

# Fixed Orthodontic Treatment and Nutrition

## Sabit Ortodontik Tedavi ve Beslenme

### ABSTRACT

The aim of this study is to investigate the effect of nutrition on the health of periodontal tissues in patients under going orthodontic treatment. A prospective single-center study was conducted in 118 adults, aged between 13-19 years, living in Isparta, Turkey. Participants who had been treated with fixed orthodontic treatment for six months were included. Demographic features of the patients were recorded with a questionnaire. All the nutrients were asked via a 52-item Food Frequency Questionnaire (FFQ). Bleeding Index (BI), Orthodontic Plaque Index (OPI), Community Periodontal Index of Treatment Needs (CPITN) were measured for the evaluation of periodontal status. The independent sample T test was used to determine whether there were any differences between the two independent groups and  $p < 0.05$  was considered significant in all values. In terms of the frequency of food consumption, it was seen that there was a statistically significant difference between semi-fat/non-fat milk, probiotic, cereal, cola drinks and potatoes according to BI and OPI likewise freshly squeezed juice drinks according to CPITN. These study results emphasize the need to develop programs to improve the dietary habits and periodontal status of adolescents, particularly before long orthodontic treatments. Multidisciplinary approach giving importance to healthy nutrition applications will be useful for the success of the orthodontic treatment.

**Key words:** food consumption frequency, nutrition, periodontal status, fixed orthodontic treatment

### ÖZET

Bu çalışmanın amacı ortodontik tedavi gören hastalarda beslenmenin periodontal dokuların sağlığı üzerindeki etkisini araştırmaktır. Çalışma Isparta'da yaşayan 13-19 yaşları arasındaki 118 yetişkinde prospektif tek merkezli bir çalışma olarak yapıldı. Katılımcılar altı aydır sabit ortodontik tedavi ile tedavi edilen hastalardı. Hastaların demografik özellikleri anket ile kaydedildi. Tüm besinler 52 maddelik bir Besin Tüketim Sıklığı (FFQ) ile sorgulandı. Periodontal durumun değerlendirilmesi Kanama İndeksi (BI), Ortodontik Plak İndeksi (OPI), Topluluk Periodontal Tedavi İhtiyaç İndeksi (CPITN) ile ölçüldü. İki bağımsız grup arasında fark olup olmadığını belirlemek için bağımsız örnek T testi kullanıldı ve tüm değerlerde  $p < 0.05$  anlamlı kabul edildi. Besin tüketimin sıklığı açısından, BI ve OPI'ye göre yarım yağlı/yağsız süt, probiyotik, tahıl, kolalı içecekler ve patatesler arasında aynı şekilde CPITN'e göre taze sıkılmış meyve suyu içeceklerinde istatistiksel olarak anlamlı bir fark olduğu görülmüştür. Bu çalışma sonuçları, özellikle uzun ortodontik tedavilerden önce, ergenlerin beslenme alışkanlıklarını ve peridontal durumunu iyileştirmek için program geliştirme ihtiyacını vurgulamaktadır. Sağlıklı beslenme uygulamalarına önem veren multidisipliner yaklaşım, ortodontik tedavinin başarısı için faydalı olacaktır.

**Anahtar Kelimeler:** besin tüketim sıklığı, beslenme, periodontal durum, sabit ortodontik tedavi

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 Geliş tarihi / Received: 02.07.2020  
Kabul tarihi / Accepted: 14.08.2020  
DOI:

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## INTRODUCTION

Today, individuals apply to dentists to gain functional and aesthetic satisfaction as well as complaints of dental caries or gum disease. The popularity of orthodontic science has increased with the increase in the level of education and the importance given to health.<sup>1</sup>

