health Organization (WHO) figures, today there are over 400 million obese and 1.6 billion overweight individuals in the world. Again according to WHO this figure is likely to become 700 million obese and 2.5 billion overweight individuals by the year 2015.[3]

In Turkey, the prevalence of obesity in individuals that are over 30 years old is 25.2% for men and 44.2% for women.[4] Similar numbers were quoted by the Turkish Ministry of Health; the obesity profile of Turkey has an average value of 34.3%, of which 16.8% is for men and 48.4% is for women.[5]

What makes individuals obese? Other than eating more than the required amount, speed of eating has also been implicated. For example, one previous work has shown that the obese subjects eat faster than their lean peers and suggested that a lack of oral stimulations could be related to energetic metabolism.[6] Patients with morbid obesity who have undergone bariatric surgery are encouraged to chew slowly in order to slow down food intake and optimize the digestion process.[7] Eating until full and eating quickly are associated with being overweight in Japanese men and women, and these eating behaviors combined may have a substantial impact on being overweight.[8] It has also been reported that the rate of eating showed a positive correlation with BMI among young Japanese students and middle-aged Japanese men and women. [9-11]

Maruyama et al[8], and Li et al[12] showed that chewing less is a risk factor for obesity. Increased chewing decreases energy intake in one meal, which is mediated partly by the modulations of plasma ghrelin, GLP-1 (glucagon like peptid-1), and CCK (cholecystokinin) concentrations. Interventions for improving chewing activity could become a valuable tool for combating obesity.

The question started the current study was the possible link between the chewing efficiency and the obesity. We wished to find out whether the reduced chewing efficiency due to loss of teeth affected the prevalence of obesity. A decreased number of teeth and conventional denture wearing have been associated with inadequate dietary habits[13], as well as altered anthropometric measures, inappropriate blood nutrient concentration[14], and increased BMI in the elderly.[15]

Tooth loss, i.e. a reduced number of teeth, has previously been found to be related to obesity.[16,17] Tooth loss was associated with both general and abdominal obesity in participants below 60 years of age, with consistent patterns in men and women.[16] BMI is an independent predictor of number of teeth in middle-aged women when socio-economic, dietary, and psychological factors are taken into account.[17]

Since poor oral / dental health has serious consequences in body size and obesity, in this study the aim was to find out the current situation in Turkey. The oral health of Turkish elderly people is known to be poor.[18] Poor oral/dental health would affect chewing efficiency and individuals with poor dental health would consume softer diet in order to avoid pain during chewing.[19]

In the Turkish group, we also concentrated on the women, as they are known to be more susceptible to becoming obese. We also considered all age groups (18–65 years) rather than just the elderly to obtain the entire picture. Our principle hypothesis was that the number of missing teeth has a predictable relationship to the obesity variables.

MATERIAL AND METHODS

This study has taken place in the Sports Physiology Clinic of the Marmara University Pendik Training and Research Hospital, Istanbul, Turkey. The subjects were the female outpatients of the Clinic aged between 18 and 65 years old. Obesity variables, i.e., the weights, BMIs, and fat contents of the patients were determined using a bio-impedance device (Tanita-BC418).

They signed informed consent forms prepared by the Marmara University Pendik Training and Research Hospital human ethics committee. Information on the health status and whether they use any drugs were obtained.

Dental examinations of patients were performed to find out the number of missing teeth. SPSS software (16) was used to analyze the data. Student's t-test was used to compare the obesity variables of the group with no missing teeth (Teethed Group) with that of the individuals with missing teeth (Teeth-Missing Group). T-test was also used for the comparison of obesity variables of the group with five or more teeth missing (Group +5) versus the group with less than five teeth missing (Group -5). Correlation tests were also performed to indicate how the number of missing teeth affected the obesity variables. In all tests, significance level was set to $p<0.05$.

