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Impact of BMI on patients oral health and patients co-operation undergoing fixed orthodontic mechanotherapy

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Abstract---Over the last decades, overweight and obesity has become a problem in the economically developed world. The increasing number of overweight adults is alarming. During orthodontic therapy with fixed appliances, the development of white spot lesions (WSLs) is a relatively common negative side-effect. Concerning oral health, some evidence exists that there might be an association between overweight and an increased caries risk in children, but this relationship is not unambiguous. Therefore, the aim of this retrospective, explorative study was to compare normal, overweight, and obese orthodontic patients undergoing fixed appliance therapy. Therefore, it was concluded that 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.

Keywords---fixed appliances, body mass index, caries, gingivitis, obesity, overweight.

Introduction

Fixed orthodontic appliances introduce an additional constituent to the oral cavity complex that may enhance the stomatognathic system in various ways. On

the other hand, Orthodontic treatment leads to changes in the oral environmental factors that encourage the changes in salivary flow rate, viscosity, pH, bacterial count, increased plaque index, etc. that supplement the risk of caries activity and disturb the health of the oral environment. Orthodontic treatment is known to induce both positive and negative local soft-tissue reactions. The positive reaction is that properly aligned teeth are easier to clean, and correct occlusion always promotes healthier periodontium. The negative reaction is mainly associated with periodontal diseases that include gingivitis, periodontitis, gingival recession or hypertrophy, alveolar bone loss, dehiscence, fenestrations, interdental fold, and dark triangles. These occur because the Orthodontic brackets and elastics interfere with the effective removal of dental plaque, thereby increasing the risk of periodontal diseases.¹

There is a growing body of evidence suggesting that among various risk factors for destructive periodontal disease, obesity has been the major risk factor during the last decade.² Some studies on destructive periodontal disease in individuals with obesity or metabolic syndrome in adults reported that there exists a potential link in children and adolescence between body weight and periodontal disease.³ Overweight and obesity are two of the most significant preventable public health issues, and these have become a global epidemic in recent times.⁴ Recent studies have identified an association between overweight/ obesity, dental caries, and periodontal health. They suggest that the association is likely derived from shared risk factors such as a high sugar diet and other social-environmental factors.⁵⁻⁸ However; this commonality remains under-investigated

Dental caries (commonly known as tooth decay) are highly prevalent chronic diseases affecting children worldwide. Although largely preventable by early diagnosis, parental counselling, and topical fluoride therapy, the rapidly progressing nature of caries may cause immediate and long-term health ramifications if left untreated.⁹⁻¹² A few studies addressing the influence of childhood overweight on orthodontic treatment success found that overweight children did not cooperate reasonably during orthodontic therapy and developed more caries than their normal-weight peers.¹³⁻¹⁴ However, there is a scarcity of data in the Indian population. There is no literature that suggests the influence of co-operative or un-cooperative overweight or obese orthodontic patients on their periodontal health. Therefore, this retrospective and explorative study aimed to compare normal, overweight, and obese orthodontic patients undergoing fixed appliance therapy to analyse intergroup differences concerning the incidence of caries and gingivitis and the level of cooperation

Methodology

This is a Cross-sectional analytical and non-interventional study with sample size of 100 patients. The subjects were randomly selected from the Department of Orthodontics and Dentofacial Orthopaedics, Institute of Dental Sciences & SUM Hospital, Bhubaneswar, Odisha. Their BMI was calculated based on the pre-treatment weight and height data, Caries index was measured using WHO modification of DMF index, Gingival health was measured using Gingival index given by Loe and Silness 1963 and the patients' co-operation was measured according to the number of negative file entries. Periodic verbal and visual re-

enforcement of oral hygiene, mouthwash, fluorinated toothpaste and interdental brush was given all the needful measurements and evaluation were done and subjected to statistical analysis using SPSS Software version 24.0.

Results

Severity of inflammation was significantly associated with increased BMI at the beginning of treatment until 4-months of treatment. BMI was significantly associated with increased DMF at the beginning of treatment, and 2-months after treatment. Patients' cooperation was significantly associated with increased BMI at the beginning of treatment until 3-months of treatment.