Most orthodontic treatments are done during adolescence and treatment can produce physical, physiological and psychological stresses. During this period, the need for additional nutrients in adolescents increases due to growth, activities and stresses. Therefore, a nutritional history should be considered in the course of orthodontic treatment during adolescence. The diets of the patients should be adjusted to include all the necessary elements, taking into account the patients' habits, comfort, likes and dislikes. There is a two-way relationship between nutrition and orthodontic treatment, where nutritional quality affects the speed of orthodontic treatment and orthodontic treatment affects food intake. A well-balanced diet provides all the elements necessary to facilitate orthodontic treatment by helping bone reshape, keeping the tissues in the mouth healthy. On the other hand, orthodontic treatment minimally affects the patient's diet and therefore nutrition but this depends on person.<sup>1,2,3</sup> Periodontal diseases are affected not only by malnutrition, but also by other factors such as oral hygiene, tobacco use and genetics.<sup>4</sup> Periodontal diseases range from gingivitis to tooth loss. Dietary factors affect the inflammatory process and play an important role in periodontal diseases.<sup>5</sup>

It is known that orthodontic treatment and diet have a strong effect on each other.<sup>6</sup> Considering the effects of food on periodontal status and the effects of orthodontic treatment on nutrition, follow-up of patients' nutritional order becomes important during treatment. However, there are not many studies in the literature evaluating the effects of nutrients taken during orthodontic treatment on the status of periodontal tissues. In addition, patient-centered diet recommendations are insufficient according to age and device type. Some recommendations are provided to minimize the damage to teeth and orthodontic devices only. Evaluating the effects of nutrients taken during orthodontic treatment and developing dietary recommendations based on the findings obtained may be beneficial for protecting patients' oral health.<sup>7,8,9,10</sup>

In the light of this information, the purpose of our study

is to evaluate the effect of nutrients taken during fixed orthodontic treatment on periodontal tissues. Therefore, the present study aims to contribute to the literature by filling this gap.

## METHODS

### Study population:

This prospective single-center study was conducted in adults aged 13-19 years between August 2017 and July 2018. The research was carried out with patients who had fixed orthodontic treatment with metal bracket system in Suleyman Demirel University Faculty of Dentistry Orthodontics Department in Isparta, Turkey. Detailed information about the study was given to the patients in adolescence and their parents included in the study and after completing the informed volunteer consent form, the study started. Study data was generated via a questionnaire, using face to face interviews. In total, 118 adults filled out the questionnaire. Criteria for not being included in the study are having a systemic disorder, being an untreated caries tooth in the mouth, using any medication that will affect periodontal tissues, using any mouthwash regularly, having mental and behavioral disorders, standard brushing habit 2-3 times a day, not having cooperation to follow the instructions given. Ethical approval (reference number 72867572.050.01-98229) was obtained from the Suleyman Demirel University Faculty of Medicine Clinical Research Ethics Committee.

### Evaluation of Periodontal Health:

To evaluate the periodontal condition, patients were examined by the physician using mirror, sond and WHO periodontal end, and BI, OPI and CPITN data were recorded on the examination form.

#### Bleeding Index (BI):

It is an index that gives an idea about the patient's plaque control. It is evaluated whether there is bleeding on all four teeth 15 seconds after probing the gingiva. Thus, the presence of gingival bleeding is determined as %. This is Bleeding Index Formula "BI=(Number of Bleeding Regions/Number of Regions Reviewed)×100".<sup>11,12</sup> In the study, after measuring periodontal pocket depths, the bleeding index was performed by evaluating positively (+) locations of bleeding within 10-15 seconds following sonding performed in the mesiobuccal, midbuccal and dystobuccal and midlingual/midpalatal gingival sections of all teeth. Mesial, distal buccal and lingual

areas of the gingival groove; in case of bleeding (+); if there was no bleeding, it was evaluated as (-); the presence of bleeding gums in each area was detected.

The bleeding index value of patients was expressed in % by dividing the number of regions with bleeding by the total number of regions examined. Patients with  $\leq 20\%$  bleeding with probing were classified as healthy and those with bleeding  $> 20\%$  were considered to have gingivitis. The bleeding index for each period was calculated using the "Bleeding Index Formula" method.

