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Title:
Evaluation of the relationship between body mass index (BMI) with malocclusion in adolescents who were referred to the dentistry department of Tabriz university of medical science

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In the name of Allah

Statement of Originality

I certify that the following thesis is based on the results of investigations performed by me, that this is my own composition, and that it has not previously been presented for a higher degree.

I hereby confirm above mentioned statement, as a supervisor/advisor of this thesis.
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Abstract

**Purpose:** The Purpose of this thesis is to Evaluation the relationship between body mass index (BMI) with malocclusion in adolescents who were referred to the dentistry department of Tabriz university of medical science.

**Method and Materials:** The present study is a retrospective type of study which conducted on a group of 154 adolescents of 10-18 years old age from both sexes who had attended the Department of Orthodontics at Tabriz University of Medical Sciences with good general health and no systemic disease or hospitalization. Statistical analysis done using the SPSS17 software and p-value p<0.05 considered.

**Results:** The average BMI was generally 18.32 ± 3.71 with the lowest of 13.17 and the highest of 29.40. The average of BMI percent was 45.78 ± 34.31. dental OCC was reported in 44 (34.4%) patients Class I, 60 (46.9%) were Class II and 24 (18.8%) were classified as Class III. skeletal OCC was reported in 40 (31.3%) patients Class I, 56 (43.8%) were Class II, and 32 (25%) were classified as Class III. to compare these indicators in different categories skeletal OCC and dental OCC, nonparametric test of Kruskal- Wallis was used. The highest mean BMI was reported in class III with an average of 19.04 ± 3.61 and the lowest in class II with an average of 18.04 ± 3.36. The highest mean BMI percent was in Class III with an average of 37.68 ± 50.66 and the lowest in Class I with an average of 34.19 ± 44.13. The highest and lowest mean BMI percent was reported in the same way with averages of 53.81 ± 37.27 and 33.4 ± 30.49, respectively. it was evaluated by Chi-square test.

**Conclusion:** The results of our study revealed that class II malocclusion was the most prevalent concern between studied subjects. The lowest pattern belonged to class III. Moreover, our study showed that the highest amount of the BMI mean in both dental and skeletal malocclusions associated with class III patients. Meanwhile the lowest rate of malocclusion was related to the class II patients. While concerning the BMI percentage, the highest percent related to class III (like dental malocclusion) and the lowest was for class I.

**Keywords:** Body Mass Index (BMI), Malocclusion, adolescents
Chapter 1:
Introduction and Problem Statement
**Introduction**

Childhood obesity is increasingly recognized as a public health concern globally (1). In general medicine, childhood obesity is already a big issue and these children receive special attention (2). Obesity is considered as a major risk factor in increased prevalence of hypertension, type 2 diabetes mellitus, accelerates dental development and decreased masticatory performance. This study for the first time evaluated the relationship between malocclusion and body mass index (BMI) in adolescent (3). Obesity can be a potentially complicating factor within dentistry. Since the shape of the human face depends on both the structure of the hard tissue (bone) and the soft tissue that covers it, soft tissue should be analyzed for the correct evaluation of an underlying skeletal discrepancy because of individual differences in soft tissue thickness (4).

Body mass index is an Important Factor that effects child’s dental and skeletal development (5). It has been proven that overweight and obese children are skeletally and dentally more advanced than their peers with a normal BMI (5). The position of anatomical landmarks may be less obvious if surrounded by fatty tissue (6). Several studies incorporated three body-type categories (slender, normal, and obese) into their assessments of soft tissue thicknesses, and found that body mass index (BMI) was a major contributing factor in accurately determining differences in facial soft tissue thicknesses between individuals (4). The amount of fat tissue present in the body plays an important role in growth. Obese children usually show an accelerated increase in height growth, which is concomitant with acceleration of bone epiphyses maturation (7).

On the other hand, dental development and skeletal maturation are widely used to determine the timing of orthodontic treatment and the selection of treatment modalities in growing patients (8). Treatment timing can influence therapeutic outcomes aimed to produce orthopedic effects in the craniofacial structures and
knowledge of the remaining skeletal growth potential is essential for correct diagnosis and therapy (9).

In particular, obesity has been hypothesized to impact craniofacial growth and lead to more precocious skeletal maturation of the maxilla and mandible (9). If the relationship between obesity and craniofacial skeletal growth is better understood, then it may be possible to decrease part of the burden of treatment and achieve prevention of orthodontic disorders (10).

Childhood obesity is increasingly recognized as a public health concern globally. Obesity is considered as a major risk factor for accelerated dental development and decreased masticatory performance. Current research is the first attempted that evaluated the relationship between malocclusion and body mass index (BMI) in adolescents.

While dental and skeletal development has many contributing factors and consequences in orthodontic treatment, determining a child's BMI is a noninvasive way to help predict dental and skeletal development. As obesity and childhood overweight has been associated with many health related issues including dental problems, the objective of this study is to assess the relationship between weight status as determined by BMI and orthodontic malocclusion in a large group of actively growing orthodontic patients and to investigate the possibility of clinical application of this information.
Assumption:

The hypothesis is that there is an association between BMI and malocclusion.

The overall Objective:

Evaluation of the relationship between body mass index (BMI) with malocclusion in adolescents

Specific objectives:

1. To assess the prevalence of different malocclusions in slender children (BMI <5%)
2. To assess the prevalence of different malocclusions in normal children 5%< BMI < 85%
3. To assess the prevalence of different malocclusions in obese children (85%<BMI)
4. Comparison of occlusion types among children classified as slender, normal and obese.
Keywords:

**Body mass index (BMI):** A key index for relating weight to height. BMI is a person's weight in kilograms (kg) divided by his or her height in meters squared and applies to most adult men and women aged 20 and over. For children aged 2 and over, BMI percentile is the best assessment of body fat (11, 12).

**Malocclusion:** The term malocclusion refers to the misalignment of teeth and/or an incorrect relation between the teeth of the maxilla and mandible. Malocclusion is an appreciable deviation of the ideal occlusion and may be considered aesthetically unsatisfactory thus implying a condition of imbalance in the relative sizes and position of teeth, facial bones and soft tissues (13).
Chapter 2:
Overview and literature review
In 1900, Angle classified malocclusion of the permanent dentition based on the first molar and canine relationships. Since that time, the study and treatment of malocclusions has expanded dramatically. The American Association of Orthodontists (AAO) estimates that more than 3 million people in the United States wear braces every year. In addition, dental malocclusion affects roughly two-thirds of the population of the United States (14). Although orthodontic treatment is a good solution for correcting malocclusion, there is a significant disparity in treatment associated with household income of the family. In contrast, there is no difference in malocclusion prevalence based on socio-economic status. According to Proffit et.al. (1998), treatment occurs more frequently in upper income groups (25-30%), with approximately 5% of those in the lowest income group and 10% to 15% of those in intermediate income groups reporting being treated (6, 15).

