# How Do The Diet, Oral Hygiene Habits And Body Mass Index Affect Tooth Caries In The Students Of The Faculty Of Dentistry?

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**ABSTRACT**

The purpose of this study is to examine the effects of oral hygiene and dietary habits on body mass index (BMI) and decayed, missing and filled teeth (DMFT) index of dentistry faculty students.

A total of 166 students studying at Van Yuzuncu Yil University Faculty of Dentistry were included in the study. Participants were asked to complete a questionnaire containing 16 questions related to diet and oral hygiene habits. The number of teeth in the mouth and DMFT indexes were recorded according to WHO criteria. During the general health examination, the length and weight of the participants were measured and recorded. Body mass index (BMI) was calculated as kilograms per meter squared.

Calculated BMI of the male and the female participants was found as 23.23 and 21.48 respectively. Statistically, no significant relationship was found between the diet and oral hygiene habits in the survey and BMI and DMFT($p > 0.05$). When ZINB regression results were examined, it was observed that there is a significant difference statistically between the classes in terms of DMFT ($p < 0.0001$), however there is no difference in terms of BMI and gender ($p > 0.05$).

Considering the future roles of the students in the faculty of dentistry, it is very important to find out their information level about both oral hygiene habits and diet habits and if necessary to plan future trainings about this and aim to increase the information levels.

**Key Words:** BMI, DMFT, diet habits

## Introduction

Dental caries are accepted as a disease related to diet and food consumption is necessary for the process of caries to begin (1). The studies conducted about caries and diet habits mostly focus on the amount of sugar consumption, threshold value for the formation of caries and the effects of the sugary products consumed and today researches agree that sugar is the most important dietetic factor for caries (2-4). On the other hand, the studies of the nutritionists which emphasize that diet habits should not be ignored have led to new questions about caries (5, 6). According to these results, not only sugar or carbohydrate consumption but diet habits such as skipping meals and vegetarian diet directly affect obesity and body mass index (BMI) (7). Examining the effects of body mass index and diet habits on dental caries in line with this information is a significant point in terms of defining the risk factors for caries.

The biggest responsibility in raising awareness of the society and the individual belongs to the dentists. Thus, the dentists should not only diagnose the current caries but also modify the diets of their patients or refer their patients to a dietician (8). However, the study conducted on 3000 members of the American Dental Association by Curran and et.al revealed that dentists do not have sufficient knowledge about this. According to these findings, only 4.8% of the participants referred the obese patients they treated to a nutritionist; but 82% of the participants opened up to diet modification and dietician consultation if the relationship between obesity, diet habits and oral diseases is clearly explained (9).

Considering the effects of the activations to be done about the diets of the patients on oral health, to increase the knowledge and the abilities of them regarding how to train the students at the faculty of dentistry who will be future service providers about dental care is undeniably important. The key question

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is how to train the students in the best way possible about diet, nutrition and oral health. In this context, integration of the materials about nutrition and diet into basic and clinical science classes about these and determination of the awareness levels of the current students and their state of oral hygiene is a controversial subject (10-12).

Decayed, missing or filled tooth (DMFT) is a well-accepted indicator in assessing the caries experience and oral care (13, 14). The aim of this study is to examine the relationship between the students of Van Yuzuncu Yil University Faculty of Dentistry and diet and oral care habits.

## Materıal and Method

**Population of the Study:** Totally 250 students studying at Van Yuzuncu Yil University Faculty of Dentistry were informed about our study on February, 2018. Oral examinations of 216 volunteers among the students were made and they were asked to answer the surveys defined below. Among the volunteers, 34 participants under 18 and 16 people who did not answer all of the questions were excluded from the study. As a result, data obtained from 166 students (93 males, 73 females) between 18-24 years old were analyzed. Ethics committee approval of the study was given by Van Yuzuncu Yil University Medical Faculty Non-Invasive Clinical Studies Ethical Committee. (No:007/ Date:31/01/2018). In addition, a written consent form was taken from each participant.

**Survey:** Surveys were filled in before general health examinations and health data records of the participants. First three multiple-choice questions in the survey were aimed at detecting the oral care habits of the individuals. In accordance with the answers given, participants' frequency of dentist visits, frequency of tooth brushing and frequency of use of paste containing fluorine were recorded (15). In order to determine diet habits considered to be effective, once again 6 multi-choice questions were asked: daily sugar consumption, daily meal number, fast food consumption frequency and habit of junk food consumption (16).