Orthodontic Plaque Index (OPI):

It is an index developed specifically for patients who receive fixed orthodontic treatment. The status is shown with a score between "0-4". Score assesses plaque and gingival inflammation detected on each face of the bracket base of a tooth (mesial, distal, occlusal/incisal and cervical). "0" means no plaque, "1-3" indicates plaque buildup around the base of the bracket, and "4" indicates gingival inflammation in addition to plaque build-up.<sup>13</sup> In the study, OPI was used to evaluate the plaque index. All teeth were isolated with cotton pads and dried for 20 seconds with air spray. The presence of plaque on the face of the vestibule was detected by carefully circulating the end of normal dentistry in each tooth in the marginal region. Plaque scoring was determined between "0-4" for each tooth.

Community Periodontal Index of Treatment Needs (CPITN):

The special sond named WHO end is used for pocket depth measurements in the CPITN system. 20-25 grams of force should be applied in the measurements. In this index, the upper and lower jaw are divided into three sexes. In each dental arch, 2 posterior and 1 anterior teeth are evaluated. Probing is performed on the selected index teeth of each sextant. Gravity indication should not be applied to these teeth for evaluation. For those under the age of nineteen, Teeth 16, 11, 26 and 46, 31, 36 are evaluated. It is "0=Healthy", "1=Probing bleeding", "2=Supra and/or subgingival gemstone, presence of flood restoration edges", "3=There is a shallow pocket between 3.5-5.5 mm", "4=There are deeper than 5.5 mm" in the form of index scoring.<sup>11,12,14</sup> In the study, a special ending named WHO ending was used for the measurements. In the measurements, 20-25 grams of forces were applied. The lower and upper jaws were divided into three sextats. Two posterior and one anterior teeth (teeth 16,11,26 and 46,31,6) were evaluated in each dental arch. The value of the tooth with the worst periodontal condition in a posterior sextant was recorded as the value of that

posterior sextant. Scoring was done according to the index.

### Evaluation of Nutritional Status:

Patients were asked to mark one of the options ("None", "every meal", "every day", "every other day", "2 times a week", "1 time per week", "1 time in 15 days", "1 time per month") to reflect their consumption status in the food consumption frequency survey.

### Statistical analyses:

The data were transferred to SPSS Statistics (SPSS, version 22, Armonk, New York, USA) and the analyses were completed. While evaluating the data, frequency distributions for categorical variables and descriptive statistics ( $\bar{x} \pm ss$ ) for numerical variables were given. The independent sample T test was used to determine whether there were any differences between the two independent groups.  $p < 0.05$  was considered significant in all values.

## RESULTS

While 79 (66.9%) of the patients participating in the study were female, 39 (33.1%) were male. The average age of the patients was 16.1, the average height was 165.6 cm, the average body weight was 55.9 kg, and the average body mass index was 20.3 kg/m<sup>2</sup>. Table shows the differences between BI, OPI and CPITN groups according to the average of food frequencies consumed. For BI; There was a statistically significant difference between the gum bleeding rate below 20% and those above 20% compared to the mean frequency of consumption of only semi-skimmed/skimmed milk, probiotics, breakfast cereals and cola drinks ( $p < 0.05$ ). According to this, the mean frequency of consumption of semi-skimmed/skim milk ( $\bar{x} = 3.0$ ) of patients with a gum bleeding rate below 20% was significantly lower than the average of patients with gum bleeding rate above 20% ( $\bar{x} = 4.2$ ). The probability of probiotic consumption frequency ( $\bar{x} = 2.5$ ) of patients with gingival bleeding rate below 20% was significantly higher than the average of patients with gingival bleeding rate above 20% ( $\bar{x} = 1.7$ ). The mean frequency of breakfast cereals consumption ( $\bar{x} = 4.7$ ) of patients with gum bleeding rate below 20% was significantly higher than the average of patients with gingival bleeding rate above 20% ( $\bar{x} = 3.6$ ). Patients with gingival bleeding rates below 20% had a significantly lower mean drink



