T.C

YEDITEPE UNIVERSITY

INSTITUTE OF HEALTH SCIENCES

DEPARTMENT OF NUTRITION AND DIETETICS

MEASUREMENT OF CONSUMPTION FREQUENCY OF FOOD CONTAINING MONOSODIUM GLUTAMAT OF STUDENTS STUDYING IN PREPERATORY CLASS AND THIRD GRADE IN NUTRITION AND DIETETICS IN YEDITEPE UNIVERSITY AND COMPARISION OF THEIR KNOWLEDGE LEVEL

MASTER THESIS

SÜMEYYE BULUT

İSTANBUL- 2019

T.C

YEDITEPE UNIVERSITY

INSTITUTE OF HEALTH SCIENCES

DEPARTMENT OF NUTRITION AND DIETETICS

MEASUREMENT OF CONSUMPTION FREQUENCY OF FOOD CONTAINING MONOSODIUM GLUTAMAT OF STUDENTS STUDYING IN PREPERATORY CLASS AND THIRD GRADE IN NUTRITION AND DIETETICS IN YEDITEPE UNIVERSITY AND COMPARISION OF THEIR KNOWLEDGE LEVEL

MASTER THESIS

SÜMEYYE BULUT

SUPERVISOR

Prof. Dr. Baki Serdar ÖZTEZCAN

İSTANBUL- 2019

TEZ ONAYI FORMU

Kurum : Yeditepe Üniversitesi Sağlık Bilimleri Enstitüsü

Program : Beslenme ve Diyetetik Bölümü

Tez Başlığı : Yeditepe Üniversitesi Beslenme ve Diyetetik Bölümü "Hazırlık ve 3.Sınıf"ta Okuyan Öğrencilerin, "Monosodyum Glutamat" İçeren Besinlerin Tüketim Sıklığının Ölçülmesi ve Bilgi Düzeylerinin Karşılaştırılması

Tez Sahibi : Sümeyye BULUT

Sınav Tarihi : 24.07.2019

Bu çalışma jurimiz tarafından kapsam ve kalite yönünden Yüksek Lisans Tezi olarak kabul edilmiştir.

	Unvanı, Adı-Soyadı (Kurumu)	İmza
Jüri Başkanı:	Dr. Öğr. Üyesi İrem KAYA CEBİOĞLU Yeditepe Üniversitesi	
Tez danışmanı:	Prof. Dr. Serdar ÖZTEZCAN Yeditepe Üniversitesi	
Üye:	Dr. Öğr. Üyesi. Jale ÇATAK İstanbul Sabahattin Zaim Üniversitesi	
Üye:		
Üye:		

ONAY

Bu tez Yeditepe Üniversitesi Lisansüstü Eğitim-Öğretim ve Sınav Yönetmeliğinin ilgili maddeleri uyarınca yukarıdaki jüri tarafından uygun görülmüş ve Enstitü Yönetim Kurulu'nun 31/07/2019 tarih ve 2019/13-08 sayılı kararı ile onaylanmıştır.

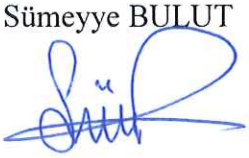
Prof. Dr. Bayram YILMAZ
Sağlık Bilimleri Enstitüsü Müdürü

DECLARATION

I hereby declare that this thesis is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which has been accepted for the award of any other degree except where due acknowledgment has been made in the text.

24.07.2019

Sümeyye BULUT



ACKNOWLEDGEMENTS

I would like to extend my gratitude to Prof. Dr. Serdar ÖZTEZCAN, who supported me in the planning and execution of my thesis and who helped and guided me through his knowledge and experience at all stages of the thesis, to my dear mother Rabia BULUT, my father Ahmet BULUT, my sisters Ayşe AKTAŞ and Yasemin TUNCER, who helped me to come to these days and did not spare their support during this study as in every stage of my life, research assistant Nazlı Nur ASLAN ÇİN and to my friends Neslişah ÇEBİ and Ümmü OMAÇ, who spiritually supported and encouraged me during my thesis.

Sümeyye BULUT

TABLE OF CONTENTS

THESIS APPROVAL FORM İİ

DECLARATION İİİ

ACKNOWLEDGEMENTS İV

TABLE OF CONTENTS V

LIST OF TABLE Vİİ

LIST OF FIGURE İX

LIST OF SYMBOLS AND ABBREVIATIONS X

ABSTRACT Xİ

ABSTRACT (TURKİSH) Xİİ

1. INTRODUCTION AND PURPOSE 1

2. LITERATURE REVIEW 4

2.1.Food 4

2.2.Food Additive 4

2.3. Reasons for use of Food Additives 4

2.4.History of Food Additives 5

2.5.Classification of Food Additives According to Its Intended Purpose 7
2.5.1.Preservatives 7
2.5.2.Structure, Preparation and Cooking Developpers 7
2.5.3. Aroma and Color Developper 8
2.5.4. Nutritional Value Developers (Nutrients) 8

2.6. Safety Tests Regarding Food Additives 9
2.6.1. Lethal Dose (LD_{50}) 9
2.6.2. No Observed Adverse Effect Level (NOAEL) 9
2.6.3. Acceptable Daily Intake (ADI) 9
2.6.4. Good Manufacturing Processes (GMP) 9
2.6.5. Quantim Satis (QS) 10

2.7. The Effect of Food Additives on Health 10

2.8. Intake Prediction of Food Additives **12**

2.9. Determining the Food Additives to be Added to Food **13**

2.10. The Organizations Determining and Controlling The Amount and Use Of Good Additives That Can Be Used in Food **13**
2.10.1. Joint Expert Commitee on Food Additives (JECFA) 14
2.10.2.Codex Alimentarus Commission (CAC) 14
2.10.3. Scientific Commitee For Food (SCF) 15

2.11. Food Labelling and "E" Numbers **15**

2.12. Umami **15**
2.12.1. Discovery of Umami Taste 16
2.12.2. Foods Containing Umami 17
2.12.3. Essential Role of Umami Substace 18

2.13.Monosodium Glutamate and General Characteristics **18**
2.13.1.Glutamate 18
2.13.2.Monosodıum Glutamate, Glutamatın Metabolism and Ejection 21
2.13.3. Useof Monosodium Glutamatin as an Additive 22
2.13.4.Commercial use of Monosodium Glutamatin 23
2.13.5. Legal Regulations Regarding Monosodium Glutamatin 23
2.13.6. The Effects of Monosodium Glutamatin on Health 24

3. MATERIAL AND METHOD **29**

4. RESULTS **32**

5. DISCUSSION AND CONCLUSION **53**

6. REFERENCES **63**

7. APPENDICES **72**

7.1. Curriculum Vitae **72**

7.2. Ethical **73**

7.3. Survey **75**

LIST OF TABLE

Table 2. 1. The Effects of Some of the Food Additives on Health 12
Table 2. 2. Natural amount of glutamate in food 20
Table 2. 3. Free glutamate amounts in organs of normal adults 22
Table 2.4. The use of monosodium glutamate according to "Declaration on Food Additives Except Colorants and Sweeteners" related to Turkish Food Codex Regulations 24

Table 4. 1. Class distribution of individuals according to gender 32
Table 4. 2. Shows the distribution of some anthropometric characteristics according to gender 32
Table 4. 3. Distribution of working status according to class 33
Table 4. 4. Distribution of work 33
Table 4. 5. Distribution of students according to the place they live and their class 34
Table 4. 6. Distribution according to number of meals and daily working hours 34
Table 4. 7. Distribution of BMI values over meal times 35
Table 4. 8. The effect of having snacks on class 35
Table 4. 9. Distribution of having snacks on class 36
Table 4. 10. The effect of chronic disease on class 36
Table 4. 11. Classifications of chronic health problems of individuals 37
Table 4. 12. Factors affecting the allergy development in participants 38
Table 4. 13. Other disease and cancer types 38
Table 4. 14. Distrubution Of Food Consumption Frequency 39
Table 4. 15. Average monthly consumption amounts of individuals consuming nutrients and approximate consumption times 40
Table 4. 16. Distribution of food consumption according to class 41
Table 4. 17. Potential risk table of monosodium glutamate for preparation class 42
Table 4.17. Potential risk table of monosodium glutamate for preparation class according to. 42
Table 4. 18. Risk table of monosodium glutamate for third grade 43
Table 4. 18. Risk table of monosodium glutamate for third grade according to. 43
Table 4. 19. Potential risk table of monosodium glutamate for all classes 44

Table 4. 19. Potential risk table of monosodium glutamate for all classes according to44
Table 4. 20. Potential dose risk assessment table 45
Table 4. 21. The degree of significance between classes for MSG consumption and potential dosing 46
Table 4. 22. English translations of the questions about MSG directed to the students47

LIST OF FIGURE

Figure 1 The Opinions of Preparatory Class Students Regarding Monodosium Glutamate-1 49
Figure 2 The Opinions of Preparatory Class Students Regarding Monosodium Glutamate-2 50
Figure 3 The Opinions of Third Grade Students Regarding Monosodium Glutamate-1 51
Figure 4 The Opinions of Third Grade Students Regarding Monosodium Glutamate-2 52