In spite of the discomfort and cosmetic concerns associated with treatment, orthodontic care fills a need that exists based on prevalence in society, as well as an impact on function. It has been noted that the prevalence of malocclusions has increased in the past century. It is unclear why the prevalence has increased, but malocclusion is considered a disease of westernization. The etiology of most malocclusions is not clear (16, 17).

The etiology of malocclusions has been attributed to genetic and environmental factors affecting each individual. There are some tendencies for certain orofacial structures such as jaw size and tooth size to be hereditary. Environmental factors such as the lack of use or over-use of masticatory muscles and the presence of oral habits also affect the jaws and teeth. The interactions between genetic and environmental components contribute to the balance of the tooth/jaw complex to determine the equilibrium and occlusion for each individual. An imbalance can, but does not necessarily, lead to malocclusion. More needs to be understood about both the genetic
and environmental variables that can affect the occlusion. Among the possible environmental contributions to occlusion, there are many factors, of which the diet appears to be one. However, the role of the diet and its effect on malocclusion is not well defined (14, 15).

Certain eating habits and non-nutritive habits have been associated with malocclusions. Other abnormalities in nutrition have also been linked to bone malformation, as well as cartilage disturbances. Some previous studies have hinted that dietary factors may affect jaw development, tooth size, as well as bone formation (16). This study will examine BMI levels and their associations with malocclusions such as crowding.

Occlusion means the contact of maxillary and mandibular teeth without food in mouth. This contact is based on the situation that mandibular bone has, happened in different situations, the condition that is the maximum contact between upper and lower jaw teeth named central occlusion. Recognition of occlusion concept and its definition was presented in the end of 1800, and Edward Angel is a person that has the highest role in evolution of occlusion concept in natural teeth (18, 19).

Malocclusion of teeth is the asymmetry of jaw level of upper and lower teeth. This complication is deviation of natural obstruction of teeth that in it all upper teeth are on the lower teeth. A person, who has natural jaw and teeth, has regular teeth and upper molar teeth fissures exactly pairs on lower molar teeth. As a result, molar teeth have proper contact together and this helps to chew food. However, many people have different kinds of malocclusion that composed a range from mild to severe.

Importance of malocclusion is the relation of it with function and public health. Malocclusion can limit person diet and by effect on chew, leads to inadequate digestion and absorption. Also malocclusion can lead to losing muscle balance and creation of problems in temporomandibular jaw, fluid respiratory problems and trauma (20). Different studies on outbreak of different malocclusion in different age
and race groups, reported different outbreak between 11-93 percent. Presented assumptions for this different distribution composed of human change and evolution, different in diet and muscle activities inheritance and race, environment factors, social class, age of surveying society and different methods evaluated and registered (21, 22). By increasing attention to assign and fast cure of malocclusion and emphasis on preventing works, information gathering from patients with lower, age are beneficial. One of the most important factor in treatment, and prevention in each sickness in assigning epidemiologic indexes of that sickness that problems related with teeth occlusion is not an exception (23). Also programming for controlling a sickness or problem had been done by regarding its outbreak. Furthermore, awareness of distribution of different kinds of malocclusion in an area helps orthodontist to better understanding of people problems in that geographical region and creating a systematic and organized programming.

Based on survey in America, about 30% of people have natural occlusion and anomalies class I is more common than other anomalies (50 to 55%). Amount of outbreak of class II, is about 15% and class III is less than one percent (24). Based on Mangori report, the highest amount of class II outbreak is in white people with North Europe race while, class III anomalies is very popular in East people (In Japan three to five percent, in China two percent, together with two or three percent, that has a fake class III. In other words, because of in consistent interactions, mandibular deviates to front cross bite (25).

**Malocclusion definition:**

The term malocclusion refers to the misalignment of teeth and/or an incorrect relation between the teeth of the maxilla and mandible. In the 1890s, Edward H. Angle, who is considered the father of modern orthodontics, was the first to classify malocclusions based on the first permanent molar relationship. According to Angle, normal occlusion involved the alignment of the maxillary and mandibular first molars.
in such a way that the mesiobuccal cusp of the maxillary first molar aligned with the mesiobuccal groove of the mandibular first molar. Any variation from this resulted in different types of classes of malocclusion (15, 26).

Severely misaligned, irregular, and maloccluding teeth may cause various problems for people. They can cause difficulties with oral function (e.g., swallowing, chewing, speech) (27), less esthetic facial appearances, and increased risk for oral disease, such as trauma (28), tooth decay, and periodontal disease (29). Although some minor malocclusions might be an esthetic concern, this may have a strong psychosocial effect on the individual, including altered self-esteem, social and interaction responses, and increased awareness of people’s perceptions. Oral function can be affected by malocclusions including, but not limited to, the temporomandibular joint complex, adaptive functions of swallowing, speech modifications, mastication inefficiency, and muscle fatigue. Although the lips, tongue, and masticatory complex are adaptive in nature, severe malocclusions can present extreme circumstances where these structures cannot be compensated. Lastly, malocclusions can increase the individual’s risk for disease. Protrusion of the maxilla and retrusion of the mandible can increase the risk for trauma to the maxillary incisors. Oral hygiene and plaque removal can be altered due to misalignment and crowding of the dentition, which can increase the risk for periodontal disease and caries (6, 30).

**Epidemiology of Malocclusion:**

Occlusal discrepancies and malocclusions are one of the most commonly reported problems among children and adolescents. At the simplest level, crowding is caused by a combination of factors that lead to insufficient space. As part of a national survey of healthcare problems and needs in the United States, estimates of orthodontic needs and malocclusions were included in the National Health and Nutrition Examination Survey (NHANES) during the years 1989-1994 (NHANES
III). For the population age 8-17, the percentages of the U.S. population with an anteroposterior malocclusion as defined by Angle’s classification were: Class I Malocclusion (50%), Class II Malocclusion (19%), and Class III Malocclusion (1%), with the remaining 30% normal. Within these groups of malocclusions were other types of misalignment of teeth. Just over half (53%) of U.S. children age 8-11 had well-aligned incisors, while the rest of the children (47%) had varying degrees of misalignment ranging from 2-15 mm of crowding. As age increased, the percentage of adolescents and adults with well-aligned incisors decreased to 42% for ages 12-17 and 37% for ages 18-50. Posterior crossbite is a deviation from normal occlusion in the transverse plane. The percentage of posterior crossbite is about nine percent at all age groups. Other deviations from normal are present in 59% of the population, with most of the malocclusion being mild. Overjet is defined as the horizontal overlap of the incisors in the antero-posterior plane. About 40% of the population has a normal overjet (0-3 mm), while approximately 40% has an overjet that is slightly increased (3-4 mm). The remaining population either has a negative overjet or a large overjet that is usually accompanied by a Class II malocclusion. Overbite is the vertical overlap of the incisors and open bite is the lack of overlap of these same teeth. Zero to two mm of overlap is considered normal for overbite. Nearly 48% of the population has normal overbite, with 3% having some form of open bite where the anterior teeth do not vertically overlap. Although these are estimated national percentages, there is a wide range of variation in the malocclusions present in the United States (6, 15).