**Oral Examination:** Oral examinations of the participants were conducted by 2 dentists. The number of teeth in the mouth and DMFT indexes were recorded according to WHO criteria (17). The data were analyzed with non-parametric kappa test and interclass correlation. The kappa correlation coefficient calculated both for the reviewer and inter-reviewers is greater than 0.8.

**Assessment of BMI:** During the general health examination, length and weight of the participants were measured and recorded. BMI index was calculated as kilograms per meter squared (18). The participants whose BMI is 25 and above were accepted as overweight (16).

**Statistical Analysis:** For the statistical analysis, SAS version 9.4 programme (SAS Inst., Inc., Cary, NC, USA) was used. As DMFT variable indicates Poisson distribution, the relationships between this variety and classes, gender and BMI were examined with regression methods based on Poisson distribution. The compliance criteria for the selection of four different regression models applied to determine the most suitable model for the data are given in Table 1. The model with the smallest values in terms of compliance criteria is the model that best describes the data. ZINB model was seen to be the most suitable model in terms of compliance criteria. Also, it was seen that ZINB once again is the most suitable model in terms of overdispersion problem occurred frequently in the Poisson regression. For overdispersion, Pearson Chi-Square / df was the closest model to the value of 1 (one).

## Results

26 students from 1st grade, 45 from 2nd grade, 41 from 3rd grade, 25 students from 4th grade and 25 students from 5th grade participated in our study. 93 of the participants were males and 73 were females. Age average of the participants was found as 21.09. While the calculated BMI of the males was 23.23 the females' BMI was 21.48. A statistically significant difference was found between the distribution rates of the students into the class according to the chi-square test (p<0.05). The participant rate from the 2nd and 3rd grades was statistically higher (Table 2).

The results of ZINB model, which focuses on the effect of BMI, class and gender variables on DMFT variable are given in Table 3. The questions included in the study questionnaire were included in the four methods mentioned above, but the effect of no question was found as significant on DMFT. Therefore, questions of the questionnaire were not included in the model. In addition, as age variable shows an increase in parallel with the increase in the class category which means there is a high and significant correlation between them, was not included in the model. However, Spearman correlation between DMFT and age was found as low as 0.065 and statistically insignificant (p>0.05).

**Table 1.** Comparison of Model compliance criteria for DMFT variable

| Compliance criteria | Poisson | NB | ZIP | ZINB |
|---|---|---|---|---|
| Full Log Likelihood | -468.3470 | -422.0210 | -428.1520 | -413.5120 |
| AIC | 950.6948 | 860.0409 | 872.3036 | 857.0244 |
| AICC | 951.4036 | 860.9581 | 873.2208 | 860.2244 |
| BIC | 972.4787 | 884.9368 | 897.1995 | 903.7042 |
| Extreme Propagation Criteria | | | | |
| Pearson Chi-Square/df | 2.424 | 0.8682 | 1.5194 | 1.0645 |

There is no over-spread hypothesis for ZIBN is accepted *(p=0.2780)*

**Table 2.** Demographic data and distributions of participants

| | Gender | N | Mean | Std. Deviation | T test | p |
|---|---|---|---|---|---|---|
| Age | Male | 93 | 21.99 | 1.89 | 3.261 | 0.001 |
| | Female | 73 | 21.09 | 1.54 | | |
| | Total | 166 | 21.60 | 1.80 | | |
| BMI | Male | 93 | 23.23 | 3.03 | 3.877 | <0.001 |
| | Female | 73 | 21.48 | 2.69 | | |
| | Total | 166 | 22.46 | 3.01 | | |

When ZINB results were examined, it was observed that there is a statistically significant difference between classes in terms of DMFT (p<0.0001), but there was not a difference in terms of BMI and gender (p>0.05). The incident rate ratios (IIR) value given in Table 3 indicates the rate of how many times the other categories can occur according to the category determined by reference. When evaluated in this respect, it is interpreted as "The rate of incidence is 1.85 fold higher in the 3rd grade than 5th grade." As BMI and gender variables were not found as significant, their interpretation was not required.

DMFT values determined as a result of oral examination changes between 0 and 16. In 13.86% of the participants, DMFT value was determined as 5. The rate of those whose DMFT value is 12.05%. Based on the answers to the questions about the oral care habits of the questionnaire, it was determined that the primary reasons for applying to the dentist are urgent needs. While 45.18% of the responses focused on the option in line with the urgent needs, the least preferred option was in the form of routine examinations with 1 year or longer duration. Despite the lack of this information, 83.13% of the participants brush their teeth 2 times or more in a day. During this brushing procedure, 72.29% supports their daily routine with a paste containing fluorine.