LIST OF SYMBOLS AND ABBREVIATIONS

MSG	MONOSODIUM GLUTAMATE
ADI	AVERAGE DAILY INTAKE LEVEL
TFG	TURKISH FOOD CODEX
ADM	AMERICAN DEPARTMENT OF MEDICINE
FAS	FOOD ADDITIVE SUBSTANCES
B.C	BEFORE CHRIST
FAO	FOOD AND AGRICULTURAL ORGANIZATION
WHO	WORLD HEALTH ORGANIZATION
OIE	ANIMAL HEALTH ORGANIZATION
WTO	WORLD TRADE ORGANIZATION
LD50	LETAL DOSE
NOAEL	NO OBSERVED ADVERSE EFFECT LEVEL
GMP	GOOD MANUFACTURING PRACTICES
QS	QUANTUM SATIS
JESFA	THE JOINT FAO/WHO EXPERT COMMITTEE ON FOOD ADDITIVES
CAC	CODEX ALIMENTARUS COMMISSION
SCF	SCIENTIFIC FOOD COMMITTEE
NAD	NICOTINAMIDE ADENINE DINUCLEOTIDE
FAD	FLAVINE ADENINE DINUCLEOTIDE
CRS	CHINE RESTAURANT SYNDROME
FAEBA	FEDERATION OF AMERICAN EXPERIMENTAL BIOLOGY ASSOCIATIONS
FFQ	FREQUENCY OF FOOD CONSUMPTION
BHA	BUTTYLATED HYROXYANISOLE
BHT	BUTTYLATED HYDROXITOLENE
TNHS	TURKEY NUTRITION AND HEALTH SURVEY
KPMIA	KITCHEN PRODUCTS AND MARGARINE INDUSTRY ASSOCIATION
CHNS	CHINESE HEALTH AND NUTRITION SURGERY
MCC	MAXIMUM CHEMICAL CONCENTRATION
CA	DAILY CONSUMPTION AMOUNT
AEA	ANNUAL EXPOSURE AVERAGE
ED	EXPOSURE DURATION
BW	BODY WEIGHT (KG)

ABSTRACT

Bulut S. (2019). Measurement of Consumption Frequency of Food Containing Monosodium Glutamate of Students in Preparatory Class and Third Grade in Nutrition and Dietetics in Yeditepe University and Comparison of Their Knowledge Level, Yeditepe University, Institute of Health Sciences, Nutrition and Dietetics Department. Master Thesis. Istanbul

Monosodium glutamate, which is a food additive, is most commonly used as a flavoring agent. Monosodium glutamate is an attractive additive for the food industry as it causes more food to be eaten because of the increase in taste of foods containing it.For students, university life is the period in which they choose free food choices because they are away from the family environment, as well as economic conditions, lack of time, and the possibility of preparing their own meals are limited. In this study, the preparation class and the 3rd in the Nutrition and Dietetics Department of Yeditepe University. The aim of this study was to investigate the frequency of consumption of foods containing monosodium glutamate and the awareness of the level of information on this subject. 59 students from preparatory class, 50 students from 3rd grade participated in the study. The mean age of the participants was 20,27± 2,35, the mean BMI(Body Mass Index) was 21,09kg/m². It has been found to be “normal overweight” according to WHO(World Health Organization) standards. There was no statistically significant difference between the two groups (p=0,1, p> 0,05). There was no statistically significant difference in the potential dose of the students in preparation and third grade(p=0,07, p>0,05) but it was determined that the food consumption containing MSG did not exceed the potential dose ADI (acceptable daily intake level) values of the students. MSG students who were informed during their training (3rd class) when compared to students (prep class) who have not reached t least as part of their education, there is no significant difference between levels of knowledge. As a result, since the health hazards of monosodium glutamate are known, individuals should be made aware of its consumption, label reading habits should be acquired and ready food consumption should be reduced. Healthy foods should be easy to find and should be supported by government policies by making them affordable for everyone.

Key words: monosodium glutamate, food additive, umami

ABSTRACT (Turkish)

Bulut S. (2019). Yeditepe Üniversitesi Beslenme ve Diyetetik Bölümü "hazırlık sınıfı ve 3.sınıf"ta okuyan öğrencilerin, "monosodyum glutamat" içeren besinlerin tüketim sıklığının ölçülmesi ve bilgi düzeylerinin karşılaştırılması. Yeditepe Üniversitesi Sağlık Bilimleri Enstitüsü, Beslenme ve Diyetetik Bölümü. Master Tezi. İstanbul

Monosodyum glutamat (MSG) aroma verici olarak kullanılan bir gıda katkı maddesidir. Monosodyum glutamat, katıldığı besinlerin tadlarını artracak bu gıdaların daha fazla yenilmesine yol açması nedeniyle gıda sanayii için cazip bir katkı maddesi haline gelmiştir. Öğrenciler için üniversite yaşamı genellikle aile ortamından uzaklaştıkları ve ev dışında daha fazla zaman geçirdikleri bir süredir. Bu dönemde gıda seçimleri konusunda daha özgür olmaları, ayrıca ekonomik koşullar, zaman yetersizliği ve kendi yemeklerini hazırlama olanaklarının kısıtlı olması nedeniyle paketli ürünlere daha fazla yöneldikleri dönemdir. Bu çalışmada, Yeditepe Üniversitesi Beslenme ve Diyetetik Bölümü'nde hazırlık sınıfı ve 3. sınıfta okuyan öğrencilerde MSG içeren besinlerin tüketim sıklığını ve bu konudaki bilgi düzeylerinin farkındalığın araştırılması amaçlanmıştır. Hazırlık sınıfından 59 öğrenci, 3. sınıftan 50 öğrenci çalışmaya katılmıştır. Katılımcıların yaş ortalamaları 20,27±2,35 BKI(Beden Kitle İndeksi) ortalaması 21,09 kg/m² dir. Dolayısıyla öğrencilerin büyük çoğunluğu DSÖ (Dünya Sağlık Örgütü) standartlarına göre "normal kilolu" olarak bulunmuştur. Hazırlık sınıfı ve 3. sınıfta okuyan öğrencilerin MSGtüketim miktarları için istatistiksel olarak anlamlı bir fark bulunamamıştır ($p= 0,1$, $p>0,05$). Hazırlık sınıfı ve 3. sınıfta okuyan öğrencilerin potansiyel doz alımında istatistiksel olarak anlamlı bir fark bulunmamıştır($p=0,07$, $p>0,05$); ancak öğrencilerin MSG içeren besin tüketimlerinin potansiyel dozları ADI(Günlük Kabul Edilebilir Alım Düzeyi)değerlerini aşmadığı tespit edilmiştir. MSG ile ilgili bilgi düzeylerinde, eğitimleri sırasında bilgi edinen öğrencileri (3. sınıf), bu bilgiye en azından eğitimlerinin bir parçası olarak henüz ulaşmamış öğrencilerle (hazırlık sınıfı) kıyasladığımızda bilgi düzeyleri arasında anlamlı bir fark bulunamamıştır. Sonuç olarak, MSG'nin sağlık üzerindeki olumsuz etkileri oldukça kabul gören bir fikir olduğundan, bu maddenin aşırı tüketimiyle ilgili bireyler bilinçlendirilmeli, etiket okuma alışkanlığı edinilmeli ve hazır yiyecek tüketimi azaltılmalıdır. Sağlıklı besinlere kolay ulaşılabilmeli ve herkesin ucuz satın alınabileceği hale getirilerek devlet politikalarıyla desteklenmelidir.

Anahtar kelimeler: monosodium glutamat, gıda katkı maddesi, umami

1. INTRODUCTION AND PURPOSE

Nutrition is one of the fundamental needs of human life. After 2nd World War, the economies have developed, well fare of countries have progressed and nutrition habits have substantially changed (1).

The use of additives have become prevalent due to new production techniques in food sector, food diversification, increase in the attractiveness of food packages, availability and consumption of seasonal vegetables and fruits in every term, serving variety of different products, prolongation of expiry date, more delicious food, paying attention to hygiene (bacterial transmission concern) (2).

Chemical compounds which are food additives are natural compounds of food (for example: carbohydrate, protein, fat, mineral, vitamin) are also substances that are consciously and unconsciously added to the food. Today, approximately 80,000 chemical substances are used for variety of purposes and the number is increasing day by day (3).

Considering the chemicals added consciously, food additives are included in the group which is audited the most by international institutions. Although the majority of the additives are allowed by official authorities and they are substances added to food, the society does not have awareness and consciousness about them (4).

The definition of additives in the Ministry of Health regulation is as follows: Under normal circumstances, these are substances which are not consumed alone or not used as food product, they either have nutritional value or not, they can be found in finished products as residual or derivatives during the operation or production which is applied according to the technology chosen and they are allowed to be used preserve the taste, smell, appearance, structure or other qualities and to regulate (5).

Flavorants are used to make the aroma more attractive increasing its current taste and/or smell and monosodium glutamate is the mostly used flavorant. Monosodium glutamate is the monosodium salt of glutamic acid, which is obtained from glutamic acid and is the most common aroma for this purpose (6).

Glutamic acid is an amino acid which is added to the structure of many foods rich in terms of protein. It is especially found in meat, fish, cheese, milk, walnuts and mushrooms (7).

Increase flavor and foods specifically called umami and 5. it is a substance that gives taste. Monosodium glutamate (MSG), starch, corn, sugar beet, melas or sugar cane is obtained by fermenting (7).

Corynebacterium Glutamicus bacteria is produced in a liquid environment containing sugar, molasses or amylum. Bacteria produce glutamic acid by fermentation and release it to the environment. Glutamic acid is collected in the environment and it is separated by filtration, purified and turned into MSG by neutralization. Afterwards, it turns into a white powder by purification, crystallization, exsiccation and then it is used as flavorant (8).

MSG is found in food as monosodium salt of glutamic acid. We see MSG under different names including glutamic acid or glutamine in crisps, broth, instant soups, baby food, processed meat, processed fish and chicken, sauces, some of sweet and salty finished products, mayonnaise, seasoning mix, bouillon and processing steps of vegetables, breakfast margarine and many other products. Along with take home foods, organic fertilizers used for organic agriculture products also include MSG (9).

Considering generally, daily average MSG intake in industrializing countries are between 0,3–1 gram despite changing according to food content or personal taste preferences (10).

Glutamate is a food additive that is legal in use according to US (United States), EU (European Union) and Turkish regulations. Commercial types of additives used as additives are known in the form of glutamatic acid (E620) and monosodium glutamate (E621), monopotassium glutamate (E622), calcium diglutamate (E623), monoammonium glutamate (E624) and magnesium diglutamate (E625) (11).