Etiology of Malocclusions:

Reasons of malocclusion occurring can be because of difference in upper and lower jaw or difference in jaw and teeth size. This kind of problems leads to irregular teeth or jaw anomalies like over bite, under bite or cross bite (31). Children anomalies like cleft lip and palate, long time use of milk bottle, finger or papilla sucking can lead to damage to teeth from and order some people has mixed teeth. Some other has less or
more teeth and the others teeth has abnormal shape all of these can lead to different kinds of teeth malocclusion (32, 33).

Many causes of malocclusions have been identified. Some of these include disturbances in embryologic development, skeletal growth disturbances, muscle dysfunction, acromegaly, disturbances in dental development, genetic influences, environmental influences, changes in the soft tissue equilibrium, early loss of primary teeth, masticatory function, digit or pacifier sucking, tongue habits, and soft diets (6, 34).

The exploration of the etiology of all types of malocclusion is beyond the scope of this project. However, the etiology of significant crowding will be explored. Although the prevalence of malocclusions has been widely reported, less has been reported concerning the factors associated with malocclusions. While many malocclusions are believed to be associated with genetic or inherited factors, there also are indications for environmental considerations. Some environmental factors that have been associated with malocclusions include diet, mastication forces, extraoral habits, nonnutritive sucking, habitual mouth breathing, and early loss of primary teeth (16, 35).

Genetic considerations in orthodontics, and dentistry in general, are becoming more widely investigated. However, little is known about the specific genetic factors from parents and offspring that may cause an increase in malocclusion prevalence. Some have speculated and studied the similarities and differences between jaw size, tooth size and total arch size among father, mother and child. Others researchers have postulated that the increased malocclusion from westernization comes from increased mixing of genetic information as different populations interact. As different groups of people intermix, the expression of different dental, orofacial and skeletal features can create imbalances in the maxillofacial complex leading to dental and skeletal malocclusions (36).
Environmental factors have been explored sporadically throughout the previous century. Non-nutritive sucking is perhaps the most widely accepted factor associated with anterior open bite and decreased maxillary arch width. Another contributing factor to the narrowing of the maxillary arch is mouth breathing. The extra inward stress on the maxillo-mandibular complex placed by the cheek, buccinators and orbicularis oris during mouth breathing has been associated with narrow maxillary arch. Human development of the jaws occurs early in life. Inter-canine width is established by the eruption of the primary canines around age 2. This dimension is stable through the eruption of the permanent canines and decreases slightly after eruption of these teeth (37, 38).

Genetic factors play a role in determining inter-canine width as do environmental ones, which includes the diet. It is unclear, however, the contribution and relationship these factors have on crowding and malocclusion. It is generally accepted that the prevalence of malocclusion has increased in modern times. The reasons for this are unclear, but a prominent theory holds that changes in diet may explain some of the increased prevalence of malocclusion. The remainder of this review of literature will focus on studies that have investigated the relationship between diet and malocclusion (39, 40).

**Types of jaw anomalies**

Teeth anomaly is one of the main reasons of patients referral for orthodontic treatment and can cause inability to observe health, gum diseases and ruin of their beauty (14). So by on time recognition of space shortage or jaw problems and as a result doing prevention cure specially, one can prevent from severe anomalies in future (41).

Surveying the situation of children and adolescent’s teeth and putting them in four groups of natural occlusion, anomalies class I, II and III are important. Based on surveys in America, maximum people who has natural occlusion in 30% and class I
anomalies is more common than other anomalies that are about 50 _ 55%. The least common is for anomalies class III (14). Based on EL-Mangoury report, the highest outbreak of class II is in while people of northern Europe. But class III anomalies in East people have the highest outbreak (25). In a study that had been done by Danaie and Asadi and surveyed about teeth anomalies in Shiraz, it was known that about 30% of them have natural occlusion, 47% has class I malocclusion, 14/7% has class II malocclusion and 2/1% has class III malocclusion (24).

**Types of teeth occlusion:**

Proposal of malocclusion classification from Angel in year 1890 was the first important step in orthodontic evolution. This classification in addition to define normal occlusion of natural teeth simply, also defines all kinds of malocclusion and their subgroups too. Angel classification system is based on permanent first molar mesiodistal and maxilla first molar tooth is a key in Angel classification. Angel classification after more than a century is still the most used method of classification system of malocclusions (42, 43) for the first time types of teeth malocclusion classified based on relative position of maxilla molar tooth. For a complete obstruction is jaw, maxilla molar tooth cusps should be on mandibular fissure. Other tooth should be in a row line. Each change and deviation considered as malocclusion that classified in three categories (44).

**Class I Malocclusion:**

This anomaly is the most common type of malocclusion that maxilla tooth has overlap with lower molar fissure. By the way, sick person may has distance between tooth, tooth crowding, growth of teeth under another and much growth of crown in comparison with other tooth (43).
**Class II Malocclusion:**

This kind of malocclusion recognized as over bite. Tooth and maxilla has a strong overlap with jaw and lower tooth and maxilla tooth is strongly a head of mandibular tooth. In this class of malocclusion, front tooth are going out or posterior tooth has overlap with central tooth (42).

**Class III Malocclusion:**

This class of malocclusion named under bite (prognathism), happens when mandibular incisors are in front of maxilla incisors and patient has big mandibular or small maxilla. This anomaly leads to irregular tooth and mandibular incisors context with maxilla tooth gum tissue (32, 43).

**Other kinds of tooth malocclusion**

Although those upper classes are the main kind of malocclusions, there are other anomalies that people may have them. People with long face or people who sucking a finger or thrust tongue suffered this bite, but people who has short face or inadequate growth of molar tooth a fouls deep bite (32). Orthodontic treatment can cure all kinds of malocclusions.

**Class III anomalies (17):**

Outbreak of class III anomalies is different between multiple races and populations. Class III malocclusion with retrognathic maxillary describe with hopsburg jaw, because this kind of anomalies is very high in Royal family (45). In this situation, upper and lower jaw is disharmonic, it means that maxilla is behind or mandibular is front or a mix of these two types existed. Face shape or profile of these people is in
concave way. In these people for over jet compensation, mandibular tooth are bowed to back that this tendency leads to mandibular tooth or crowding (46).