frequency ( $\bar{x}=2.3$ ) than the average of patients with gingival bleeding rates above 20% ( $\bar{x}=3.3$ ). For OPI; There was a statistically significant difference between the groups according to the average consumption frequency of cola drink only ( $p < 0.05$ ). According to this; the mean frequency of cola beverage consumption of patients with score 2 ( $\bar{x}=2.0$ ) was significantly lower than the average of patients with score 3 ( $\bar{x}=3.2$ ). For CPITN; There was a statistically significant difference between only the potatoes and freshly squeezed fruit juice consumption averages ( $p < 0.05$ ). According to this; the mean frequency of potato consumption of patients with dental calculus ( $\bar{x}=5.0$ ) was significantly lower than the average of patients with bleeding ( $\bar{x}=6.1$ ). The mean frequency of freshly squeezed juice consumption of patients with dental calculus ( $\bar{x}=3.5$ ) was significantly lower than the average of patients with bleeding ( $\bar{x}=5.0$ )(Table 1).

## DISCUSSION

Orthodontic treatment contributes to improving the craniofacial, skeletal and dentoalveolar structures, oral functions and quality of life. It is known that eating habits may have negative or positive effects on oral health regardless of orthodontic treatment.<sup>15</sup> To date, limited studies have examined the relationship between fixed orthodontic treatments and diet. There are not many studies evaluating the effect of nutritional habits on periodontal status in patients under orthodontic treatment.<sup>7</sup> Due to the limited number, and conflicting results from previous studies, this is the study evaluating the effect of nutrition habits of patients under orthodontic treatment on the health of periodontal tissues.

In our study, according to the gingival bleeding rate, the mean frequency of consumption of semi-skimmed/skim milk was significantly lower than the average of patients with gum bleeding rate above 20%. There was a statistically significant difference between the population periodontal index groups according to the average of potato consumption frequency. According to this the average frequency of potato consumption in patients with dental calculus was significantly lower than the average of patients with bleeding. During orthodontic treatment, patients are advised to consume the recommended foods in the edible food consumption

model, such as milk, cheese, eggs, chips, fried potatoes, boiled vegetables.<sup>6</sup> Sugar-free milk and dairy products protect the enamel tissue against demineralization thanks to the substances such as calcium phosphate and casein.<sup>16</sup> In a study, it was reported that periodontal status is better in those who eat foods rich in protein.<sup>17</sup> Similarly, according to the results of the study in which Al-Zahrani<sup>18</sup> evaluated the data of the National Health and Nutritional Examination Survey (NHANES III), it was found that the consumption of milk and dairy products may be inversely related to the prevalence of periodontitis. However, these results are not similar to the findings we obtained in our study. It is thought that this result may have resulted from the fact that the patients did not give the necessary care and attention due to the large variety of milk and milk products in the frequency of consumption.

One of the most important points to be considered in the diet is not to use high sugar and acidic beverages called "soft drink".<sup>19</sup> From a dental point of view, water or unsweetened drinks are recommended first. Fruit juices and soft drinks usually contain fruit acids and sucrose, they should not be consumed as regular beverages due to acidic pH.<sup>20</sup> Especially drinks with sucrose content, citric acid and phosphoric acid such as cola are not recommended as they decrease the pH of the mouth.<sup>21</sup> According to the data in our study, the mean glaze consumption rate of patients with gum bleeding rate below 20% was significantly lower than the average of patients with gingival bleeding rate above 20%. There was a statistically significant difference between orthodontic plaque index groups according to the average consumption frequency of cola beverage. According to this, the mean frequency of cola beverage consumption of patients with a score of 2 (available oral hygiene) was significantly lower than the average of patients with a score of 3-4 (inadequate available oral hygiene). There was a statistically significant difference between the community periodontal index groups according to the mean of the frequency of freshly squeezed juice consumption. According to this, the mean frequency of freshly squeezed juice consumption of patients with dental calculus was significantly lower than the average of patients with bleeding.