This substance, which is used abundantly in Chinese restaurants to increase the taste, causes side effects such as chest pain, headache (migraine), redness, shortness of breath, edema and sweating in some people (11).

Foods which can be quickly and easily accessed have become a part of popular culture and food additives are widely used in these products. The label information of packaged foods are very important and they include a great amount of MSG. Monosodium glutamate is the mostly used food additive. Foods cluding monosodium glutamate become more attractive for individuals because it makes one addicted due to its flavor increasing effect and it causes state of being full to be occurred late. University students prefer more packaged foods because of their free food choice which is arising from the following reasons: being far away family environment, lack of time and undeveloped

cooking facilities and techniques. This study aims to determine students' knowledge level of monosodium glutamate included food consumption, the frequency of consuming this type of food who is studying at preparatory class and third-grade in Nutrition and Dietetics department of Yeditepe University and to compare the awareness of their level of knowledge regarding this subject.

2. LITERATURE REVIEW

2.1.Food

Except tobacco and those used only as medicines food is all kinds of raw, semi or fully processed substances which are consumed by people including beverages and chewing gums according to Turkish Food Codex (TFC) (12).

2.2.Food Additive

Food additives are substances which are not used by itself or food auxiliary or main product, which is used as a necessity of the technology chosen and included in remnants and finished products during the process or production and which is allowed to protect the taste, smell, appearance, structure and other qualities of the food substance during the food production, preparation, packaging, transportation and storage or to prevent undesirable changes Except tobacco and those used only as medicines, food is all kinds of raw, semi or fully processed substances which are consumed by people including beverages and chewing gums. This definition does not include contaminants which are the chemical substances undesirably transmitted to food.Food contaminants are plant, animal and soil based foreign substances, drug residues, metallic and biological contamination; residues of plastic materials, detergents, disinfectants and radioactive substances which are harmful to human health (12).

However, substances increasing the nutritional value of foods or participating in food for the purpose of cheating do not enter this group (13).

According to the US Food and Drug Administration (FDA), food additives are defined as substances added to food for certain physical or technical effects. Food additives are used not to hide the low quality of the products but to increase their nutritional value, quality, appearance, texture and taste. Food additives have many technical functions on food (14).

2.3. Reasons for use of Food Additives

The general conditions of FA are as follows:

1. None of the FA must harm human health no matter its adding reason. Analysis results and amount of food additive to be used must be known (15).

2. FA must not damage the nutritional value of the food or mixture it participates in. It should not harm the vitamins in the food and decrease the food absorption (15).

3. Information regarding the features of the FA which is considered or desired to be added to the food must be known and in-vivo and in-vitro experiments must be conducted. The substances used as additives must be determined according to their specific features and no other FA must be used (15).

4. There must be reliable analysis methods to perform the quantitative analysis of the substance considered to be added and the institutions that will carry out these analyzes and conduct the control services must be exist (15).

5. The food, amount and the purposes of adding the food additive must be mentioned in FA codex. More than specified amount must not be added to the food and food which are included food additives must be inspected during production (15).

6. Full name and the amount of the additive must be on the food label. The additive must be homogeneously dispersed in the foods it contains and must not increase the cost of the product (15).

7. The food additive must not mask the decomposition of the food and be deceptive to the consumer (15).

8. Addition conditions and amounts of additive considered to be added to certain food such as children food and diet food must be subject to dispensation (15).

2.4.History of Food Additives

The history of food safety is as old as the history of mankind. People began to face with food safety in BC 8000 along with the first domesticated animal species(16).

Meat products were salted, wood-dried or dried, or waxed with a wax for a long time for preservation in BC 3000-9000. Babylonian and Sumerian preserved milk safely in bottleneck containers (BC 3000). Egyptians used colorant agents in food in BC 1500. Prophet Moses set the rules for health protection about butchery animal meat. In addition, Jewish people had experience to realize cirrhosis, degeneration, tuberculosis in animal livers in BC 1300. The Roman Empire established a police service for health inspection to sustain food security (BC 400). The Huns found that meat can be preserved as sausage, bacon and roasting for its long-lasting. (BC 220). American Indians preserved meat by frosting. The use of salt, wood fume and especially seasonings as flavorant increased in BC 50 (16).

Turks preserved meat by frying and milk by drying AD 772 (mentioned in Dada Gorgud Epic). In the middle Ages, the necessity of collective butchering and performing it in a certain place were brought in Germany (1276). In the Ottoman Empire, Fatih The Conquerer established 33 butchering place and provided people a safe access to meat. In addition, private provisions regarding health safety for initiation laws (strict control of the food that the society consume, municipal police) (1485) ,(16).

Food safety has been given importance in the period of Sultan Beyazid II (1501). In 1580s, official inspections made in meat butchering and marketing places became widespread in Europe. In France, the use of food dyes which was used to camouflage fish datedness was banned in 1662. The first veterinary school in Europe was established in France (1762), (16).

The Food Hygiene Act in USA was adopted in 1773 in Boston. The first open slaughter house in France was founded in 1807 by Napoleon. The first veterinary school in Ottoman period was founded in 1842. Aniline Purple has been used as an artificial dyestuff since 1856. During the American and Spain war, a compromise was made regarding the fact that a veterinarian who had postgraduate education in the food inspection branch for food safety for soldiers in the war (1889). This issue was carried out between Republic of Turkey by Turkish armed forces in 1924-1933 (in Bursa, Gemlik Military Veterinary Research Institute, 1924) and Ankara University Faculty of Veterinary Medicine (1934). The first modern slaughter house was established in Karaağaç (Kocaeli) on July 12, 1923. Law on municipalities was enacted by Ministry of Health. According to the law, the issue regarding the fact those municipalities with population more than 10.000 can control the food entered into force (1930). Turkish Standards Institute was established and authorized to prepare and promulgate food standards regarding foodstuffs (November 22, 1960), (16).

For the prevention of health problems due to globalization in recent years, organizations such as FAO (Food and Agriculture Organization), WHO (World Health Organization), OIE (World Animal Health Organization) and WTO (World Trade Organization) have taken action. These organizations establish rules which are necessary to be followed between countries. These rules are based on the decisions made as a result for the studies and reports prepared by the scientific committees within their body that cooperate with affiliated universities, industrial institutions and organizations. At the same time, these rules are the foundation of food security (16).

2.5.Classification of Food Additives According to Its Intended Purpose

2.5.1.Preservatives

2.5.1.1. Antimicrobials

These are nitrite and nitrates (E250, E251) which are the most commonly used substances to protect nutrients in bacteria, mold, yeast spoilage, extend shelf life, protect natural color and aroma (17).

2.5.1.2.Antioxidants

They are especially used in fats and fatty foods since they have benefits such as preventing/retarding undesired smell, aroma, taste changes, enzymatic darkening or loss of color (oxidative acidity) and they prolong the shelf-life (ascorbic acid, etc.). Oxidative reactions in nutrients occur as a result of the destruction of lipids, colorants, essential amino acids and vitamins (17).

2.5.2.Structure, Preparation and Cooking Developpers

2.5.2.1.pH Adjusters

Acidity regulators are used to adjust the pH of the food. They can also show bactericidal and bacteriostatic effect in food decreasing its ph. Increased acidity increases the temperature sensitivity of many pathogenic and nutrient microorganisms. Cooking and other heat treatment prolongs the self-life destroying the bacteria (17).

2.5.2.2. Anti-Caking Agents

Anti-caking agents are used to protect the flowability of powdered mixtures such as salt, powdered sugar, spices, instant soup, milk powder, to prevent agglomeration and aggregation (17).

2.5.2.3. Emulsifiers (Lecithin, Mono And Diglycerides):

They are used to maintain mixing of water and oil in food and providing a homogenous dispersion reducing the surface tension (lecithin, sorbitan monostearate etc.) (17).

2.5.2.4. Stabilizers, Thickeners, Artificial Sweeteners:

Stabilizers are used to prevent re-separation of oil and water. Gelling agent are used to provide a structure to the food with gel formation (goat's horn gum, pectin, etc.) (17).
Artificial sweeteners are used to make aroma and taste more attractive (aspartame, acesulfam K, sorbitol, saccharin) (17).

2.5.2.5. Others

Color stabilization agent stabilizes the color of the food and ensures its permanence. Flour processing agent improves the cooking quality or color of flour (17).

2.5.3. Aroma and Color Developper

2.5.3.1. Aroma Substances

The most commonly used flavoring agent is monosodium glutamate (MSG). The taste created by MSG and called umami may lead Chinese restaurant syndrome (17). MSG intake may cause chest pain, burning on face, redness, paresthesia, sweating, dizziness, headache, palpitations, nausea and vomiting. Children may experience shaking and chills irritability, scream and delirium. The mechanism of this is not known. Of the general population 15-20% is observed to be sensitive to small doses of MSG however, this may occur in large doses in some individuals. The symptoms start within an hour after food is taken, but may be delayed up to fourteen hours from onset, familial predisposition may exist (18).
Aromatizers are used to increase the flavor and/or smell present in the food, make the aroma more attractive, preserve and improve the original aroma (17).

2.5.3.2. Colorants

They are added to regain the natural color lost during processing and storage, to strengthen the weak color, to give color to the food which is actually colorless, and to gain consumer appreciation by concealing low quality. These substances are used in many products such as soft drinks, candies, ice creams, jellies, bakery products, artificial powder drinks, gums, wafer biscuits and creams (17).

2.5.4. Nutritional Value Developers (Nutrients)

Replacing nutrients which are lost during processing (B_1, B_2, niacin)

Dietary supplements (A, D vitamins) (17).

2.6. Safety Tests Regarding Food Additives

2.6.1. Lethal Dose (LD_{50})

The dose which causes 50% of the experimental animals to die. The experimental animals are given a lethal dose of the additive and the dose is gradually decreased and the dose-response relationship is investigated. The absorption, metabolism and excretion of the additive are examined at each dose. Carcinogenic, mutagenic, teratogenic and allergic effects are investigated examining experiment animals' cells, tissues and organs. If no dose is obtained at the end of the studies, the additive is not allowed to be added to the nutrients (18).