If class III anomalies was because of maxillary deficiency and patient was before age of puberty, one can use instrument of out of mouth orthodontic or even using little instrument inside mouth with new technique of Bone Anchorage that guided maxillary to front (47, 48).

Main instruments of out of mouth that can cure this kind of anomalies are: face mask, Reverse chin cup.

If class III anomalies were because of mandibular prognathism with family history, usually it can’t be cure with orthodontic only and it also needs jaw surgery (49). Malocclusion class III can be caused by defect in anterior posterior of maxilla. If maxilla is small or be in posterior part, its effect on creation of class III is direct and if its vertical growth has been disturbed, indirectly leads to rotate forward and upper of mandibular and creates mandibular prognathism appearance. Different index like index of orthodontic treatment need (IOTN) for classification of malocclusion deviation from normal state is designed (50). For orthodontic anomalies registration using these indexes that can be measured and quantizing less, may lead to a contradiction in results. An alternative method of using index is registration of occlusion characteristic that can be measured like over bite (51).

**Body Mass Index**

For evaluation of obesity and overweight, we use body mass index. Body mass index (BMI) computed by division of weight(Kg) on height squared(m$^2$) and by using BMI percentiles for age and sex that was set by control and prevention from illnesses of America (CDC), classified (52). This index is an instrument for showing weight situation in people and it is a criterion that can be used for obesity and overweight. BMI as a nutrition health indexes is the best index for determining person health and for this reason has a near relation with death from illnesses such as diabetes, digestive
diseases, vascular lung and gallbladder. In people who have BMI less than 20 and more than 30 Kg/m², mount of death is increasing (53, 54).

Different spectrum of BMI increases danger of some disease in a way that overweight and obesity are with increase of illness like cardiovascular, increased blood pressure, Diabetes kind II, stroke, gallbladder illness. Osteoarthritis, stop breathing when you sleep and breath problems and some cancers (breast, endometrium, prostate, colon). Signs of many of these illnesses are not obvious in youth so most young people who have not signs continue their life methods which are not suitable for food or long health. Obesity is not as the result of eating too much food or getting energy more than physiologic need of body but this factor is a general reason of obesity. Usually more than one or a collection of reasons causes obesity like genetic, environment, nervous and hormonal; body activity decrease, economical, culture or psychological factors can be from effective agents that causes obesity (53).

It seems that obesity plays role in periodontal illnesses that this process happened from effect of metabolic and safety parameters (55). Obesity is with pro inflammatory and anti-inflammatory grid change and its effects on monocyte genes and macrophage (56). Obesity also decreases safety reaction to protugalial gingivitis and by disorder this bacteria clearance, causes tissue destruction and bone loss (57).

**BMI and Malocclusions:**

Tooth evolution and their completeness are under the effect of different factors. One of these factors that have a wide effect on tooth and skeleton evolution in people is child BMI. Results of different studies show that weight increase and obesity in people leads to much growth of dental skeletons in comparison with who has normal BMI (9, 58) International reports points about bites force and BMI and obesity and they show that bite force is effective on total body muscular power that these are caused by the endocrine body reaction and they release Adipokine and inflammatory markers. At last they create high level of free fatty acid as a reflection of skeletal
muscles and they lead to decrease of muscular function in obesity person in comparison with normal people (59, 60).
Literature review:

In a study by Duygu Koç et al in 2011, they evaluated effect of gender, facial dimensions, body mass index and type of functional occlusion on bite force. So, 34 individuals aged 19-20 years-old were selected for this study. Maximum bite force was measured with strain-gauge transducers at first molar region. Facial dimensions were defined by standardized frontal photographs as follows: anterior total facial height (ATFH), bizygomatic facial width (BFW) and intergonial width (IGW). BMI was calculated using the equation weight/height. The type of functional occlusion and the balancing side interferences of the subjects were identified by clinical examination. They concluded that bite force was proved to be significantly higher in men than women (p<0.05). While there was a negative correlation between the bite force and ATFH/BFW, ATFH/IGW ratios in men (p<0.05), women did not show any statistically significant correlation (p>0.05). Also, BMI and bite force correlation was not statistically significant (p>0.05). The average bite force did not differ in subjects with canine guidance or group function occlusion and in the presence of balancing side interferences (p>0.05). this results suggest that bite force is affected by gender. However, BMI, type of functional occlusion and the presence of balancing side interferences did not exert a meaningful influence on bite force. In addition, transverse facial dimensions showed correlation with bite force in only men (61).

In the other study by Ahlberg Jari.P et al in 2003, they examined the association between maximal bite force (MBF) and Occlusion, and Body Mass Index. MBF in the molar and incisal regions was measured using a calibrated method in 384 (196 males, 188 females) and 357 (181 males, 176 females) individuals, respectively. Two attempts in each region (right molar, left molar, and incisal) were made in random order. The subjects completed a multiple-choice questionnaire including subjective symptoms of TMD and were subsequently clinically examined. Helkimo's clinical
dysfunction index and BMI were calculated. The mean MBF value in the molar region was significantly higher in males (878 N, SD 194) than in females (690 N, SD 175) (p<0.001). The incisal forces were 283 N (SD 95) and 226 N (SD 86) (p<0.001), respectively. According to multiple linear regression, TMJ discomfort was significantly negatively associated with MBF in the molar region (p<0.05) and overjet was significantly negatively associated with maximal incisal bite force (p<0.05). No significant associations between MBFs and body mass were found. The results demonstrate that in a population-based cohort of young adults signs, and symptoms of TMD and studied occlusal factors, unlike body mass, associate independently with MBF.

In the other study by Sheller B et al in 2009, they described the BMI of children with severe early childhood caries (S-ECC) receiving dental rehabilitation under general anesthesia. Demographics, BMI percentile, decayed, missing, or filled teeth (dmft), and the number of pulp-involved teeth were analyzed for 293 healthy 2- to 5-year-olds (mean=47.2 months). Weight groups were assigned using current Centers for Disease Control (CDC) BMI-for-age and gender definitions. Descriptive statistics were calculated and multivariate analysis used to evaluate BMI's association with oral health measures. BMI distribution of the subjects was compared graphically and with the use of confidence intervals to a reference population with similar demographics. The results showed that the distribution of subjects' BMI percentiles was: underweight=11%; normal weight=67%; at risk for overweight=9%; and overweight=11%. The mean dmft was 11.8; BMI percentile did not correlate with dmft or the number of pulp-involved teeth. Significantly, more children in the sample were underweight than in the reference population (11% vs 5%). In this sample of S-ECC children, the BMI percentile was not correlated with dmft or the number of pulp-involved teeth, even after adjusting for confounding factors.