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RESULTS:

Four hundred and twenty six patients took part in these studies, 132 of which had full set of teeth. Although the number of missing teeth did vary in amongst the 'teeth-missing' patients (1 tooth missing 52 subjects; 2 teeth missing 69; 3 teeth missing 50; 4 teeth missing 49; 5 teeth missing 27; 6 teeth missing 18; 7 teeth missing 10; 8 teeth missing 6; 9 teeth missing 1; 10 teeth missing 10; and 12 teeth missing 2) all of the subjects with missing teeth were grouped together (Teeth-Missing Group) and compared with the 'teethed' patients (Teethed Group) to highlight the differences in the obesity variables between the two groups.

Comparison of the Teethed Group (n=132) and the Teeth-Missing Group (n=294) for the obesity variables indicated that the body weight of the Teethed Group was significantly lower compared with the Teeth-Missing Group (87 versus 91 kilos; p=0.035). The fat-free mass also indicated a significant difference between the two groups. This was 51 kilos in the Teethed Group against 52 kilos in the Teeth-Missing Group (p=0.022). Age of the patients was examined between the two groups. It was found that age of the subjects was not a significant factor for indicating these two groups (p=0.23) (for details of the analysis please refer to Table 1).

Table 1: Comparison of the obesity variables between teethed and teeth missing groups:

	Teeth Group	Teeth-Missing Group	Significance
AGE	39	40	N.S.
HEIGHT	158	159	N.S.
FAT FREE WEIGHT	50.5	52	P<0.05
FAT WEIGHT	37	39	P=0.06
FAT PERCENTAGE	41	42	N.S.
WEIGHT	87	91	P<0.05
BMI	35	36	P=0.07

In table 1 data from 132 women with no missing teeth (Teethed Group) and 294 women with one or more teeth missing (Teeth-Missing Group) are shown. Comparison is made using Student's t-test for independent samples.

Comparison of the obesity variables between the Group -5 (n=379) and Group +5 (n=47) indicated the following significant results: Group -5 individuals were younger, taller and had lower BMI index compared with the Group +5 (39 versus 45 years; 159 versus 156 cm; 35.5 versus 38) (Table 2). Please note that the group numbers were not equal.

In the correlation statistics, the weight had a significant relationship with the number of missing teeth (R^2=0.4753; p<0.05).
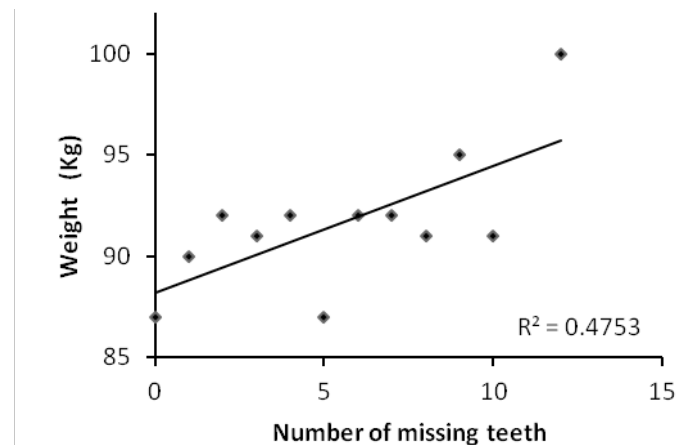
Table 2: Comparison of the obesity variables between two groups of individuals:

	4 or less teeth missing	5 or more teeth missing	Significance
AGE	39	45	P<0.001
HEIGHT	159	156	P<0.01
FAT FREE WEIGHT	51.2	52.6	N.S.
FAT WEIGHT	38	40	N.S.
FAT PERCENTAGE	41.4	42.4	N.S.
WEIGHT	89.5	92.2	N.S.
BMI	35.5	38	P<0.01

In table 2, Data from 379 women with four or less missing teeth (Group –5) and 47 women with five or more teeth missing (Group +5) are shown. Comparison is made using Student's t-test for independent samples.

This relationship is illustrated in Figure 1. Other obesity variables however were not significantly related to the number of missing teeth.