2.6.2. No Observed Adverse Effect Level (NOAEL)

It is the highest dose that no toxic effect and no physiologic difference were observed due to the substance in the control group that no substance was given although they were given for their whole life (19).

2.6.3. Acceptable Daily Intake (ADI)

It is the body weight value of each food additive calculated on a daily basis without any health risk despite being consumed for a lifetime. The phrase "without any health risk" means that it should not give any harm despite being exposed to chemical additive for a lifetime (19). With the NOAEL dose of the substance, the experiment continues in time to cover 85% of the life of the experimental animals. However, this dose is a determined by the body weight of the experimental animal and its effects on the human are not known. Since the experiment cannot be carried out on humans for ethical reasons, one-tenth of the dose is taken. Considering the individual privileges among people, it is divided by the security factor of NOAEL 100 by taking one-tenth again.
(ADI = NOAEL / 100)

2.6.4. Good Manufacturing Processes (GMP)

GMP is the amount required under good manufacturing conditions to produce the desired technological effect of an additive (20). Daily maximum intake = ADI x Body

weight (kg) If the amount of use of some additives is given as GMP; in this case the QS expression in the use amount column (maximum dose) takes place (20).

2.6.5. Quantim Satis (QS)

It is a statement that the maximum level is not indicated in this food for an additive. While an additive is allowed with a maximum amount of QS in a foodstuff, the amount of use of the same substance may limited to a different food. For example, while maximum dosage of alphakoferol (E370) in refined olive oil was 200 mg/L, QS level in non-emulsified animal and vegetable fats and oils is permitted (3).

Acute, chronic and pharmacological experiments are obligatory to be performed on two different animals except for the mouse to determine its negative effects regarding cancer, birth defects, nerve system or other organs and to be used according to laws (1).

The main toxicity tests are as follows (3).

• Acute Toxicity: Toxicity due to multiple doses taken within one or 24 hours.

• Chronic Toxicity: Toxicity due to prolonged administration of low doses which will not lead to acute toxicity.

• Mutagenic effect: Permanent change on DNA.

• Carcinogenic Effect: Cancer-causing effect.

• Teratogenic Effect: Inflicted effect on offspring.

• Transplacental Carcinogenic Effect: Cancer formation years after in the child of pregnant women.

• Immunotoxic Effect: Toxic effect on the immune system.

• Neurotoxic Effect: Toxic effect on the immune system.

In order to allow the use of a food additive:

• Determining that it is used in permitted amounts and is harmless in terms of health,

• It is necessary to use technologically in terms of compulsory and consumer taste,

• Food additive in the purity of food,

• Having an internationally valid analysis method for the determination of type and quantity in foodstuffs,

• Using only in permitted foodstuffs and in a manner not to exceed the permissible quantity,

• Necessary to be written on the packaging of the food it participates in (3).

2.7. The Effect of Food Additives on Health

Non-food chemicals, which are transmitted from various sources or added to food for some purpose, have negative effects on human health. Consumers are exposed to various food additives and other chemicals contaminated to food every day. These are toxic substances for cells which are not metabolized in human and animal organism as well as contaminated to good and FAS (21, 22).

The action mechanism of these substances is on microorganisms. It destroys or reduces the activity of enzymes which plays a role in membrane, cell wall or cell metabolism (23).

Symptoms regarding certain diseases increased in parallel with the increase in the consumption of food containing natural or synthetic food additive substance. The most common of these are clinical cases such as eczema, asthma, headache, allergic itching, gastric disorders, diarrhea, hyperactivity and hypersensitivity (especially in children) (1).

Dr. Benjamin F. Feingold et al. found in 1964 that additive substances with low molecular weight caused behavioral disorders in age groups with undeveloped or pressurized immune system. Researchers have shown that additives and similar chemicals led to hyperactivity and some neuropsychological disorders in some children based on evidences from various cases. These phenomena were also observed with some natural salicylates. The same investigators also observed that children with neuropsychological responses to aspirin also provided against salicylated natural foods. These findings led them to investigate the effects of similar low molecular weight substances such as additives in foods and reached similar findings (24, 25).

According to a study by Donna McCann et al conducted to investigate the effects of additives on children aged between 3 and 9, Childhood Hyperactivity named as Attention Deficit Disorder, Minimal or Cerebral Brain Dysfunction Disorder, Hyperkinesia etc. was observed in both groups consuming various products containing artificial colorant (26).

Uncontrolled use of additives has negative effects on human health. Some researchers explained that butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT) used as antioxidant caused inflammation in chronicle urticaria although its mechanism was not fully explained (27).

Following the increase in the reaction developed against sulphite, a regulation to ban the use of sulphite in fruit and vegetables except potato which are considered to be sold fresh to consumers was promulgated in 1986. After a while (January 1987), FDA has

made it necessary to specify on the labels that if the sulfide content exceeded 10 ppm in processed and ready-to-eat foods, it would be placed on the labels (28).

Moreover, in certain cases where additives are taken at the same time, they may increase or decrease each other's effects. Especially if the two additives affect the same target organ and are taken for a long time, it may be prominent (29).

Table 2. 1. The Effects of Some of the Food Additives on Health (15)

Additive Substance	Health Problem	Foods Allowed to Participate
E250-251 Nitrite and Nitrate	It creates nitrosamines that lead to cancer and reduces the ability of the blood to carry oxygen.	Processed meat products such as salami and sausage and sausage type meat products
E223 Sodium meta bisulphite	Asthma attack in asthmatic patients. It causes mutation in bacteria. It destroys thiamine.	Biscuits, wafers, cakes, cookies, potatoes, chips-porridge and vinegar
E210 Benzoic Acid	Asthma, skin rash, migraine	Margarine, olive paste, non-alcoholic, drinks, jam, jelly, biscuit, wafer, cake creams.
E627 Sodium guanilate E 631 Sodium inosinate	It intensifies gout disease. It should not be used in foods with low purine.	Meat products, broth tablets, soybean products, prepared soups
E621 Monosodium glutamate	Dizziness, palpitations Brain lesion in experimental animals "Chinese Restaurant Syndrome"	Prepared soups, meat products, cookies, potato chips, sauces

(Bağcı T. "Food additives and their effects on our health", Hacettepe Medical Journal (1997); 28 (1); 18-23.)

2.8. Intake Prediction of Food Additives

Food consumption data and nutrient additives need to be known to make intake prediction of food additives (18). Especially children aged between 1 and 6, pregnant

women, nursing mothers and intake predictions to be made in elderly people who are considered in risk groups have an importance.

Intake predictions are made in three stages (18):

Stage 3: The maximum amount of additives allowed to be used in food (If the amount that can be taken daily with this rough calculation is not exceeded, stage 2 is not required

Stage 3: The maximum amount of additives allowed to use in food (In this stage, the food intake of the estimated group is taken, taking into account the maximum amount of additives allowed for these nutrients).

Stage 3: Actual nutrient consumption amount of additive in X food (If the ADI value of the additive is not exceeded at this stage, there is no risk of this additive.) If it is determined that the ADI value is exceeded, there is a risk for the use of that additive. Switch to risk management and take necessary measures.)

2.9. Determining the Food Additives to be Added to Food

National regulations stipulate scientific data proving that its use at the intended level before any substance is added to the food is safe (30).

It is necessary to know the following factors to determine the maximum level of additive which will be added to the food (18, 31)

• Daily intake amount of additive (ADI (mg / kg)),

• The quantity that the production technology of food required (GMP),

• How many supplements the additives will be added to,

• Average daily consumption of nutrients to be added by the additive

If the amount of additive required by production technology exceeds the recommended ADI value for that additive, it is not allowed to use it in that product (18).

2.10. The Organizations Determining and Controlling The Amount and Use Of Good Additives That Can Be Used in Food

With the expansion of international food trade; social and economic benefits, many commercial barriers, increase in the risks associated with food, the need to protect the life and health of people, animals and plants gave a path to the necessity of fair and correct application. International terminology and standardizations were initiated to meet these necessities and ease the trade between countries.

The first record regarding the commercial operation of additives was first made in 1800s with calcium phosphate. In 1956, a scanning study by WHO and FAO including 43 countries tackled the additives systematically for the first time and it was found that nearly 200 additives were used in food (19).

2.10.1. Joint Expert Commitee on Food Additives (JECFA)

The Joint FAO/WHO Expert Committee on Food Additives is the name given to joint committees of FAO and WHO which are gathered to assess FAS in terms of human health. These committees examine all scientific data for FAS that they receive in their agendas and make evaluations and determine their ADI values. When it is established, it only controlled the use of GKM in foods however today, all chemical, toxicological and other contaminants and veterinary drug residues are detected to contaminate humans. Up to now, JECFA has evaluated 1500 food additives, 40 food contaminants and food natural chemicals and 90 veterinary drugs as risk-based. These evaluations are published as monographs (32, 33)

The duties of JECFA can be listed as follows (34)

1. Determining methodology for toxicology evaluation of additives.
2. Conducting toxicology evaluations and determining ADI value assessing them.
3. Determining specifications, purity criteria and analysis methods for each additive.
4. Determining and assessing daily and annual consumption of FAS in various societies from common food consumption scanning.

A member of nearly 200 counties, Turkey, FAO, WHO and JECFA. Each country arranges these publications and add to its regulations (3).

2.10.2.Codex Alimentarus Commission (CAC)

The CAC (Codex Alimentarius Commission), founded by the World Health Organization (WHO) and the Food and Agriculture Organization (FAO) of the United Nations Organization, was established in 1963. The number of member countries has reached to 180. The mission of the organization is to standardize health-related practices in the world. The documents prepared by the organization for this purpose are used as a reference for reliable food production for all countries in the world. Codex standards are not mandatory standards for countries. However, countries consider codex standards when preparing their national standards. Codeks Alimentarius, which is a member of

our country, continues its studies with 20 committees. The working groups of these committees are composed of the most competent scientists in the world (35).