In the other research by Mack K.B et al in 2013 Which examined the relationship between body mass index percentile and skeletal maturation and dental development
in orthodontic patients. In this study, orthodontic patients between 8 and 17 years of age were measured with a retrospective chart review. Skeletal maturation was evaluated by using the cervical vertebral method, dental age with the Demirjian valuation method, and weight status with the BMI percentile. Finally, linear regression and logistic regression models were used to assess the effect of the BMI percentile on dental age and cervical vertebral stage, respectively. For this research, 540 subjects met the inclusion criteria; 27% of the boys and 32% of the girls were either overweight or obese. Cervical vertebral stage and dental age were more advanced in subjects with increased BMI percentiles. For dental age, the coefficient for the BMI percentile was 0.005 year per 1 unit of increase (P <0.001), and the odds ratio for the effect of the BMI percentile on the cervical vertebral method was 1.02 (P <0.001). According to the results of this study, orthodontists should consider weight status when evaluating growing children and adolescents because it can affect skeletal and dental (8).

In the study by DuPlessis E.A et al in 2016 which evaluated the relationship body mass and dental and skeletal development in children and adolescents. For this purpose, the sample of 197 orthodontic patients (82 boys, 115 girls) was selected. Ethnicity was recorded, and body mass index (BMI) was measured according to the standard equation from the Centers for Disease Control and Prevention, and then a BMI percentile according to sex and age was obtained. And The panoramic radiographs were used to calculate the dental ages with an index. The chronologic ages were subtracted from the calculated dental ages to determine a “dental age difference” for each subject. The lateral cephalogram radiographs were analyzed for skeletal development using the cervical vertebral maturation stage method. The results showed that the white population (60%) had an average BMI percentile of 53.6 and was statistically different from the Hispanic/black population (40%), which had an average percentile of 64.3. There were no significant differences for boys and girls for the BMI percentile and dental age difference, or for the BMI percentile and
cervical vertebral stages. Also, the multiple regression model showed that BMI percentile and ethnicity were statistically significant explanatory variables for the dental age difference. The study results showed that a relationship exists between body mass and dental and skeletal development. BMI percentile, dental age difference, and cervical vertebral stage are weakly correlated. No significant differences existed between boys and girls in any variables. BMI percentile and ethnicity are weak predictors of the discrepancy between dental age and chronologic age (5).
Chapter 3:
Methods & materials
The study population:

The present study is a retrospective type of study which conducted on a group of 154 adolescents of 10-18 years old age from both sexes who had attended the Department of Orthodontics at Tabriz University of Medical Sciences with good general health and no systemic disease or hospitalization.

Sample size:

To determine the sample size using the absolute results of study on: Body fat mass assessed by body mass index (BMI) in patients with skeletal class III malocclusion (7). considering the percent of obese people in class III malocclusion 0.038 and in control group members 0.19 and also considering $\alpha=0.05$ and 80% power, 154 samples selected.

Method:

Patient records reviewed in reverse chronologic order starting from December 2016, by using the following criteria. The inclusion criteria are (1) pretreatment panoramic and lateral cephalometric radiographs of adequate diagnostic quality taken within 1 month of each other; (2) height and weight recorded within 1 month of the panoramic and lateral cephalometric radiographs; (3) age greater than or equal to 10 years but less than 18 years at the time of pretreatment records; and (4) a full complement of mandibular permanent teeth excluding the third molars.

The exclusion criteria are (1) any congenital tooth anomalies; and (2) any significant medical history that would affect physical development and growth (3). No history of previous orthodontic treatment (4). Age less than 10 years and greater than 18 years
at the time of pretreatment records (5). In case of any unerupted or missing mandibular permanent teeth excluding the third molar.

At the initial records appointment, height and weight assessed after removing any over garments by using a wall-mounted stadiometer and a standard mechanical scale and recorded in the subject’s treatment record by the treating resident. Digital panoramic, cephalometric radiographs and dental casts were also obtained at the initial records appointment.

Raw BMI scores calculated by using height and weight data. The raw BMI score, age, and sex used to obtain the BMI percentile value for each subject with age- and sex-specific growth charts from the Centers for Disease Control. By using established conventions, BMI percentile categories designated as follows for descriptive purposes: less than the fifth BMI percentile, underweight; fifth to 85th percentile, normal weight; 85th to 95th percentile, overweight; and greater than the 95th percentile, obese.

The lateral cephalogram analysis and panoramic radiographs used to evaluate the malocclusion. Dental crowding defined according to the World Health Organization (WHO) ‘as a misalignment in the teeth position (in millimeters)’. The arch considered as crowded when there was a shortage of 2mm or more of space preventing the correct alignment of all teeth.

The evaluation of obese and non-obese subgroups conducted using BMI percentile above 85% for overweight and obese cases and 5%< BMI <85% for non-obese cases and the results compared between these groups.

BMI scores calculated by using height and weight data. The raw BMI score, age, and sex used to obtain the BMI percentile value for each subject with age- and sex-specific growth charts from the Centers for Disease Control. BMI score more than 85% considered as obese. The lateral cephalogram analysis, panoramic radiographs and dental casts used to evaluate the malocclusion. Dental crowding defined
according to the World Health Organization (WHO) 'as a misalignment in the teeth position (in millimeters)'. The arch considered as crowded when there was a shortage of 2mm or more of space preventing the correct alignment of all teeth

**Variables table:**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Scale type</th>
<th>Variable type</th>
<th>Control / evaluation method</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>Quantitative/interval</td>
<td>Independent</td>
<td>measurement of height and weight</td>
</tr>
<tr>
<td>dental occlusion</td>
<td>Qualitative</td>
<td>Dependent</td>
<td>Assessment on lateral cephalogram</td>
</tr>
<tr>
<td>Dental crowding</td>
<td>Quantitative</td>
<td>Dependent</td>
<td>Assessment on dental casts</td>
</tr>
<tr>
<td>Class I occlusion</td>
<td>Qualitative</td>
<td>Dependent</td>
<td>Assessment on lateral cephalogram</td>
</tr>
<tr>
<td>Class II occlusion</td>
<td>Qualitative</td>
<td>Dependent</td>
<td>Assessment on lateral cephalogram</td>
</tr>
<tr>
<td>Class III occlusion</td>
<td>Qualitative</td>
<td>Dependent</td>
<td>Assessment on lateral cephalogram</td>
</tr>
<tr>
<td>Dental crowding</td>
<td>Quantitative</td>
<td>Dependent</td>
<td>Assessment on dental casts</td>
</tr>
</tbody>
</table>
statistical analysis:

The results of the study reported using descriptive statistical methods (frequencies, mean ± standard deviation). The data analyzed using chi-square, independent t, ANOVA or nonparametric equivalents. Statistical analysis done using the SPSS17 software and p-value p<0.05 considered.

The prevalence of different malocclusions in BMI categories compared using chi square test. Dental crowding compared among BMI categories using ANOVA or equivalent nonparametric test.