Discussion

According to studies, apart from systemic health problems associated with increased BMI, oral health problems like caries, WSLs and periodontal problems have been seen to develop more frequently in obese and overweight individuals.²⁸ Evidences prove that higher BMI (obese and overweight) appears to be associated with more oral health related problems (higher caries, gingivitis incidence) and lesser patients' cooperation during orthodontic treatment.²³ The current study revealed that obesity were more commonly seen in the young adults (23-25 years) and overweight individuals were seen mainly in the age group 19-22 years (transition age from teenage to young adult). This finding is in agreement with WHO ¹⁰ that the early young adults are to stay overweight and then move to obesity in young adulthood. This occurs due to changes in the environmental and social life of young adults and adults, which includes, changing the modes of transportation (adults have personal vehicles) and increase in the social life (causing increase intake of high calorie food, carbonated and non-carbonated beverages etc.).

In the present study, assessment of BMI based on gender revealed that more number of females i.e. 62.5% fall under obese BMI as compared to the males that contribute to 37.5%. This gender difference was not statistically significant ($p=0.124$). However, in the study conducted by Kyoung-Bae Kim and Yun-A Shin ¹⁵ suggests that the prevalence of obese and overweight males is much higher than that of females. Manoj Kar et al ¹⁶ showed physical activities (participation in regular physical exercise), food habit (carbonated and non-carbonated drinks) and family history of obesity, in both rural and urban adolescents did influence change in BMI. This study showed an increase in prevalence of overweight and obesity in urban adolescents in the state of Odisha especially with male gender. Among all the soft and hard tissue reaction of the fixed orthodontic treatment, the periodontal breakdown has been the most common that occurs due the difficulty in removal of plaque or any debris.

In this study, assessment of BMI based on gingival health revealed that the subjects with higher BMI had a significantly higher gingival index in comparison to low BMI subjects from the beginning of treatment until 4-months after treatment. Von Breman et al ¹⁷ reported that before any orthodontic intervention, a gingivitis was present in 53.3 per cent of the obese patients (compared to 32.6 per cent of the normal weight subjects). After multi bracket treatment, 79.4 per

cent of the normal weight patients had gingivitis, compared to 79.5 per cent of the overweight and 93.3 per cent of the obese patients showing that subjects with higher BMI had a significantly higher gingival index in comparison to low BMI. Reeves et al ¹⁸ in his study associated obesity and gingival health with higher levels of pro-inflammatory cytokines (TNF- α , IL-1, IL-6) in obese group, which play a fundamental role in the progression of periodontitis. Therefore, it was concluded that periodontitis may follow patterns similar to other chronic conditions that originate early in life and are related to central adiposity.

Assessment of caries incidence based on BMI was done in this study which revealed that BMI was significantly associated with caries at the beginning of treatment, and 2- months after treatment. In Von Breman et al ¹⁷ study, before treatment all patients presented WSL on at least one of the four upper incisors. Pre-treatment WSLs were least frequent in normal weight compared to overweight and obese patients. In our study, assessment of BMI based on patients' co-operation was done. It showed that overweight and obese patients had lower cooperation than normal patients from beginning of treatment until 3-months after treatment, which was statistically significant. In 2nd and 3rd month of fixed orthodontic treatment the obese group showed lower cooperation compared to the normal group, however, this difference was statistically insignificant. Von Breman et al ¹⁷ reported that there appeared to be an association between the BMI and the patient cooperation. More number of the normal weight patients had a good cooperation, as compared to overweight and obese patients, but not at the level of statistical significance. This finding is similar to ours. Independent of the BMI, females displayed a better cooperation than males in this study. Hafsa Quabool et al¹⁹ conducted a cross- sectional study assessed cooperation and compliance with dietary habits and BMI in adult orthodontic patients and results showed that the patients co-operation decreased with the progress of treatment, and the cooperation was poorer in the obese group. The authors associated obesity and poor cooperation with eating large amount of processed food, fast food, acidic beverages etc. Too little physical activity can also contribute to the poor oral hygiene and hence poor co-operation.

Conclusion

This study provides potential relevance to prior studies done for comparing the normal, overweight, and obese orthodontic patients undergoing fixed appliance therapy to analyse intergroup differences concerning the incidence of caries and gingivitis and the level of cooperation. Knowledge of which, can help the orthodontist to change the treatment protocols or adapt any measures to prevent these negative consequences and deliver the quality of care the patient requires.