2.10.3. Scientific Commitee For Food (SCF)

The evaluation of food additives is also carried out by the SCF commission. The E-codes used in our country show the codes given by the SCF to all the specified food additives undergoing the necessary safety tests and are an expression of safety (36). In the Turkish Food Codex Regulation, around 300 food additives have been allowed to be used in food in different amounts. American Food and Drug Administration allowed the use of approximately 2800 food additives until today. The number additives permitted by European Union is 297 (3).

2.11. Food Labelling and "E" Numbers

On the packages of prepared foods, the categories of the FAS are indicated by the special names and the "E" numbers according to their intended use. E numbers are developed with a practical coding system of FAS in European Union countries. The classification of fundamental functions of FAS with E number system is as follows (5):

1-Colorants E100-180

2- Preservatives E200-297

3-Antioxidants E300-321

4- Emulsifiers and Stabilizers E322-500

5- Acid-base providers E500-578

6- Sweeteners, odorizes E620-637

7- Wide purpose GKM E900-927

2.12. Umami

Taste which is one of the five senses occurs when the chemoreceptors on the tongue sense the chemical substances in the subjects that contacts the tongue. Taste is one of the important factors in terms of nutrition choice, intake in body, absorption and digestion. Umami, one of the five scientifically accepted senses of taste, was discovered in 1908 at Tokyo Imperial University by Kikunae Ikeda who is a chemistry professor (37,38).

As a Japanese word Umami means "the taste one likes, delicious or pulpy" (39). Umami represents the taste of amino acid L-glutamate (GMP) and 5-ribonucleotide (IMP) like guanosine monophosphate and inosine monophosphate (37, 40, and 41).

Japanese Professor Ikeda defined umami which means the taste one likes and delicious by isolating glutamic acid from seaweed in 1908 (42). Flavor enhancers activate receptors for the taste umami which is characterized as fifth essential taste along with sweet, sour, salty and bitter flavors that humans can distinguish. In this way, they bring a new kind of flavor to the products (43).

Umami taste is found in foods which are glutamate rich including fish, meat, milk, tomato and some vegetables. Besides, umami taste is enriched with certain ribonucleotides (inosine and guanosine nucleotides) found in some meats and fish (44, 45, 46). Actually a synergic effect is known to be exist between glutamate and ribonucleotides. When the glutamate rich foods are combined with ribonucleotides, the dense taste was found to be more than the total of these two tastes (45, 44).

2.12.1. Discovery of Umami Taste

The sense that a nutrient left in the mouth is called taste. The notion of taste which differentiates based on individuals and the societies allows body to intake the nutrient in terms of meeting the needs of body and it is a signal in terms of protecting body against harmful substances. For example, sweet signals sugar which is the energy source, bitter taste gives sign of the nutrients which protect body from harmful substances and umami taste gives sign of nutrients which are essential protein sources (37). In brief, taste sense can be a director of nutrient choice that body needs.

Ikeda realized that nutrients such as tomato, asparagus, cheese, meat etc. that he tastes in Germany between 1899 and 1901 had a strange and tender taste. Ikeda realized the difference in the taste he experienced food in Germany when he ate traditional dashi soup which was made of dried kombu seaweed -laminariaceae bory- in Japan. As a result, he started a study to define the important chemical compound in kombu seaweed which is the source this unique flavor (44,47).

Professor Ikeada obtained monosodium glutamate (MSG) that revealed a strong taste and similar to salt in water from the compounds of kombu seaweed. He determined that this taste is different than sweet, bitter and salty and named it as umami (48, 49). Therefore, the first umami substance has determined as monosodium glutamate.

Following the completion of his studies, Ikeda presented his first article about monosodium glutamate in Applied Chemistry Congress organized in U.S.A in 1912 (50,41).

2.12.2. Foods Containing Umami

Food contains various types of chemical components. However, only a limited number of components contribute to the taste characteristics (51). An important component of the Umami flavor is glutamic acid. Glutamate is a very common amino acid found in food. It is an important compound of both plant and animal based protein. It is in free form in many foods, especially after cooking, fermentation, and maturation. Meat, poultry, marine products and some vegetables can be listed among the food with high free glutamic acid (52). In addition, it is known that breast milk contains high level of glutamate level due to amino acids it contains (53).

Inosine 50-monophosphate (IMP) and guanosine 50-monophosphate (GMP) are the ribonucleotides which contributes the umami taste the most and they are found in many nutrients we consume every day. Inosinat is found in meats while guanilate is more in plants. Adenosine 50-monophosphate (AMP) is abundant in fish and shellfish (37).

Turkish cuisine has umami rich products as well. In Turkish cuisine, most products are fermented, dried or brine made to maintain for a long time. During this process, food becomes rich in terms of umami. The best example of this situation is tomato paste which is widely used in Turkish cuisine culture. Tomato paste is very rich in umami content. In addition, recently tomato taste is given as traditional taste of Turkey with umami taste on the website called "Umami Information Centers" which was created to introduce and develop umami taste of tomato paste (47).

When MSG is considered in terms of NaCI different from common salt, it is seen that it contains less sodium. It also increases the effect on flavor by providing an appropriate interaction with the salt. Although salt is used at low level, studies showed that MSG increase the taste of product. Therefore, consumers would take less sodium consuming less salt in a more delicious way with MSG added food (54).

In addition to glutamate and nucleotides, a number of different molecules have been reported to reveal the umami taste. Free amino acids including aspartic acid, phenylalanine and tyrosine; glutamate including di-and tri-tetrapeptids; organic acids

such as lactic acid, propionic acid, succinic acid and gallic acid and mollecules in tea including theanine and theogallin can be counted (55,56,57,58,59, 60).

2.12.3. Essential Role of Umami Substace

Umami substances have a number of functions in human body. The umami substances stimulate the exocrine secretion of the pancreas, gastric juice, gastric acid and insulin secretion. Due to these effects, it is known that it increases digestion and decreases dissatisfaction from food (61). Moreover, MSG promotes gastric emptying and distal colon peristaltic reflex. It also regulates the release of bicarbonate and gastric mucus (62,63, 64)

According to a different result concluded from the studies, umami taste increased salivation. The study showed that umami substances caused a prolonged salivation compared to a sour taste. It is concluded that this role of this umami substances may develop the function of saliva which plays a fundamental role for taste(65, 66).

Umami substances can be used especially in certain groups since it increases appetite and the taste of food. As an example to this situation, it can be beneficial for people with hypertension. It is also stated that sodium amount in food can be decreased adding monosodium glutamate to certain food so that a clear decrease in sodium intake may be provided (44, 67, 37, 11, 68). Another study performed on diabetic patients showed that adding monosodium glutamate to vegetable dishes may cause an increase in their consumption without affecting total calories (69).

2.13.Monosodium Glutamate and General Characteristics

Monosodium glutamate is the sodium salt of glutamic acid, one of the most abundant amino acids in nature. Its chemical name is L-glutamate monohydrate ($C_5H_8NNaO_4.H_2O$) and its molecular weight is 187, 13. Practically it is an odorless and crystalline powder. It is easily soluble in water and partially soluble in ethanol but not in ether. It is produced by fermenting starch, corn syrup, or sugar cane molasses (70, 71).

2.13.1.Glutamate

Glutamic acid (Glu) is a non-essential amino acid however it is an amino group provider for the synthesis of other amino acids. Glutamate is also used as substrate for

glutathione synthesis along with providing energy for some tissues in the body. The molecular weight of L-Glutamate (L-glutamic acid, 2-aminopentandioic acid), which is acidic aminocyte, is 147 and contains 9.5% nitrogen (71, 72).

In addition being significant for brain functions, glutamate contributes to the synthesis of L-glutamine, purines, NAD (Nicotinamide adenine dinucleotide), FAD (Flavin adenine dinucleotide) and various basic compounds. Glutamate plays a key role in regulating energy and nitrogen metabolism and it is one of the main energy sources. Thiamine, riboflavin, niacin, vitamin B_6, pantothenate, lipoate, ubiquinone, iron and magnesium are required to fully oxidize (72).

Glutamic acid is a non-essential amino acid naturally occurring in high amounts in some foods such as parmesan cheese, tomatoes, mushrooms, meat and soy sauce, which comprise about 20% of the dietary proteins (72,73) . Glutamate is either free in the organism or is bound to proteins; for example, breast milk contains 21.6 mg / 100 g of free glutamate (73)

Glutamate has two natural forms: L form which is the only form that provides umami taste and D form which has isomer does not provide this taste (9). The mechanism of this flavor provided by glutamate is explained by the fact that some nucleotides such as 5-ribonucleotide synergies with L-glutamate to increase the intensity of flavor. Such nucleotides are found in many edible foods and contain inosinate found in meat, fish and poultry (74).

Wheat (324 mg/g protein) and rye (279 mg/g) contain glutamate rich proteins. Oats (220 mg/g), rice (195 mg/g), dairy products (209 mg/g), and soy products (200 mg/g) contain moderate level of glutamate. Foods with relatively low glutamate content are beef, pork, chicken meat, fish, eggs and peas (about 150 mg/g). The average amount of glutamate that a person weighing 70 received was calculated as 28 g. Moldy cheese varieties and in seaweed contain high amounts of glutamic acid. Long-term heating at alkaline pH facilitates protein-based D-glutamate formation (71). Table 2.2 shows the natural glutamate content of foods (75).