When statistically analyzed, although there is no significant result in terms of coffee consumption frequency and bleeding, orthodontic plaque and community periodontal index, gingival bleeding rate is below 20%, average coffee consumption frequency ( $\bar{x}=5.0$ ), gingival bleeding rate 20% is higher than patients above ( $\bar{x}=4.0$ ). The caffeine contained in coffee

has a modulating effect on natural and acquired immune response.<sup>22</sup> Studies have shown that consuming coffee in adults has a protective effect against periodontal bone loss.<sup>23,24</sup> In another study<sup>25</sup>, it was reported that there was a negative relationship between the consumption of coffee ( $\geq 1$  cup/day) and severe periodontitis prevalence in patients in the maintenance phase of periodontal therapy. Han et al.<sup>26</sup> reported that coffee consumption was significantly higher in male patients with periodontitis, and that coffee consumption may be an independent risk factor for periodontal disease.

Factors that increase and decrease risk should be considered in the prevention and treatment of dental caries and major dietary factors associated with gum disease.<sup>8</sup> Grains of whole grain (whole-grain breakfast cereal, corn, wheat germ, bran, brown rice and bread) have protective properties and require excessive chewing during eating; this causes an increase in saliva secretion, which is beneficial for dental health.<sup>27</sup> Similarly, according to the data of our study, the average frequency of breakfast cereals consumption of healthy patients with gingival bleeding rate below 20% was significantly higher than the average of patients with gingival bleeding rate above 20%.

According to the findings we obtained in our study, the probiotic consumption frequency of patients with gingival bleeding rate below 20% was significantly higher than the average of patients with gingival bleeding rate above 20%. B.C. in 3000 years, it was reported that fermented milk products made from animal milk and fermented in goat skin were consumed in ancient Egypt.<sup>28</sup> It is seen that fermented foods with microorganisms have been used as therapeutic agents since classical Roman history.<sup>29</sup> Probiotics were scientifically first studied in the oral cavity in 1954.<sup>30</sup> There have been several laboratory, animal and human studies on this subject since the reporting of the beneficial effect of lactic acid bacteria on inflammatory infections in the oral mucosa from that year.<sup>29</sup> Many studies have supported that the consumption of probiotics containing *Streptococcus*, *Lactobacillus* or *Bifidobacterium* products is useful in preventing and treating oral infections, including dental caries <sup>31,32</sup>, halitosis <sup>33</sup>, and *Candida albicans* infections <sup>34</sup>. In recent years, especially the effects of probiotics on periodontal health have been investigated and it has been stated that with the use of probiotic microorganisms, clinical periodontal parameters improve <sup>35-41</sup>, periodontopathogenic microorganisms

are suppressed <sup>42-46</sup> and inflammatory cytokines that increase with inflammation decrease.<sup>40</sup> It has also been demonstrated in other studies that bleeding during the probiotic application in humans decreased plaque index and gingival index values.<sup>35-41</sup> In the study of Shimauchi et al. <sup>39</sup>, it was stated that it might be beneficial for patients with high risk of periodontal disease to consume probiotics for the development and maintenance of oral health. In the study conducted by Twetman et al. <sup>40</sup> on patients with moderate gingival inflammation, bleeding at the end of the *Lactobacillus reuteri* or placebo chewing gums 2 times a day for 10 minutes for 2 weeks, and proinflammatory cytokines level changes were examined. It was seen that bleeding level and DOS volume decreased in chewing period in all groups, but the decrease in only probiotic-using groups was statistically significant

## CONCLUSION

These study results emphasize the need to develop programs to improve the dietary habits and periodontal status of adolescents, particularly before long orthodontic treatments. Multidisciplinary approach giving importance to healthy nutrition applications and also periodontal health will be useful for the success of the orthodontic treatment.

### Disclosure statement:

No potential conflict of interest was reported by the authors.

**Table 1:** Examination of the difference between BI, OPI and CPITN groups according to the average of food frequencies consumed.