Ethical considerations:

The patients/the parents of the participants signed individual informed consent forms containing information about the aim of the study and the study procedures In addition to the consent of the child, the consent of the parents also taken. At first, complete explanation of research and the cause of the research, methods and patient’s duties explained to the patients so that they can decide consciously to take part in the study and if they participate in this study, an informed Consent obtained for the patients who cannot read and write, complete explanation of the study process done verbally and in simple expression and after obtaining their verbal consent, written consent obtained from their parents or legal guardians. Furthermore all the human subjects rights mentioned in this study. After obtaining the code of ethics from Tabriz university of medical science of ethics committee, we start our study. No additional costs asked from patients for this study. All of the patient’s information confidential. When submitting the research results, all the material and moral rights are guaranteed. Any damage caused by participation in this research compensate according to approved laws.
Chapter 4:

Result
This is a cross-sectional analytical study and 154 patients who were attending orthodontic treatment were included in the study. Of these, 44 (34.4%) were male and 84 (65.6%) were female, with an average age of 12.6 ± 1.5 years, with a minimum age of 9 years old and a maximum age of 17 years. Of these, 36 (28.1%) were slender, 72 (56.3%) had a normal weight and 20 (15.6%) were overweight. The average BMI was generally 18.32 ± 3.71 with the lowest of 13.17 and the highest of 29.40. The average of BMI percent was 45.78 ± 34.31. dental OCC was reported in 44 (34.4%) patients Class I, 60 (46.9%) were Class II and 24 (18.8%) were classified as Class III. skeletal OCC was reported in 40 (31.3%) patients Class I, 56 (43.8%) were Class II, and 32 (25%) were classified as Class III. The descriptive statistics of the indicators are presented in Table 1.4.
### Table 1.4 Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>Mean(SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>18.32(3.71)</td>
</tr>
<tr>
<td>BMI Percent</td>
<td>45.78(34.31)</td>
</tr>
<tr>
<td>Age</td>
<td>12.6(1.5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Frequency(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>44(34.4)</td>
</tr>
<tr>
<td>Female</td>
<td>84(65.6)</td>
</tr>
</tbody>
</table>

| BMI (categorical)      |            |
| Slender                | 36(28.1)    |
| Normal                 | 72(56.3)    |
| Obese                  | 20(15.6)    |

| OCC dental             |            |
| Class I                | 44(34.4)    |
| Class II               | 60(46.9)    |
| Class III              | 24(18.8)    |

| OCC skeletal           |            |
| Class I                | 40(31.3)    |
| Class II               | 56(43.8)    |
| Class III              | 32(25)      |
Normality of the data was analyzed using Kolmogorov-smirnov test and the results showed that both BMI and BMI percent have an abnormal distribution (P < 0.05). So to compare these indicators in different categories skeletal OCC and dental OCC, nonparametric test of Kruskal-Wallis was used. The results of this comparison are presented in Table 2.4. The highest mean BMI was reported in class III with an average of 19.04 ± 3.61 and the lowest in class II with an average of 18.04 ± 3.36. The highest mean BMI percent was in Class III with an average of 37.68 ± 50.66 and the lowest in Class I with an average of 34.19 ± 44.13. The mean difference in BMI (P = 0.582) and BMI percent (P = 0.691) between the different classes of dental OCC was not statistically significant. Also, the highest BMI of skeletal OCC was in Class III with an average of 18.94 ± 3.5 and the lowest in Class I with an average of 17.27 ± 3.64. The highest and lowest mean BMI percent was reported in the same way with averages of 53.81 ± 37.27 and 33.4 ± 30.49, respectively. The mean difference in BMI (P = 0.181) and BMI percent (P = 0.185) between skeletal OCC classes was not statistically significant.
Table 2.4 Comparison of BMI in OCC dental and OCC skeletal

| Class | OCC dental | | OCC skeletal | |
|-------|------------|------------------|------------------|
|       | BMI | BMI Percent | BMI | BMI Percent |
| Class I | 18.31(4.29) | 44.13(34.19) | 17.27(3.64) | 33.4(30.49) |
| Class II | 18.04(3.36) | 45.03(34.14) | 18.71(3.84) | 50.03(33.92) |
| Class III | 19.04(3.61) | 50.66(37.48) | 18.94(3.5) | 53.81(37.27) |
| P-value | 0.582 | 0.691 | 0.181 | 0.185 |

BMI were classified according to the three categories: Slender, Normal, and Obese, and its relationship with dental OCC and skeletal OCC was evaluated by Chi-square test. The results are presented in Table 3.4 and show that the highest frequency in dental OCC is for Class II patients with BMI Normal 34 (26.6%). The lowest frequency was also reported for Class III with BMI Slender 4 (3.1%). No statistically significant correlation was found between BMI categorical and dental OCC (P = 0.4). Also, the highest prevalence in skeletal OCC, similar to dental OCC, is for Class II patients with BMI Normal 34 (26.6%). The lowest frequency was also reported for
Class I with BMI Obese 4 (3.1%). There was no statistically significant correlation between BMI categorical and dental OCC (P = 0.356).

Table 3.4 Comparison of Categorical BMI in OCC dental and OCC skeletal

<table>
<thead>
<tr>
<th></th>
<th>Slender</th>
<th>Normal</th>
<th>Obese</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OCC dental</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class I</td>
<td>12(9.4)</td>
<td>20(15.6)</td>
<td>4(3.1)</td>
</tr>
<tr>
<td>Class II</td>
<td>26(20.3)</td>
<td>34(26.6)</td>
<td>12(9.4)</td>
</tr>
<tr>
<td>Class III</td>
<td>6(4.7)</td>
<td>6(4.7)</td>
<td>8(6.3)</td>
</tr>
<tr>
<td><strong>P-value</strong></td>
<td>0.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OCC skeletal</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class I</td>
<td>14(10.9)</td>
<td>16(12.5)</td>
<td>6(4.7)</td>
</tr>
<tr>
<td>Class II</td>
<td>22(17.2)</td>
<td>34(26.6)</td>
<td>16(12.5)</td>
</tr>
<tr>
<td>Class III</td>
<td>4(3.1)</td>
<td>6(4.7)</td>
<td>10(7.8)</td>
</tr>
<tr>
<td><strong>P-value</strong></td>
<td>0.356</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Graph 1.4 to 4.4 shows a comparison of the mean BMI and BMI percent in the three class of OCC dental and OCC skeletal.