The answers to the nutritional habits revealed that the participants defined themselves as a moderate sugar consumer and this rate was 53.01%. This response was followed by 22.89% saying in a small amount and 12.05% equal rate saying very little and very high. 74.7% of the participants had a daily meal number of 0-3 and 85.54% had a non-vegetarian diet. 71.08% often had the habit of skipping meals. More than half of the participants preferred fast food consumption every week, and a significant proportion (84.34%) of them consumed junk food between meals. The effects of all these dietary habits on BMI were evaluated by one-way analysis of variance (Table 4).

The effects of nutrition and oral care habits on DT (tooth caries), MT (missing tooth) and FT (filled tooth) indexes were examined by ZINB regression. In this respect, no significant regression relationship was found between the questions in the questionnaire and DT, MT and FT variables (p> 0.05) (Table 5).

## Discussion

In our study, how diet and oral care habits of dentistry faculty students affects oral health parameters such as tooth caries etc. were examined. Because it is very important to know the self-awareness and status of future dentists who are tasked with informing and motivating people to provide adequate oral hygiene (19). However, there are a limited number of studies that have identified dentistry students as a sample group and reveal their level of awareness (20, 21).

**Table 3.** ZINB regression results of BMI, Class and Gender variables on DMFT

| Variable | Level | Parameter Estimation | Standard Error | 95% Confidence Limits | | p value | IRR | 95% Confidence Limits | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Max | | | Min | Max |
| BMI | | -0.0159 | 0.018 | -0.0512 | 0.0193 | 0.3758 | 0.98 | 0.95 | 1.02 |
| Grade | 1 | 0.0647 | 0.2079 | -0.3427 | 0.4722 | | 1.07 | 0.71 | 1.60 |
| | 2 | 0.3812 | 0.1772 | 0.034 | 0.7285 | | 1.46 | 1.03 | 2.07 |
| | 3 | 0.6167 | 0.1755 | 0.2728 | 0.9606 | 0.0009 | 1.85 | 1.31 | 2.61 |
| | 4 | 0.5899 | 0.1879 | 0.2216 | 0.9583 | | 1.80 | 1.25 | 2.61 |
| | 5 | 0 | 0 | 0 | 0 | | 1.00 | 1.00 | 1.00 |
| Gender | Male | -0.1084 | 0.1063 | -0.3167 | 0.0999 | 0.3103 | 0.90 | 0.73 | 1.11 |
| | Female | 0 | 0 | 0 | 0 | | 1.00 | 1.00 | 1.00 |

IRR: incident rate ratios

**Table 4.** One-way analysis of variance for BMI on the number of daily meals, type of diet, meal skipping habits, frequency of fast food meals and habit of consuming snacks between meals