Foods	BI		t; p	OPI		t; p	CPITN		t; p
	<20% (n=25)	≥20% (n=93)		2 (n=15)	3 (n=103)		1 (n=111)	2 (n=7)	
	$\bar{x}\pm ss$	$\bar{x}\pm ss$		$\bar{x}\pm ss$	$\bar{x}\pm ss$		$\bar{x}\pm ss$	$\bar{x}\pm ss$	
Red meat	3.9±1.30	3.9±1.42	-0.005; 0.996	3.9±1.48	3.9±1.38	0.154; 0.878	3.9±1.38	3.1±1.46	1.455; 0.148
White meat	3.7±1.21	4.1±1.33	-1.410; 0.161	3.9±1.24	4.0±1.33	-0.445; 0.657	4.0±1.31	4.1±1.46	-0.277; 0.782
Fish	2.6±0.91	2.5±1.01	0.147; 0.883	2.5±0.99	2.5±0.99	-0.002; 0.998	2.5±0.95	3.1±1.46	-1.686; 0.094
Offal	1.9±1.20	1.6±1.024	1.205; 0.231	1.9±1.06	1.6±1.06	0.832; 0.407	1.6±1.00	1.9±1.86	-0.522; 0.602
Sausage-Salami etc.	4.1±1.57	4.1±1.68	-0.102; 0.919	4.3±1.71	4.1±1.64	0.558; 0.578	4.0±1.65	5.3±1.11	-1.964; 0.052
Egg	5.8±1.11	5.5±1.550	1.019; 0.311	5.7±1.63	5.5±1.45	0.373; 0.710	5.5±1.48	5.6±1.27	-0.069; 0.945
Dry Beans	4.6±1.22	4.3±1.614	0.977; 0.331	4.4±1.40	4.4±1.56	0.073; 0.942	4.4±1.55	4.1±1.34	0.406; 0.686
Soybean/Soybean Products	2.2±1.78	2.5±1.612	-0.598; 0.551	2.1±1.84	2.5±1.62	-0.709; 0.480	2.3±1.62	3.6±1.61	-1.940; 0.055
Oily Seeds	3.0±1.74	3.0±1.87	-0.200; 0.842	2.5±1.88	3.0±1.83	-0.996; 0.322	3.0±1.84	3.1±1.77	-0.249; 0.804
Whole Milk	4.2±2.12	3.9±2.28	0.564; 0.574	4.9±2.20	3.8±2.23	1.661; 0.099	3.9±2.24	4.9±2.26	-1.074; 0.285
Semi-Skimmed/Skimmed Milk	3.0±2.09	4.2±2.28	-2.215; <b>0.029*</b>	3.8±2.67	3.9±2.23	-0.224; 0.823	3.9±2.30	3.6±1.98	0.419; 0.676
Full Fat Yogurt	4.9±2.12	4.6±2.28	0.562; 0.575	4.7±2.35	4.7±2.24	-0.052; 0.959	4.6±2.25	5.6±2.14	-1.064; 0.289
Low-Fat/Fat-Free Yogurt	3.4±2.06	3.9±2.31	-0.845; 0.400	4.3±2.41	3.7±2.24	1.015; 0.312	3.8±2.28	3.3±1.89	0.594; 0.554
Prebiotic/Probiotic	2.5±2.02	1.7±1.49	2.024; <b>0.045*</b>	2.5±2.35	1.8±1.50	1.443; 0.152	1.9±1.67	1.4±0.78	0.780; 0.437
Full Fat White Cheese	5.7±1.93	5.0±2.44	1.266; 0.208	4.3±2.66	5.3±2.29	-1.451; 0.150	5.1±2.37	6.1±1.86	-1.150; 0.252
Low Fat White Cheese	3.2±2.51	4.0±2.41	-1.453; 0.149	3.2±2.62	3.9±2.42	-0.997; 0.321	3.8±2.45	3.9±2.54	-0.077; 0.939