Table 2. 2. Natural amount of glutamate in food (75)

	Protein based Glutamate (mg/100g)	Free Glutamate (mg/100g)
Milk/Daily Products		
Cow milk	819	2
Human Milk	229	22
Parmesan Cheese	9847	1200
Poultry Products		
Egg	1538	23
Chicken	3309	44
Duck	3636	69
Meat Products		
Beef	2846	33
Pork	2325	23
Fish		
Cod Fish	2101	9
Mackerel	2382	36
Salmon	2216	20
Vegetables		
Peas	5583	200
Corn	1765	130
Beet	256	30
Carrot	218	33
Onion	208	18
Spinach	289	39
Tomato	238	140
Green Dome	120	32

(Löliger, J. Function and importance of glutamate for savory foods. *The Journal of Nutrition,* 2000, 130(4), 915-920.)

2.13.2.Monosodıum Glutamate, Glutamatın Metabolism and Ejection

Glutamate has a central place in human metabolism. It is 10-40% of many proteins in terms of weight and can be invo synthesized. It is an important neurotransmitter in the brain and is used as an energy source for important tissues. Glutamate, taken by diet and affecting hormones, is released by split of proteins during digestion or by digestion of foods rich in free glutamic acid or with added MSG. Glutamate taken by food are transferred to mucosal cells by active carriage system being absorbed from intestines and it is metabolized as energy source in there. Intestine tissues are largely responsible for glutamate metabolism taken by foods. Very little amount of glutamate taken by food can reach blood flow. Digestion of MSG and other sources of glutamate taken by food is necessary to have a clear effect on plasma glutamate level. A significant dose of glutamate digestion (> 5g MSG) is required for a significant change in plasma glutamate level (76).

A large amount of glutamate is blood synthesized by amination or transamination of alpha-ketoglutarate from muscles (50%), liver (15%) and lungs (5-10%). Almost all amino acids can lead glutamate synthesis through alfa-ketoglutarat in Krebs cycle by means of giving all amino groups. A small amount of glutamate is formed as a result deamination of L-histidine, L-proline and L-glutamine by glutaminase in the mitochondrial membrane. Amino acids and proteins are almost completely absorbed from the proximal part of the small intestine in healthy individuals. Proteins taken by foods are hydrolyzed by gastric, pancreatic and enteric enzymes and they form glutamate in the form or in free form of oligopeptides.

Regular plasma concentration of glutamate is 14 μmol/L. It is transferred to tissues by various members of sodium dependent system. They may be taken into the cell by macrophages and other immune system cells. It is transferred to the brain by the x-C system, which is not a sodium-dependent carrier. It passes from mother to fetus through apical and basal membranes via sodium-dependent systems (71, 77). Table 2.3 shows the free glutamate amounts found in different human tissues (78,79).

Table 2. 3. Free glutamate amounts in organs of normal adults (78,79)

Tissue	Free Glutamate Amount (mg)
Muscles	6,000
Brain	2,250
Kidneys	680
Liver	670
Blood Plasma	40
Total	9,640

(Giacometti, T. Free and bound glutamate in natural products. In L.J. Filer (Eds.), *Glutamic acid: Advances in Biochemistry and Physiology*, Raven Press, New York, 1979, pp. 25-34.

Ault, A. The monosodium glutamate story: the commercial production of MSG and other amino acids. *Journal of Chemical Education, 2004,* 81(3), 347.)

Increasing protein and free amino acid concentration increase afterwards lead glu concentration to rise. Excess glutamate is converted to N-acetyl glutamate by N-acetyltransferase. Glutamate and L-glutamine compete for glutaminase. Glutamate creation rate from L-glutamatine increase when intracellular glutamate concentration decrease (77). The need for glutamate is considerably higher in terms of the intermediates required for the crumble cycle in the first minutes of intensive exercise. Continuance of exercise facilitates the formation of glutamate dehydrogenase and glutamine. The reabsorption of glutamate in healthy people is very high, and very few suffer from loss of feces and urine. (71)

2.13.3. Useof Monosodium Glutamatin as an Additive

Aromatizer are used to increase the flavor and/or smell present in the food, make the aroma more attractive, preserve and improve the original aroma and monosodium glutamate is the most commonly used aromatized for this purpose (6).

Monosodium glutamate was isolated as glutamic acid in 1866 for the first time. Thus, it has become an important source of the trillion-dollar industry worldwide and the population (78).

A German chemist Ritthausen was first isolated glutamic acid as a pure compound in 1866 as a result of hydrolysis of gliadin (a component of wheat gluten). However,

Laminaria japonica, which is a seaweed, has been used for preparing soup for centuries before Japanese chemist Kikunae Ikeda found that glutamic acid in it has flavor enhancing characteristic. Ikeda extracted 40 kg of seaweed with hot water and obtained 30 gr (S)-glutamic acid. He then patented the process and named monosodium glutamate as the origin of the flavor (78).

Glutamic acid can be isolated from the remnants (steffen waste) obtained during the formation of wheat gluten, soybean meal, casein and beet sugar as well as countless plant source (78).

Glutamate can also be used in the form of monosodium glutamate as a food additive, as well as mono-ammonium glutamate, monopotassium glutamate and magnesium diglutamate. It only provides flavor to foods while in free form and in L-configuration. Generally glutamate is added to convenience food in 0,1-0,8% concentration and the values correspond to the amount of natural glutamate in tomato and parmesan cheese. MSG is mainly used in canned foods, dried mixtures, sauces and other processed foods. Glutamate is especially used in processed food in Asian cuisine while preparing food. A psychometric study carried out about taste found no difference between the addition of MSG or pure glutamate to foods in terms of its effect on aroma. Asian consumers learn to distinguish MSG taste and assess it from early childhood. Western consumers, however, have learned to distinguish the umami taste in recent years. (79).

2.13.4.Commercial use of Monosodium Glutamatin

MSG is generally used in combination with salt and it is generally prepared with 10 to 20% salt. The crude glutamic acid in crystalline form is hold in water suspended form first, then it solves and neutralized, afterwards, it becomes the monosodium salt with the addition of sodium hydroxide to the content. The solution is decolorized using activated carbon and, if necessary, it is concentrated under vacuum at 60 ° C prior to cooling and it is prepared (80).

2.13.5. Legal Regulations Regarding Monosodium Glutamatin

According to "Declaration on Food Additives Except Colorants and Sweeteners" updated on May 22, 2008, the use limit of glutamic acid or its salts in all foodstuffs was determined to be 10 g / kg and QS (Undetermined quantity, Quantum Satis) in flavoring substances (81).

As per this regulation, MSG is used as determined in Table 2.5 in accordance with international "ADI Not Specified" and "GRAS" applications (81).

Table 2. 4. The use of monosodium glutamate according to "Declaration on Food Additives Except Colorants and Sweeteners" related to Turkish Food Codex Regulations (81)

	Turkish Food Substances (except those included in paragraph d of article 5)	Flavorings
E 621 Monosodium Glutamate	10 g/kg, alone or in combination, as glutamic acid	QS

Quantum Satis (QS): No quantity limitation (as needed).

(Communication on the amendment of the Turkish food Codex communication on sugar. T.C.Official Gazette Number: 26883 Accessed at 28 May 2019 http://www.resmigazete.gov.tr/eskiler/2008/05/20080522-7.html)

2.13.6. The Effects of Monosodium Glutamatin on Health

2.13.6.1.Chinese Restaurant Syndrome

In 1968, Robert Ho Man Kwok wrote a letter to New England medical journal. He stated that he had numbness behind the neck, numbness in the arms and back, general weakness and palpation and these feelings started 15 minutes after he ate in a Chinese restaurant and stopped 2 hours later (73).

Dr. Kwok though that these symptoms must have been related to alcohol, sodium and flavor enhancer MSG used in Chinese food (73). He described similar symptoms in 6 consecutive letters, or in some cases he added symptoms such as numbness, tears, periorbital fasciculation, syncope and headache (71).

After the author of the journal had realized that these symptoms that Kwok wrote to the journal were similar to those he experienced in sensitivity toward acetylsalicylic acid, many studies on MSG started (10).

Dr. Kwok named these symptoms as "Chinese restaurant syndrome or MSG Complex Symptoms". The letter raised a great deal of conflict and interest regarding MSG consumption and side effects in the community and in the medical circles. In addition to

Chinese restaurant syndromes, MSG consumption was associated with reactions including asthma, urticaria, angioedema, and headache, tremors in children, psychiatric disorders and convulsion (10).

There were some problems in the initial studies conducted on Chinese restaurant syndrome. A group of researchers showed that when MSG was administered to the subjects by means of soup, water, broth through intravenous administration in a study conducted with six subjects, they showed dosage based reaction and almost all subjects responded. Afterwards, a study conducted at Harvard Medical School in 1977 revealed that 25% of the population might have encountered CRS. Although there were several debates regarding the reliability of this study, the study greatly increased sensitivity about MSG (71).

According to a hypothesis of a group of researchers, CRS had similar symptoms with acetylcholinosis in terms of skin redness, chest pain and flushing. The conversion of glutamate to acetylcholine by the tricarboxylic acid cycle supported this hypothesis. The researchers gave MSG and prophylactic atropine to the groups separately to prove their theories. The group received atropine did not show CRS symptoms (71).

The studies conducted following the definition of CRS syndromes; it failed to define its relationship with MSG consumption (71). In 1992 when the complaints from the society continued about MSG, FDA prepared a report with Federation of American Societies for Experimental Biology (FASEB) indicating that glutamate in food is scientifically safe (74).

In 1995, FASEB stated that a subgroup consuming MSG may experience some symptoms on an acute, temporary and personal basis. These are as follows (74)

1. Inflammation sensitivity in neck, chest and arms
2. Pressure and strain on face
3. Chest pain
4. Headache
5. Nausea
6. Palpation
7. Numbness in the waist, neck, arms and legs
8. Bronchospasm (in asthmatic ones)
9. Body weakness and tingling
10. Numbness

2.13.6.2.Monosodium Glutamat and Obesity

MSG is found to increase appetite, insulin release, ketogenesis and repress the release of growth hormone in adolescence so that it triggers obesity. In an experiment conducted on MSG's relation with increased appetite, sheep were given herbs containing different amounts of MSG and the relationship between MSG and herb eating was observed. As a result, herbs containing MSG was found to increase appetite 146% (82). Studies conducted on humans showed that humans feeding with food containing MSG were getting hungry in a short time (83). It was found that people consuming food with MSG ate faster and more (84). MSG given to rats in the postpartum period was found to lead hyperinsulinemia by over-stimulating the pancreas (85). A study by Bunyan et al. (1976) revealed that after giving 3 mg of MSG per 1 gram body weight to new born mice in different ways for 8 days, 16% of the test subjects died before going dry and 90% of the survivors became obese (86).