Figure 1: **Relationship between the number of missing teeth and the weight of the patients.** Note that the weight of the subject increased as the number of missing teeth increased. Each point indicates the average weight of subjects belonging to the group with the same number of missing teeth. Note however that the number of subjects for each of the groups were not equal: zero teeth missing 132 subjects; 1 tooth missing 52 subjects; 2 teeth missing 69; 3 teeth missing 50; 4 teeth missing 49; 5 teeth missing 27; 6 teeth missing 18; 7 teeth missing 10; 8 teeth missing 6; 9 teeth missing 1; 10 teeth missing 10; and 12 teeth missing 2.

DISCUSSION

Confirming our principal hypothesis, the current study has shown that the number of missing teeth has a significant relationship with some of the obesity variables.

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Importance of number of teeth in chewing

Variables representing dental health are associated with the obesity indicators of BMI and waist circumference[20], and that a minimum of 20 teeth are needed for satisfactory chewing ability and functional dentition.[21]

In adults, the intake of non-starch polysaccharides from whole meal breads, cereals, vegetables, and fruits was higher in dentate than complete denture wearers.[22] In one study, participants with fewer than 28 teeth had a lower intake of carrots, tossed salads, and dietary fiber, and lower serum levels of beta-carotene, foliate, and vitamin C than dentate participants.[23] Although other environmental factors could contribute to variations in body fat, BMI is associated with number of teeth; even when socioeconomic, dietary, psychological, lifestyle, and co-morbidity factors are considered.[24,25] Our current findings on Turkish women support the findings of earlier studies on the relationship between the number of missing teeth and BMI of individuals. Therefore, current scientific evidence stress the importance of keeping the natural teeth for combating obesity.

Age as a predictor for BMI

Age was identified as a confounder of the relationship between number of teeth and obesity and was also an effect-modifying variable. In our Teethed and Teeth-Missing Groups however age was not a significant factor as we used a wide range of ages. However, there was a significant relationship between the age of the individuals and the number of missing teeth when the patient population was divided into few and large number of missing teeth (Group −5 versus Group +5). In other studies, the prevalence of obesity varied across different age groups depending on the number of teeth. Individuals with less than 10 teeth in at least one arch and edentulous adults showed higher obesity rates by age, which suggested that age modified the effect of tooth loss on obesity.[26]

Conclusions

The current findings indicate the importance of the dental health and loss of teeth as a significant factor for obesity. It is suggested that the individuals with missing teeth may choose to eat softer food to avoid pain and discomfort. Since softer food does not require vigorous mastication, the degree of oral stimulation would be reduced in these individuals as they swallow food rapidly. Since the oral stimulation is one of the key factors for satiety, these individuals would have to eat larger portions for feeling full hence leading to obesity.

Kaynaklar / References

1. Yanowski SZ, Yanowski JA. Obesity. N Engl J Med 2002;346:591-602.

2. WHO. Obesity: Preventing and managing the global epidemic. Report of a WHO consultation on obesity. Geneva, 1997 (Geneva:World Health Organization,1998 WHO/NUT/NCD/98:1).

3. The World Health Organization. Preventing Chronic Disease: A vital investment: WHO global report. Geneva: WHO, 2005;56.

4. Onat A, Keleş I, Sansoy V, Ceyhan K, Uysal O, Çetinkaya A ve ark. Rising obesity indices in 10-tear follow-up of Turkish men and women: Body mass index independent predictor of coronary events among men. Türk Kardiyoloji Derneği Arşivi 2001;29:430-36.

5. T.C. Sağlık Bakanlığı Türkiye obesite ile mücadele programı ve Ulusal Eylem Planı Taslağı 3. Taslak (2008-2012).

6. Bellisle F, Le Magnen J. The structure of meals in humans: Eating and drinking patterns in lean and obese subjects. Physiol Behav 1981;27:649-58.

7. Veyrune JL, Miller CC, Czernichow S, Ciangura CA, Nicolas E, Hennequin M. Impact of morbid obesity on chewing ability. Obes Surg 2008;18:1467-72.