Slide	3.0±1.76	2.9±2.01	0.285; 0.776	3.3±1.75	2.9±1.99	0.689; 0.492	2.9±1.99	3.3±1.38	-0.479; 0.633
Cheddar Cheese	4.2±1.65	4.3±1.98	-0.276; 0.783	3.7±1.83	4.3±1.91	-1.276; 0.204	4.2±1.93	4.4±1.71	-0.248; 0.805
Curd/Curd/Tulum Cheese	3.0±2.03	2.9±2.18	0.051; 0.960	2.9±2.06	2.9±2.16	-0.143; 0.887	2.9±2.10	4.1±2.47	-1.540; 0.126
Buttermilk	4.6±1.38	4.8±1.51	-0.712; 0.478	4.3±1.43	4.9±1.48	-1.464; 0.146	4.8±1.51	5.0±1.00	-0.388; 0.699
Ice cream	3.9±1.84	4.6±1.62	-1.696; 0.093	4.6±1.95	4.4±1.65	0.432; 0.667	4.4±1.71	4.4±1.27	-0.008; 0.994
Green Leafy Vegetables	4.7±1.72	4.9±1.63	-0.512; 0.610	4.4±2.26	4.9±1.54	-1.082; 0.281	4.8±1.67	5.4±0.97	-0.989; 0.325
Potato	5.20±1.22	5.1±1.30	0.430; 0.668	4.8±1.56	5.1±1.24	-0.974; 0.332	5.0±1.27	6.1±1.06	-2.251; <b>0.026*</b>
Other Vegetables	4.6±1.68	4.4±1.51	0.608; 0.544	4.0±2.00	4.5±1.47	-1.158; 0.249	4.4±1.54	5.4±1.27	-1.770; 0.079
Citrus	5.0±1.83	4.7±1.74	0.737; 0.462	4.9±1.87	4.7±1.75	0.480; 0.632	4.7±1.77	4.9±1.67	-0.198; 0.844
Other Fresh Fruits	5.6±1.44	5.6±1.51	0.089; 0.929	5.7±1.33	5.5±1.51	0.435; 0.665	5.6±1.49	5.9±1.57	-0.512; 0.610
Dried Fruits	3.5±1.87	3.3±1.85	0.402; 0.688	3.2±1.97	3.4±1.84	-0.329; 0.743	3.3±1.87	4.3±1.25	-1.388; 0.168
White Bread and Its Types	6.1±2.15	6.4±2.04	-0.728; 0.468	6.1±2.57	6.4±1.99	-0.562; 0.575	6.3±2.10	7.4±0.78	-1.435; 0.154
Whole Wheat Bread	2.8±2.24	2.8±2.21	0.067; 0.947	3.1±2.12	2.8±2.23	0.472; 0.638	2.8±2.21	2.7±2.36	0.122; 0.903
Bazlama/Yufka	4.0±1.78	3.5±1.81	1.162; 0.248	3.8±1.61	3.6±1.84	0.394; 0.694	3.6±1.80	4.0±2.00	-0.560; 0.576
Rice	4.6±1.00	4.6±1.31	-0.046; 0.964	4.1±0.91	4.7±1.27	-1.595; 0.113	4.6±1.24	4.9±1.34	-0.538; 0.591
Bulgur	4.1±1.35	4.6±1.23	-1.685; 0.095	4.3±1.44	4.5±1.25	-0.404; 0.687	4.4±1.26	5.0±1.29	-1.165; 0.246
Paste	4.3±0.94	4.4±1.27	-0.167; 0.868	4.1±0.83	4.4±1.25	-0.762; 0.448	4.3±1.20	4.7±1.25	-0.807; 0.421
Breakfast Cereals	4.7±2.30	3.6±2.29	2.083; <b>0.039*</b>	3.3±2.49	3.9±2.30	-0.884; 0.378	3.8±2.31	4.1±2.73	-0.364; 0.716
Cakes /Biscuits/Cakes	5.1±1.60	5.3±1.71	-0.551; 0.583	5.2±1.78	5.2±1.68	-0.112; 0.911	5.3±1.69	4.9±1.67	0.626; 0.533