Chevassus et al. (2002) determined that an increase occurred in insulin values of people who received MSG orally (87). Nagata et al. (2006) stated that glucose, insulin, cholesterol and glycerides intensity in the blood of MSG-administered mice was higher than those in the control groups, these symptoms were mostly followed by obesity, advanced obesity was observed in many study subject while some of them had diabetes instead of obesity (88). According to Corder et al. (1990) only 4 mg/g of MSG was sufficient to destroy the rats that secreted growth hormone (89).

In China, an epidemiological study was performed on 752 healthy subjects to determine the effects of MSG on weight gain in humans. In the study, most of the participants brought their food from home so that it was easy to track MSG amounts in food. Of the participants 82% were consuming MSG and daily average MSG intake was 0.33 gram. The study concluded that MSG consuming subjects' weights were heavier than those who did not consume and MSG may be associated with weight gain independent from physical activity and total energy intake in humans (90).

2.13.6.3. Monosodium Glutamat and Neurological Effects

Glutamate, which is one of the major excitatory neurotransmitters, plays a key role in the viability and differentiation of neurons. On the other hand it is a well-known excitotoxin. Excessive accumulation of glutamate in synaptic space causes excitotoxicity and glutamate is associated with many neurological diseases. As a result

of glutamate accumulation, carriage systems associated with reuptake mechanism may be destroyed. Glutamate and glutamate receptors are responsible for central nervous system to work properly. Therefore, excessively active glutamate receptors may contribute chronic neurodegenerative diseases such as Alzheimer's, Parkinson's, Huntington's and ALS (Amyotrophic Lateral Sclerosis) from hypoxic-ischemic and traumatic brain injury as a result of neuronal damage (91). In a study of male 5-week-old rats, MSG was administered orally or subcutaneously for 10 days, with or without pioglutazone, except for pioglutazone. As a result of treatment with MSG, β-amyloid plaque accumulation was observed to increase in hippocampus region the rats, which is the part responsible from memory (92).

A group of researchers observed in their study that glutamate caused degeneration in the inner layers of the retina when newborn mice were feed with MSG. Another researcher reported in 1969 that when he forced newborn mice to eat MSG by injection (0,4 – 0,5 g/kg body weight MSG), a brain damage occurred and this damage especially occurred in the articulate nucleus" part of the hypothalamus. He also reported that neuronal death is limited to postsynaptic neurons and glutamate agonists. Following the discovery of this feature of glutamic acid, it has been used as a tool to create a brain lesion model in vitro and in vivo (93).

2.13.6.4. Monosodium Glutamat and Allergy

MSG can also cause development of asthma attack (94). In a double-blinded placebo controlled study on MSG, 130 patients sensitive to MSG were administered 5 r MSG and 38.5 % of the patients showed allergic reaction. However, the intensity of the symptoms did not change when the dosage increased (95,96). There are also publishing stating that MSG does have any effect on asthma attack. The most obvious example of MSG sensitivity is known as Chinese Restaurant Syndrome, where symptoms such as chest pain, headache, redness, shortness of breath, edema and sweating are observed (97). A study by Allen and Baker (1981) stated that asthma got worse 12 hours after consuming MSG (97).

2.13.6.5. Monosodium Glutamat and Reproduction System

According to a study by Bojanic et al. (2009) conducted on rats to examine the effects of MSG on ovary and menstrual cycle, one of the animal groups was injected 4 mg/gr

MSG and this process was repeated on 2nd, 4th, 6th, 8th and 10th days. At the end of the study, menstrual cycle of MSG was longer and frequent. In addition, cystic degenerations and fibrotic changes were identified in ovaries of rats. On the other hand, it was found that the ovaries contained a large number of atypical follicles and no corpus luteum was found (98).

2.13.6.6. Monosodium Glutamat and Migrain

Studies conducted to reveal the causes of headache by various researchers reported that food containing monosodium glutamate is one of the factors that lead migraine attack (99,100). A study found that high doses of MSG caused neuroendocrine abnormalities (101), neurodegeneration and neurotoxicity (102) and oxidative damage to different organs (103,104).

3. MATERIAL AND METHOD

This study was conducted on preparation school and third grade students studying in Department of Nutrition and Dietetics in Yeditepe University. The students were administered a questionnaire between December 1 and 31, 2018. Preparatory class students were sent invitations to the questionnaire to gather in one place, they were given information about the purpose of the questionnaire and they were told to fill the questionnaire about their food consumption frequency. Third grade students filled the questionnaire before the lesson, they were given information about the questionnaire and they were told to fill the questionnaire about their food consumption frequency. A total of 59 students from preparatory class and 50 students from third grade participated in the study. Students over 18 years of age filled in the consent form and they were included in the study. The study did not include students studying in first, second and fourth grade of Department of Nutrition and Dietetics and other registered students in Yeditepe University. The number of sampes to be used in the research; the number of prep students is 70 and the number of 3rd grade students is 57. The total number of universes is 127 people. At the end of the power analysis carried out in 95% confidence internal with 5% error margin, the number of samples was determined as 109 (105).Approval by Yeditepe University Clinical Research and Ethics Committee was obtained with the number KAEK 955 and date 14.02.2019

The study data was collected using General Information Form and Food Frequency Questionnaire (FFQ). FFQ was taken from a study named Investigation of the Effects of Some Nutrients Containing Food Additives and their Health: Risk Analysis of Foods in a Province in Istanbul by the researchers. Dear Irem KAYA CEBİOĞLU was contacted via e-mail for FFQ and a permission was taken from her. General Information From included 27 questions. Socio-demographic characteristics and nutrition habits of participants were asked. Participants were asked questions about their information level regarding monosodium glutamate. FFQ questioned packaged portion of the nutrients containing monosodium glutamate 15 questions. Monosodium glutamate-containing nutrients were determined by day, week, or month, and as desired. The questionnaire form was given in Annex-1.

The data were grouped in the assessment and necessary coding were done. After obtaining the data required for the research with the data collection forms on the

determined sample group, these data were analyzed using SPSS 20.0 on the computer. In the statistical analysis, the frequency distribution, percentages were analyzed by chi-square test (Fisher's Exact test) and T-test.

The following potential risk determination form was used to calculate risk analysis of substances containing monosodium glutamate (106).

$$\text{Potential dose} = \frac{MCC * CA * AEA * ED}{BW * AED} \text{ mg/kg/day}$$

MCC (Maximum chemical concentration) = the amount of chemical in the food/beverage.

CA (consumption amount) = the amount consumed daily

AEA (annual exposure average) = the number of days that the group consumed the food/beverage)

ED (exposure duration) = duration of consumption of food/beverage (year)

BW= body weight (kg)

AED (average exposure day) = average of the days that food/beverage is consumed (day)

It is planned to calculate the daily dose taken in the formula and compare this dose with ADI values in Turkish Food Codex.

Consumption amounts (CA), annual exposure average (AEA), exposure duration (ED), body weight (BW) and average exposure day (AED) data were obtained through a detailed questionnaire.

Consumption rate, frequency, duration and body weight values were taken as the average of the whole sample. The average of the exposure days was taken as the average number of days consumed by those consuming only the selected food.

Maximum chemical concentration in food were considered as the legally allowed maximum values. The maximum values recommended by the Turkish Food Codex and Codex Alimentarius were taken for monosodium glutamate.

CA date in the formula was given as L-kg/day. Therefore, we used some standards to adapt the unit of data we collected to the formula. These standards are as follows:

Instant soup 1 serving / bowl = 19g (Dry 1 package weight 76g and 4 servings / bowl recommendation),

• Ready-made biscuits: 1 biscuit = 6,25g (1 pack of biscuit biscuits; 28 pcs and 175grams.)

• Chocolate: 1 pack = 38 g (1 pack of tablets of chocolate),

• Wafer: 1 pack = 38g (1 pack of chocolate wafers),

• Ready cakes: 1 pack = 35 g (1 pack cake),

• Ice Cream: 1 pack = 52g (1 pack algida max),

• Ketchup and mayonnaise: 1 teaspoon = 10 g,

• Salad dressing: 1 pack = 10g,

• Pudding: 1 serving / bowl = 22.8g (1 package of 91g and 4 servings),

• Whipped cream and jellies: 1 package = 4 servings = 22g,

• Chips = 1 pack = 124g

• Bullet tablets: 1 piece = 10g

• Potato: 1 plate = 100 g

When the amount of consumption was given in L-kg / day in the formula, all units were calculated in L or kilograms and applied to the tables. The ADI value determined by JECFA for MSG is; 0-120 mg/kg (107).

4. RESULTS

Table 4. 1. Class distribution of individuals according to gender

Gender	Preparation class		Third Grade		Total	
	n	%	n	%	n	%
Female	56	94,9	46	92	102	93,6
Male	3	5,1	4	8	7	6,4

(p=0,7, p> 0,05)

When the distribution of individuals according to gender was examined, the study included 94,9% female (n=56) and 5,1% male (n=3) from preparatory class and 92% female (n=46), 8% male (n=4) from third grade, in total 93.6% (n=102) and 6,4% male (n=7) (Table 4.1.).