8. Maruyama K, Sato S, Ohira T, Maeda K, Noda H, Kubota Y, et al. The joint impact on being overweight of self reported behaviours of eating quickly and eating until full: cross sectional survey. BMJ 2008;337:1091-93.

9. Sasaki S,Katagiri A,Tsuji T, Shimoda T, Amano K. Self-reported rate of eating correlates with body mass index in 18-y-old Japanese women.Int J Obes Relat Metab Disord. 2003;27:1405-10.

10. Otsuka R, Tamakoshi K, Yatsuya H, Murata C, Sekiya A, Wada K, et al. Eating fast leads to obesity: Findings based on self-administered questionnaires among middle-aged Japanese men and women. J Epidemiol 2006;16: 117-24.

11. Otsuka R, Tamakoshi K, Yatsuya H, Wada K, Matsushita K, OuYang P, et al. Eating fast leads to insulin resistance: Findings in middleaged Japanese men and women. Prev Med 2008; 46: 154-59.

12. Li J, Zhang N, Hu L, Li Z, Li R, Li C, et al. Improvement in chewing activity reduces energy intake in one meal and modulates plasma gut hormone concentrations in obese and lean young Chinese men. Am J Clin Nutr 2011;94:709-16.

13. Tsai AC, Chang TL. Association of dental prosthetic condition with food consumption and the risk of malnutrition and follow-up 4-year mortality risk in elderly Taiwanese. J Nutr Health Aging 2011;15:265-70.

14. Nowjack-Raymer RE, Sheiham A. Association of edentulism and diet and nutrition in US adults. J Dent Res 2003;82:123-6.

15. Sheiham A, Steele JG, Marcenes W, Finch S, Walls A.W.G. The relationship

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between oral health status and Body Mass Index among older people: A national survey of older people in Great Britain. Br Dent J 2002;192:703-6.

16. Östberg AL, Nyholm M, Gullberg B, Råstam L, Lindblad U. Tooth loss and obesity in a defined Swedish population. Scand J Public Health 2009; 37:427-33.

17. Forslund HB, Lindroos AK, BLomkvist K, Hakeberg M, Berggren U, Jontell M, et al . Number of teeth, body mass index, and dental anxiety in middle-aged Swedish women. Acta Odont Scand 2002;60:346-52.

18. Ünlüer Ş, Gökalp S, Doğan B.G. Oral health status of the elderly in a residential home in Turkey. Gerodontology 2007;24:22-9.

19. Bellisle F, Rolland-Cachera MF, Deheeger M, Guilloud-Bataille M . Obesity and food intake in children: Evidence for a role of metabolic and/or behavioral daily rhythms. Appetite 1988;11:111–18.

20. Östberg AL, Bengtsson C, Lissner L, Hakeberg M. Oral health and obesity indicators BMC Oral Health 2012;12:1-7.

21. Sheiham A, Steele JG, Marcenes W, Finch S, Walls AWG. The relationship between oral health status and body mass index among older people: A national survey of older people in Great Britain. Br Dent J 2002;192:703-6.

22. Moynihan PJ, Snow S, Jepson NJ, Butler TJ. Intake of non-starch polysaccharide (dietary fibre) in edentulous and dentate persons: An observational study. Br Dent J 1994;177 :243-47.

23. Nowjack-Raymer RE, Sheiham A. Numbers of natural teeth, diet, and nutritional status in US adults. J Dent Res 2007;86:1171-5.

24. Forslund HB, Lindroos AK, Blomkvist K, Berggren U,Jontel M, Torgerson JS. Number of teeth, body mass index, and dental anxiety in middle-aged Swedish women. Acta Odontol Scand 2002;60:346-52.

25. Ostberg AL, Nyholm M, Gullberg B, Rastam L, Lindblad U. Tooth loss and obesity in a defined Swedish population. Scand J Public Health 2009;37:427-33.

26. Bernardo CO, Boing AF, Vasconcelos F, Peres KG, Peres MA. Association between tooth loss and obesity in Brazilian adults: A population-based study. Rev Saúde Pública 2012;46:834-42.