| | | | | 95% CI for Mean | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Number of Daily meals | N | Mean | Std. Deviation | Lower Bound | Upper Bound | Min. | Max. | F* | p value |
| 0-3 | 124 | 22.48 | 2.99 | 21.95 | 23.01 | 16.61 | 31.77 | | |
| 4-5 | 37 | 22.34 | 3.20 | 21.27 | 23.41 | 16.14 | 31.64 | 0.115 | 0.892 |
| 6-7 | 5 | 23.01 | 2.48 | 19.94 | 26.09 | 19.22 | 26.17 | | |
| Total | 166 | 22.46 | 3.01 | 22.00 | 22.92 | 16.14 | 31.77 | | |
| | | | | 95% CI for Mean | | | | | |
| Type of diet | N | Mean | Std. Deviation | Lower Bound | Upper Bound | Min. | Max. | t | p value |
| Nonvegetarian | 142 | 22.28 | 2.98 | 21.78 | 22.77 | 16.14 | 31.77 | -1.971 | 0.0504 |
| Vegetarian | 24 | 23.57 | 3.04 | 22.29 | 24.86 | 19.15 | 30.69 | | |
| Total | 166 | 22.46 | 3.01 | 22.00 | 22.92 | 16.14 | 31.77 | | |
| | | | | 95% CI for Mean | | | | | |
| | N | Mean | Std. Deviation | Lower Bound | Upper Bound | Min. | Max. | t | p value |
| I skip the meals | 118 | 22.41 | 3.01 | 21.86 | 22.95 | 16.14 | 31.77 | -0.379 | 0.705 |
| I do not skip the meals | 48 | 22.60 | 3.06 | 21.72 | 23.49 | 16.90 | 31.64 | | |
| Total | 166 | 22.46 | 3.01 | 22.00 | 22.92 | 16.14 | 31.77 | | |
| | | | | 95% CI for Mean | | | | | |
| Frequency of fast foods | N | Mean | Std. Deviation | Lower Bound | Upper Bound | Min. | Max. | F | p value |
| Every week | 89 | 22.47 | 3.17 | 21.80 | 23.14 | 16.14 | 31.64 | | |
| One in a month | 29 | 22.19 | 2.62 | 21.19 | 23.19 | 16.96 | 28.36 | 0.178 | 0.837 |
| Rarely | 48 | 22.61 | 2.98 | 21.75 | 23.48 | 16.90 | 31.77 | | |
| Total | 166 | 22.46 | 3.01 | 22.00 | 22.92 | 16.14 | 31.77 | | |
| | | | | 95% CI for Mean | | | | | |
| | N | Mean | Std. Deviation | Lower Bound | Upper Bound | Min. | Max. | t | p value |
| I consume junk food between meals | 140 | 22.51 | 3.03 | 22.01 | 23.02 | 16.14 | 31.77 | 0.502 | 0.616 |
| I do not consume junk food between meals | 26 | 22.19 | 2.95 | 21.00 | 23.38 | 17.40 | 29.98 | | |
| Total | 166 | 22.46 | 3.01 | 22.00 | 22.92 | 16.14 | 31.77 | | |

**Table 5.** Results of ZINB regression between survey questions with DT, MT and FT

| | | DT | | MT | | FT | |
|---|---|---|---|---|---|---|---|
| Question | Df | Chi-Square | p value | Chi-Square | p value | Chi-Square | p value |
| Frequency of referral to dentist | 2 | 0.88 | 0.6433 | 0.56 | 0.7552 | 3.08 | 0.2148 |
| Brushing frequency | 1 | 3.01 | 0.0829 | 0.00 | 0.9837 | 0.00 | 0.9606 |
| Frequency of toothpaste use with fluoride | 2 | 0.07 | 0.9644 | 2.60 | 0.2724 | 3.67 | 0.1593 |
| Daily sugar consumption | 3 | 1.99 | 0.5736 | 7.59 | 0.0554 | 2.39 | 0.4961 |
| Number of Daily meals | 2 | 0.55 | 0.7577 | - | - | 1.38 | 0.5024 |
| Diet type | 1 | 0.00 | 0.9851 | 1.14 | 0.2865 | 1.18 | 0.2775 |
| Skipping meal habit | 1 | 0.05 | 0.8256 | 0.39 | 0.5302 | 3.37 | 0.0664 |
| Fast food consumption frequency | 2 | 0.01 | 0.9958 | 0.70 | 0.7034 | 2.35 | 0.3087 |
| Junk food consumption habits between meals | 1 | 0.79 | 0.3731 | 0.72 | 0.3962 | 0.05 | 0.8237 |

One of the main elements examined in our study was how oral care habits affected oral health status. In this respect, variables such as the frequency of going to the dentist, the frequency of tooth brushing and the use of toothpaste with fluorine were investigated. Dentists around the world often advise their patients to brush twice a day with a toothpaste containing fluorine at the appropriate concentration. However, in the case of an evidence-based review, the effects of tooth brushing on caries are unclear (22). Addy stated that the tooth brushing frequency has no additional benefit in preventing caries, except for the release of fluorine ions from toothpaste (23). Many studies have found an association between cumulative tooth decay levels and reported tooth brushing frequency, but there is only one published experimental study evaluating the effect of tooth brushing on tooth decay, and the results of the study are quite striking in that there is a strong inverse correlation (24). However, in a Cochrane review, it is stated that brushing performed twice a day increases the effectiveness of fluorinated toothpastes and reduces tooth decay (25). In our study findings, no statistical relationship was detected between tooth brushing frequency and DMFT, DT, MT and FT indexes (p>0,05). This may be due to the fact that 83.13%

of our study population is comprised of individuals who currently have 2 or more teeth brushing frequency per day. In addition, the fact that the participants prefer to go to the dentist in emergencies often leads to inability to follow the carious development stages; this may have made it difficult to determine the relationship between the frequency of tooth brushing and oral health indices. The effects of fluoride on the control of dental caries is very clear and systematic reviews reveal that the incidence of permanent tooth decay is reduced by approximately 24-29% due to the use of fluorine-containing toothpastes at a standard rate (1000-1500 ppm) (25, 26). In our study results, it is noteworthy that 72.29% of our participants preferred a toothpaste with fluorine in their daily routine and only 6.63% of them tried to avoid using fluoride paste. And no statistical relationship between paste preferences and DMFT, DT, MT and FT indexes were determined (p>0,05). This may be due to the lack of a uniform distribution of the toothpaste preferences of the participants.