References

1. Colak H, Dülgergil CT, Dalli M, Hamidi MM. Early childhood caries update: A review of causes, diagnoses, and treatments. *J Nat Sci Biol Med.* 2013;4:29–38.
2. Policy on Early Childhood Caries (ECC): Classifications, Consequences, and Preventive Strategies. *Pediatr Dent.* 2016;38:52–4.

3. Martins-Júnior PA, Vieira-Andrade RG, Corrêa-Faria P, Oliveira-Ferreira F, Marques LS, Ramos-Jorge ML. Impact of early childhood caries on the oral health-related quality of life of preschool children and their parents. *Caries Res.* 2013;47:211–8.
4. Acharya A, Khan S, Hoang H, Bettiol S, Goldberg L, Crocombe L. Dental conditions associated with preventable hospital admissions in Australia: a systematic literature review. *BMC Health Serv Res.* 2018;18:921.
5. Meeran NA. Iatrogenic possibilities of orthodontic treatment and modalities of prevention. *J Orthod Sci.* 2013;2:73–86.
6. Alexander SA. Effects of orthodontic attachments on the gingival health of permanent second molars. *Am J Orthod Dentofac Orthop Off Publ Am Assoc Orthod Its Const Soc Am Board Orthod.* 1991;100:337–40.
7. Nishimura F, Iwamoto Y, Mineshiba J, Shimizu A, Soga Y, Murayama Y. Periodontal disease and diabetes mellitus: the role of tumor necrosis factor- α in a 2-way relationship. *J Periodontol.* 2003;74:97–102.
8. Ng M, Fleming T, Robinson M, Thomson B, Graetz N, Margono C, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet Lond Engl.* 2014;384:766–81.
9. Overweight and Obesity | NHLBI, NIH [Internet]. [cited 2021 Sep 18]. Available from: <https://www.nhlbi.nih.gov/health-topics/overweight-and-obesity>
10. Obesity [Internet]. [cited 2021 Sep 18]. Available from: <https://www.who.int/westernpacific/health-topics/obesity>
11. GBD 2015 Obesity Collaborators, Afshin A, Forouzanfar MH, Reitsma MB, Sur P, Estep K, et al. Health Effects of Overweight and Obesity in 195 Countries over 25 Years. *N Engl J Med.* 2017;377:13–27.
12. Sanders RH, Han A, Baker JS, Cobley S. Childhood obesity and its physical and psychological co-morbidities: a systematic review of Australian children and adolescents. *Eur J Pediatr.* 2015;174:715–46.
13. Hooley M, Skouteris H, Millar L. The relationship between childhood weight, dental caries and eating practices in children aged 4–8 years in Australia, 2004–2008. *Pediatr Obes.* 2012;7:461–70.
14. Trikaliotis A, Boka V, Kotsanos N, Karagiannis V, Hassapidou M. Short communication: Dmfs and BMI in preschool Greek children. An epidemiological study. *Eur Arch Paediatr Dent Off J Eur Acad Paediatr Dent.* 2011;12:176–8.
15. Kyoung-Bae Kim and Yun-A Shin, Males with Obesity and Overweight *J Obes Metab Syndr.* 2020 Mar 30; 29(1): 18–25. Published online 2020 Mar 30. doi: 10.7570/jomes20008
16. Manoj Kar , Sasmita Behera, Study on prevalence of obesity in urban and rural adolescents in Odisha: Implications for public health strategies *The Journal of Community Health Management* 2021
17. von Bremen J, Lorenz N, Ruf S. Impact of body mass index on oral health during orthodontic treatment: an explorative pilot study. *Eur J Orthod.* 2016;38:386–92.
18. Reeves AF, Rees JM, Schiff M, Hujoel P. Total body weight and waist circumference associated with chronic periodontitis among adolescents in the United States. *Arch Pediatr Adolesc Med.* 2006;160:894–9.

19. HafsaQabool, Rashna HoshangSukhia, MubassarFida. Assessment of cooperation and compliance in adult patients at three stages of orthodontic treatment at a tertiary care hospital: A cross-sectional study. International Orthodontics . Volume 18, Issue 4, December 2020