Graph 1.4 Comparison of BMI between 3 Class of OCC dental
Graph 2.4 Comparison of BMI percent between 3 Class of OCC dental

Graph 3.4 Comparison of BMI between 3 Class of OCC skeletal
Graph 3.4 Comparison of BMI percent between 3 Class of OCC skeletal
Chapter 5:
Discussion and Conclusion
Discussion

Determining the epidemiologic parameters of any disease is one of the fundamental factors in the treatment and prevention of any disease (1). Knowledge about the distribution of different types of malocclusions will contribute to better understand the problems of people in given geographic region which would be a valuable tool create a systematic and organized treatment planning. Epidemiologic studies majorly use the classification of parasites to identify orthodontic abnormalities and problems (2).

The growth of the bone structure accelerates during childhood and adolescence, reaches the peak of its growth rate, and then comes up with considerable individual changes at the onset, duration, and growth rate. Several mechanisms are involved in regulating the growth of the craniofacial complex, including hormonal and genetic mechanisms as well as epigenetic factors. Therefore, changes in these factors may result in changes in skeletal development of the people (3, 4), from which body weight and BMI can ultimately affect the bone skeleton of individuals (5). Obesity and BMI also appear to play a role in the incidence of periodontal and skeletal dental diseases, and this process is more likely to happen through affecting metabolic and immune parameters (6). Obesity is associated with altered pre-inflammatory and anti-inflammatory pathways while affecting the gene expression status of monocytes and macrophages (7).

In the same line, interestingly, the results of our study revealed that considering both dental and skeletal malocclusions, class II malocclusions were significantly prevalent than other malocclusion. In contrast to our results, study of Sobouti et al. who investigated the prevalence of dental malocclusion showed that the highest frequency was related to class I malocclusion and the lowest was for class III (8). In addition, the results of Azarbayejani et al. and Ramezanzadeh et al. indicated that the highest prevalence of malocclusion was related to class I and the lowest one was for class III
(9, 10). Moreover, the results of most previous studies, including Lew et al, Isirkwe (11), Saleh (12), Decosta et al, (13), Gubris et al. (14), Guichard et al. (14) and Willems et al. (15) showed that the maximum frequency is related to class I malocclusion, and the lowest frequency is related to class II. These results were in contrast with our study in terms of the frequency of maximum malocclusion.

Furthermore, our results suggested that the highest rate of BMI average in both dental and skeletal malocclusions related to the class III, and the lowest rate was seen in class II. While concerning the BMI percentage, the highest level was for class III (like dental malocclusion) and the lowest level was related to the class I. The study by Khan S.H. et al. in 2014 found that a significant relationship between nutritional status and malnutrition in patients with dental malocclusion (16). Malnutrition is a multifaceted disease that can begin in early childhood or during childhood, or during the lifetime of a person due to inappropriate nutrition or repetition of infectious diseases. In addition, evidence suggests that protein-energy malnutrition is associated with reduced bone growth and development. Although researchers have reported dental tissue differences as etiologic factors for malocclusion, based on the above studies, malnutrition and BMI cannot be ruled out, too (16, 17).

Furthermore, our results showed no significant difference between the types of malocclusions in terms of BMI classification, however, the most frequency was related to class II with normal BMI, and the least stood for class I with obese BMI. The results of logistic regression analysis in the study by Kataoka K .et al. revealed that malocclusion might have a significant relationship with weight gain and BMI in obese subjects (18).

Given the results of this research and other studies, it can be concluded that the different prevalence of malocclusion in different societies could be attributed to the different ethnic and racial differences as well as differences in diet types. Differences in BMI attributed to various diet types and habits different societies (19).
Conclusion:

The results of our study revealed that class II malocclusion was the most prevalent concern between studied subjects. The lowest pattern belonged to class III. Moreover, our study showed that the highest amount of the BMI mean in both dental and skeletal malocclusions associated with class III patients. Meanwhile the lowest rate of malocclusion was related to the class II patients. While concerning the BMI percentage, the highest percent related to class III (like dental malocclusion) and the lowest was for class I.
**Recommendations:**

1. Investigation of different types of malocclusion in different populations in terms of race and determining its relationship with diet type, BMI, sex and age of individuals

2. Investigation of different types of malocclusion in different populations in terms of race and determining its relationship with different genetic factors (determination of gene expression and serum level of involved factors)

3. Determining and comparing the frequency of different types of malocclusions with the demographic and clinical characteristics of individuals
References

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53. Mortazavi Z, Shahrakipour M. Body mass index in Zahedan University of Medical sciences students. 2002.


راهنمای تهیه فرم رضایت آگاهانه در طرح های تحقیقاتی
برگ نخست

حواری اطلاعات برای مشارکت کننده

تاريخ:
عنوان/موضوع تحقیق: بررسی ارتباط بین شاخص توده بدنی با مال اکلوزن در توجهان

نوع تحقیق

آقای / خانم محترم

[بخش اطفال یا نمایندگی روزنامه‌ای‌های شما دعوت می‌شود در یک مطالعه تحقیقاتی که توسط
نحوه آزمودن یا مطالعه انجام گرفته‌ای در مورد جود و توانایی دانشکده تامین مالی
می‌شود شرکت کنید. بخش‌های آن‌که تصمیم به شرکت با عدم شرکت بنمایید، من تحقیق را بطور خلاصه
برای شما توضیح می‌دهم: چرا این تحقیق صورت می‌گیرد و این تحقیق مستلزم چه چیزی است.
لطفاً در خواهان اطلاعات زیر در مورد تحقیق عجله نکنید و آنها را بخوانید. هر چگونه نیاز به
توضیح داشتید سوال‌های خودتان را بپرسید. این تحقیق در مورد شرکت با عدم شرکت خودتان عجله نکنید.

[حداکثر 120 کلمه (هدف این مطالعه (تحقیق) چیست و چگونه انجام خواهد شد؟ (هدف و روش)
نوع مال اکلوژن مبایدل به زبان BMI هدف از انجام این مطالعه بررسی وجود ارتباط بین ساده تر میکوهای بررسی کنیم آیا ارتباطی بین وزن افراد با نوع قرارگیری دندان‌ها نسبت به فکین و وجود دارد و این رابطه چگونه است. در این مورد اطلاعاتی به دست آوریم.

روش مطالعه به این شکل است که قد و وزن فرزند شما را اندازه‌گیری و عکس‌های رادیوگرافی و قلب های دندانی که برای تشخیص ارتودنسی تهیه شده این داده بررسی قرار می‌دهیم.

[حداکثر 70 کلمه] چرا از انتخاب شده‌ام؟

برای اینکه فردی را برای این مطالعه انتخاب کنیم باید فرد در بازه سنی 16 تا 18 سال باشد و تحت درمان پزشکی با مبنا به بیماری سیستمیک نباشد و برای انجام درمان ارتودنسی به دانشکده دندانپزشکی تبریز مراجعه کرده و قبلاً تحت درمان قرار نگرفته باشد که شما دارای این شرایط می‌باشید.