Sugar	5.0±2.53	5.6±2.37	-1.129; 0.261	5.1±2.66	5.5±2.38	-0.599; 0.550	5.4±2.44	6.4±1.61	-1.069; 0.287
Honey	4.9±1.78	4.5±2.09	0.912; 0.364	5.5±1.68	4.4±2.05	1.889; 0.061	4.5±2.02	4.6±2.37	-0.028; 0.978
Jam	4.4±2.02	4.2±2.07	0.035; 0.726	5.0±2.10	4.2±2.03	1.476; 0.143	4.2±2.07	5.0±1.82	-0.966; 0.336
Molasses	3.4±2.28	2.8±1.97	1.228; 0.222	2.7±2.12	2.9±2.04	-0.367; 0.714	2.9±2.04	3.3±2.13	-0.493; 0.623
Dough Desserts	3.8±1.28	3.5±1.41	0.935; 0.352	3.8±1.37	3.6±1.39	0.567; 0.572	3.6±1.40	3.6±1.13	0.076; 0.940
Milky Desserts	3.8±1.53	3.6±1.35	0.433; 0.666	4.1±1.48	3.6±1.37	1.236; 0.219	3.7±1.40	3.0±1.00	1.282; 0.202
Sunflower Oil	5.5±2.20	5.5±2.14	-0.030; 0.976	5.8±2.14	5.4±2.15	0.594; 0.554	5.5±2.14	5.9±2.34	-0.463; 0.644
Olive Oil	5.3±2.18	5.6±1.79	-0.860; 0.392	5.6±2.38	5.56±1.81	0.071; 0.944	5.6±1.89	5.7±1.79	-0.211; 0.833
Butter	4.8±1.95	5.3±1.78	-1.246; 0.215	4.9±2.01	5.24±1.80	-0.611; 0.543	5.1±1.84	6.0±1.41	-1.191; 0.236
Tail Oil	1.4±0.86	1.4±1.02	-0.086; 0.931	1.5±1.06	1.41±0.98	0.214; 0.831	1.4±0.99	1.7±0.95	-0.823; 0.412
Ready Fruit Juice	4.0±2.09	4.3±1.89	-0.682; 0.497	3.8±2.11	4.25±1.91	-0.845; 0.400	4.1±1.91	5.3±2.05	-1.546; 0.125
Fresh Fruit Juice	3.2±1.40	3.7±1.98	-1.323; 0.188	3.7±1.87	3.59±1.89	0.142; 0.887	3.5±1.87	5.0±1.52	-2.050; <b>0.043*</b>
Cola Drinks	2.3±1.88	3.3±2.11	-2.037; <b>0.044*</b>	2.0±1.85	3.22±2.09	-2.145; <b>0.034*</b>	3.0±2.10	3.3±2.05	-0.283; 0.778
Mineral Water	3.1±2.06	2.9±2.03	0.384; 0.702	2.7±2.05	2.97±2.04	-0.421; 0.675	2.9±1.99	3.3±2.75	-0.461; 0.646
Coffee	5.0±1.85	4.5±2.04	1.110; 0.269	5.5±1.80	4.51±2.01	1.852; 0.067	4.7±2.00	4.0±2.16	0.873; 0.385
Black Tea	7.0±0.64	6.7±1.23	1.298; 0.197	7.3±0.45	6.66±1.19	1.943; 0.054	6.7±1.16	7.0±0.57	-0.625; 0.533
Herbal Teas	3.4±2.06	3.3±2.10	0.229; 0.820	3.0±2.03	3.41±2.09	-0.706; 0.782	3.4±2.11	3.0±1.63	0.464; 0.644

\* p<0.05

t= Independent Sample T Test

$\bar{x}$ =Average

p=Significance Level

ss=Standard Deviation

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