In our study, the dietary habits, daily consumption of sugar, consumption of non-vegetarian and non-vegetarian diets, meals, snacking between meals and the frequency of fast food were studied. However, none of these variables showed a

significant difference on caries formation. In most of the studies on the relationship between nutrition and tooth decay, the first focus was sugar consumption (2, 27). In the systematic review of 5990 studies on this subject, it was revealed that the only effective factor on decay formation is not the daily intake of sugar (2). Therefore, in our study, it was decided that the only diet habit to be searched should not be daily sugar consumption and the other factors considered to be effective were subjected to an evaluation as well. In our findings, there was no statistically significant relationship between daily sugar consumption and DMFT index (p> 0.05). However, this may be related to the fact that only 12.05% of participants have a limited daily sugar consumption. Researchers who argue that there may be a relationship between BMI and DMFT have built their hypotheses on the fact that dietary habits are a common factor that can affect both BMI and DMFT (16,18). A group of researchers based on this idea examined the number of main meals, having snacks and the effects of beverage and junk food consumption on caries formation in children. It was reported that the risk of caries increased in children as a result of increasing the number of snacks and increasing the number of daily meals in the study results. However, they stated that the consumption of sugar and the consumption of junk food is not a caries risk factor in children who have fiber food intake (28). In our study, it was determined that the number of meals per day, the habit of skipping meals did not affect DMFT and BMI. This difference may be due to the fact that our focus population is not the children but the students of the faculty of dentistry. However, in our findings, we found that the consumption of junk food was not a factor affecting DMI with BMI. As a result of the study, the researchers commented that the consumption of fibrous food eliminates the negative effects of the consumption of junk food. In our study, the effects of fibrous food consumption were not examined. In patients with a vegetarian diet type, DT, the decayed tooth index was lower, but this difference was not statistically significant (p> 0.05). However, it is a known fact that green vegetables in vegetarian diets have cariostatic activity (29). In a caries incidence study conducted on students in India, it was found that the children with low incidence of caries often had a vegetarian diet type (30). In another study in which 15 individuals with a vegetarian diet type were examined and the oral effects of the diet type were investigated, it was found that they exhibited a lower DMFT, DT than the control group (31).

This difference in our study results may be due to the fact that individuals with a vegetarian diet type are only 24 people and they represent a less ratio than non-vegetarian individuals. The focus of research is on the fact that fast food consumption may affect dental caries by increasing BMI not directly but indirectly (32). For this reason, we have not found any article investigating the relationship between tooth decay and fast food consumption. From this point of view, in a study conducted in the Jazan region of Saudi Arabia, the frequency of fast food consumption and the increase in the frequency of the consumption of junk food were commented as a strong factor in the increase of BMI. However, they found that these factors, which are strong factors for BMI, only affect DMFT in children who have tooth decay and who do not have the possibility of treatment, and that there is no statistical factor in children who can receive treatment and who are currently at low DMFT. In our study findings, there was no statistical correlation between the frequency of fast food consumption and DMFT. This situation can be related to the high level of knowledge and the high possibility of receiving treatment for the students of the faculty of dentistry.

A meta-analysis conducted in Turkey revealed that while the rate of obese individual followed up was 1% in 1990, this rate increased to 26.3% in 2015 (33). In this case, it may not be a wrong prediction to say that the oral health of obese individuals might be affected depending on their diet habits as well. From this point of view, we have examined the correlation between dietary habits, oral health habits and DMFT and BMI among the dentists who are expected to have a high level of knowledge about oral health and who will be entrusted with oral health of patients. Based on the results of this study, we found that oral health and diet habits did not have statistically significant effects on BMI and DMFT. However, it should be kept in mind that the oral health and dietary habits examined in our study constituted the limitation of our study and that the study population was limited to only the students of the faculty of dentistry. For this reason, our recommendation to future researchers is to examine the effects of different oral and dietary habits agreed with nutrition specialists and dentists.

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