[حداکثر 70 کلمه] مفاهیم این تحقیق چیست؟

اخيرا شاهد افزایش وزن و چاقی در نوجوانان هستیم که به علت عامل بیماری از بیماری‌های سیستمیک و ناهنجاری‌ها از جمله مشکلات تکامل دندانی و اسکلتی و نقص کارکرد عضلاتی است که با این مطالعه می‌توان این ارتباط را بررسی کرده و به دنبال راهکار‌های بی‌پای حلال این مسئله بود که در نتیجه باعث افزایش آگاهی و شاهد بهبود وضعیت دندانی و اسکلتی در این افراد شویم.
حداکثر [آیا خطر وی عوارض احتمالی نیز در کار خواهد بود؟ (اگر بله چه تضعیفی داده می‌شود؟)]

۷۰ کلمه

هیچ نوع خطر با عوارض در این تحقیق موجه فرزند شما نیستند. از یک هیچ کار تهاجمی انجام نمی‌گیرد و اطلاعات مورد نیاز از طریق اندوزه‌گیری قد و وزن و از طریق وادی‌پردازی ها و مدارکی که قبل برای بخش ارتصادی تهیه کرد، اثبات می‌شود.

خطر و عوارض احتمالی مطابق درمان های محصول شما خواهد بود و ارتباطی به مطالعه ما ندارد.

آیا شرکت من در این مطالعه محترمانه خواهد ماند؟

شرکت شما در این مطالعه و اطلاعات/ داده های که شما در اختیار من می‌گذارید، کاملاً محترمانه باقی خواهد ماند. یک شماره و یا کد شناسایی در طول مطالعه برای هر یک از شرکت کنندگان اختصاص پایه و تمام داده‌ها ناشناخته باقی خواهد ماند. در مورد داده‌ها مطابق با قوانین مراقبت از داده‌ها در ایران که محترمانه بودن آنها را تضمین می‌کند عمل خواهد شد.

اگر باهم شرکت کم که کاری باشد انجام دهیم؟

اگر شما برای شرکت در این مطالعه موافقت کنید، لازم است فرم رضایت آگاهانه را تکمیل نموده و به محقق برگردانید. لطفاً این برگ حاوی اطلاعات را برای خود نگه گذارد. اگر تصمیم به شرکت در این تحقیق گرفتید، هر زمانی شما مجاز هستید از این تحقیق کناره گیری کنید بدون اینکه دلیل برای ما اطلاع نمایید.

در این پنجم به طور خلاصه، توضیح در مورد نحوه مشارکت و نشان مشارکت کننده در تحقیق داده شود:

: [نام و نام خانوادگی محقق [اگر شما سوالی دارید و یا اینکه مایل به اطلاعات بیشتری هستید، لطفاً با
: شماره تلفن: E-mail:]

با تشکر از وقت شما برای قبول زحمت خواندن این بروز حاوی اطلاعات.
برگ دوم
رضایت آگاهانه

کد / شماره مطالعاتی:

عنوان تحقیق: بررسی ارتباط بین شاخص نوده بدنی با مال اکل hộiوز در نوجوانان

لطفاً علامت گذاری کنید:

1- من تائید می کنم که برگ اطلاعات مشارکت کننده به تاریخ خوانده و فهمیده ام و این فرصت برای من داده شده که سوالات مورد نظرم را پرسنم.

2- من میدانم که شرکت من در این تحقیق داوطلبانه است. من همچنین می دانم که من هر زمانی که بخواهم می توانم از تحقیق کنار بکشم بدون اینکه ملزم به ارائه دلیل باشم.

3- من موافقت می کنم که در مطالعه/تحقیق فوق شرکت نمایم.
نام مشارك كند:

تاريخ:

امضاء

نام محقق:

تاريخ:

امضاء

رونوشت:

- مشارك كند:
- محقق:
خلاصه فارسی

هدف: هدف از این مطالعه، ارزیابی ارتباط شاخص توده بدنه (BMI) با مال اکلوژن در نوجوانان مراجعه کننده به بخش دندانپزشکی دانشگاه علوم پزشکی می باشد.

روش کار: مطالعه حاضر نوعی مطالعه گذشته نگر است که بر روی ۱۵۴ نوجوان ۱۰ تا ۱۸ ساله از هر دو جنس که به بخش ارتودنسی دانشگاه علوم پزشکی تبريز مراجعه کرده اند و دارای سلامت عمومی خوب و بدون سابقه بیماری سیستمیک یا بستری شدن در بیمارستان می باشند، تجزیه و تحلیل آماری با استفاده از نرم افزار SPSS17 و مقدار p-value p<0.05

بررسی قرار گرفت.

یافته ها: میانگین BMI به طور کلی ۱۸/۳۲±۳/۷۱ بود که پایین ترین میزان آن ۱۲/۱۷ و پیشرین مقدار BMI متوسط ۲۹/۴۰ بود. میانگین نمره BMI به ترتیب ۵۱/۱۴/۵۷۸±۴/۳۱ بود. اکلوژن دندانی در ۴۴ بیمار (۴/۳۴٪) از نوع کلاس I، ۶۰ (۶/۴۷٪) کلاس II و ۲۴ بیمار (۱۸/۸٪) به عنوان کلاس III طبقه بندی شدند. اکلوژن اسکلتی در ۴۰ بیمار (۳/۱۸٪) بیمار در کلاس I، ۶۹ (۵/۳۶٪) بیماران کلاس II و ۳۲ بیمار (۲۵٪) در کلاس III طبقه بندی شدند. برای مقایسه این شاخص ها در گروه های مختلف اکلوژن اسکلتی و اکلوژن دندانی آزمون غیر پارامتری Kruskal-Wallis مورد استفاده قرار گرفت. بالاترین میانگین BMI در کلاس III به ترتیب با میانگین BMI در کلاس III سطح کلاس II با میانگین ۱۸/۶۷±۳/۷۶ و ۱۸/۰۱±۳/۷۶/۱۰۸ گزارش شد. پیشرین میانگین درصد III کلاس BMI با میانگین BMI در کلاس III
نتیجه گیری: نتایج مطالعه نشان داد که بالین اکلوژن کلاس II بیشترین نگرانی را در بین افراد مورد مطالعه دارد. باید برای این مطالعه ما نشان داد که میانگین BMI در هر دو گروه بالین و بیمار مربوط به کلاس دوم بود. در حالی که در مورد BMI درصد، میانگین بیماری بالین مربوط به کلاس III (میانگین بالین) و بالین ترین درجه برای کلاس اول بود.

واژه های کلیدی: شاخص توپه بالین (BMI)
دانشگاه علوم پزشکی تبریز

دانشکده دندانپزشکی
پایان نامه:

جهت دریافت درجه ی دکترای عمومی دندانپزشکی

موضوع:

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