Table 4. 2. Shows the distribution of some anthropometric characteristics according to gender

	Distribution according to gender													
	Prep. class (n=59)				Third grade (n=50)				Total (n=109)				Significance	
	min	Max	Mean	Std. Dev.	min	Max	Mean	Std. Dev.	min	Max	Mean	Std. Dev.	T	Sig.
Age	18	28	18,8	1,70	20	30	21,94	1,88	18	30	20,27	2,35	-8,927	0,000
Weight (kg)	47	87	58,28	9,02	45	100	59,23	12,09	45	100	58,72	1,05	-0,465	0,643
Height (cm)	155	183	166,1	4,75	157	190	166,8	6,98	153	190	166,4	5,86	-0,555	0,580
BMI (kg/m^2)	17,7	31,9	21,03	2,78	17	36,10	21,15	3,49	17	36,1	21,09	3,11	-0,202	0,841

The mean age of the participants was found to be 20, 27± 2, 35 (min 18 max 30). A highly significant relationship was found between age and grade studied. The age increased in parallel with the grade studies (p=0,000, p<0, 05). Table 4.2. shows the

distribution of anthropometric characteristics such as age, weight, height and BMI according to gender. The mean BMI of the preparatory classes in the group was 21,03 kg/m², the average BMI of the 3rd grades was 21,05 kg/m², and the average BMI of all individuals was 21,09 kg/m².

Table 4. 3. Distribution of working status according to class

		Preparation class (n=59)		Third grade (n=50)		Total (n=109)	
		n	%	n	%	n	%
Working Status	Yes	1	1,7	7	14	8	7,3
	No	58	98,3	43	86	101	92,7

(p=0, 23, p> 0,05)(chi square fisher's exact test result)

In the distribution of the study status according to the class, 1,7% (n = 1), 14% (n = 7) and 7,3% (n = 8) from the preparatory class, the 3rd grade, and from the whole group worked respectively. No statistical relationship was found between the working status and the grade studied (p = 0,23), (Table 4.3.).

Table 4. 4. Distribution of work

Work	n	%
Private tutoring	1	0,9
Plates teacher	1	0,9
Assistantship	1	0,9
Fitness trainer	1	0,9
Physiotherapist	1	0,9
Shop assistant	1	0,9
Personal trainer in MacFit	1	0,9
Volunteer dietitian	1	0,9

Table 4.4. shows the works that participants do The participants worked as private tutor, plates teacher, assistant, fitness coach, physiotherapist, shop assistant, personal trainer at MacFit, volunteer dietitian.

Table 4. 5. Distribution of students according to the place they live and their class

		Preparation class (n=59)		Third grade (n=50)		Total (n=109)	
		N	%	n	%	n	%
Living at home or dormitory	Home	35	59,3	44	88	79	72,5
	Dormitory	24	40,7	6	12	30	27,5

(p= 0,002 Yates' chi square test)

Table 4.5.A high level of significant relationship was found between the status of staying at home or dormitory and the class. Accordingly, the higher the class rating is, the preference to stay at home increased (p=0,002, χ^2=11,84)

Table 4. 6. Distribution according to number of meals and daily working hours

	Distribution according to class							
	Preparation (n=59)		Third grade (n=50)		Total (n=109)		Significance	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	T.	Sig.
number of meals	3,1	0,79	3,0	1,01	3,1	0,9	0,4	0,6
Daily working hours	0,06	0,52	0,7	2,0	0,3	1,47	-2,2	0,02

When daily working hours of 3rd grade and preparatory classes were compared, daily working hours were found to be different after T test. Accordingly, the daily working

hours (x = 0,7) of the students in the classroom were higher than the students in the preparatory class (x = 0,06) (p = 0,02), (Table 4.6.)

There was no significant difference in the number of meals between the groups compared to the effect on the class (p = 0,6), (Table 4.6.)

Table 4. 7. Distribution of BMI values over meal times

	Are meal times regular?					
	Yes		No		Total sample	
BMI	n	%	n	%	n	%
Weak (<18,5)	10	17,2	8	15,7	18	16,5
Normal(18,5-24,9)	45	77,6	39	46,4	84	77,1
Overweight (25-29,9)	1	1,7	2	3,9	3	2,8
Obese (30=>)	2	3,4	2	3,9	4	3,7

(p= 0,94, p>0,05 χ^2=0,5)

No statistically significant result was found on the order of meal hours of BMI values (p = 0,94), In the mean BMI of the whole group, a thin person was 16,5% (n = 18) and the obese person was 3,7% (n = 4),(Table 4.7.)

Table 4. 8. The effect of having snacks on class

		Distribution according to class					
		Preparatory class (n=59)		Third class (n=50)		Total (n=109)	
		n	%	n	%	n	%
Having snacks	Yes	55	93.2	48	96	103	94,5
	No	4	6,8	2	4	6	5,5

(p= 0,68 fisher's exact test result)

The effect of having snacks on the class was not statistically significant (p=0,68), (Table 4.8.)

Table 4. 9. Distribution of having snacks on class

	Distribution according to class							
	Preparatory class		Third Grade		Total sample		Significance	
snack type	n	%	n	%	n	%	p	χ^2
Cake, cookie, biscuits	26	44,1	21	42	47	43,1	0,98	0,04
Fruit, fruit juice	30	50,8	19	38	49	45	0,25	0,18
Milk, yogurt, ayran, cheese	16	27,1	14	28	30	27,5	1	0,01
Patty etc.	2	3,4	4	8	6	5,5	0,41	1,1
Coke, soda	4	6,8	0	0	4	3,7	0,12	3,5
Chocolate, cream cake	23	39	17	34	40	36,7	0,73	0,28
Dried fruits	30	50,8	22	44	52	47,7	0,6	0,5
Fresh vegetables	6	10,2	8	16	14	12,8	0,53	0,82
Bread, cracker	11	18,6	14	28	25	22,9	0,35	1,34
Tea, coffee, Turkish coffee	40	67,8	37	74	77	70,6	0,6	0,5

Of the participants 94,5% (n=103) were having snacks in a day. The participants preferred tea, coffee (70,6%) and dried fruits (47,7%) the most, They preferred coke and soda (3,7%) the least. (Table 4.9.)

Table 4. 10. The effect of chronic disease on class

Distribution according to class							
		Preparatory class (n=59)		Third class (n=50)		Total (n=109)	
		N	%	n	%	n	%
Chronic disease	Yes	29	49,2	28	56	57	52,3
	No	30	50,8	22	44	52	47,7

(p=0, 6 χ^2= 0, 5)

Of the participants 52,3% had a chronic disease third class 56%; it was 49,2% of the preparatory class (Table 4.10.).

Table 4. 11. Classifications of chronic health problems of individuals

	Distribution according to class							
	Preparatory class (n=59)		Third class (n=50)		Total (n=109)		Significance	
	N	%	n	%	n	%	χ^2	p
Hypertension	2	3,4	1	2	3	2,8	0,19 fisher's	-
Gall bladder	-	-	-	-	-	-	-	-
Gastritis	2	3,4	1	2	3	2,8	0,19 fisher's	
Constipation	5	8,5	9	18	14	12,8	2,1	0,23
Ulcer	-	-	-	-	-	-	-	-
Reflux	5	8,5	6	12	11	10,1	0,3	0,7
Osteoporosis	-	-	-	-	-	-	-	-
Anemia	12	20,3	7	14	19	17,4	0,7	0,5
Coronary disease	-	-	1	2	1	0,9	1,1 fisher's	0,45
Diabetes	3	5,1	-	-	3	2,8	2,6	0,24
Obesity	1	1,7	1	2	2	1,8	0,01fisher's	1
Cancer	1	1,7	-	-	1	0,9	0,8 fisher's	1
Allergy	12	20,3	8	16	20	18,3	0,3	0,7
High cholesterol	-	-	-	-	-	-	-	-
Depression	2	3,4	8	16	10	9,2	5,1	0,04
Sleeping disorder	7	11,9	6	12,0	13	11,9	0,0	1
Neurological diseases	0	0	1	2	1	0,9	1,1	0,45
Other diseases	2	3,4	2	4	4	3,71	0,29 fisher's	1

The most common disease of the participants was allergy 18,3% (n = 20). Considering the distribution of diseases according to classes (χ^2=5, 1, p=0, 04), depression in the students in the third grade were significantly higher than the students in the preparatory class (Table 4.11.).

Table 4. 12. Factors affecting the allergy development in participants

Allergy factor	n	%
Chocolate, candy	2	1,8
Smells	1	0,9
Arveles	1	0,9
Skin products	1	0,9
Sun	1	0,9
Gluten, sugar	1	0,9
Apricot	1	0,9
Lactose, food coloring bemiks	1	0,9
Pollen	2	1,8
Grain and mushroom	1	0,9
Butter	1	0,9
Dust	7	6,4

The factors affecting participants' allergy development are as follows: dust (7 people), pollen (2 people), chocolate (2 people), smell, arveles, skin products, sun gluten, apricot, lactose, food coloring, bemiks, cereal and mushrooms, butter (1 person) (Table 4.12.).

Table 4. 13. Other disease and cancer types

		N	%
Other disease types	Asthma, bronchitis	1	0,9
	Insulin resistance	3	2,8
Cancer type	Leukemia	1	0,9

Of the participants 0,9% (n = 1) had asthma bronchitis and 2,8% (n = 3) had insulin resistance. As a cancer type, 0,9% (n=1) had leukemia (Table 4.13.).

Table 4. 14. Distrubution Of Food Consumption Frequency

	consumption frequency																			
Foods	Every day		6 days in a week		5 days in a week		4 days in a week		3 days in a week		2 days in a week		1 day in a week		1 day in two weeks		1 day in a month		Never	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Instant soup	-	-	3	2,8	-	-	2	1,8	3	2,8	4	3,7	4	3,7	6	5,5	17	15,6	70	64,2
Biscuits	5	4,6	2	1,8	6	5,5	6	5,5	9	8,3	25	22,9	15	13,8	13	11,9	15	13,8	13	11,9
Chocolate	18	16,5	2	1,8	5	4,6	16	14,7	13	11,9	17	15,6	21	19,3	6	5,5	8	7,3	3	2,8
Wafer	2	1,8	2	1,8	1	0,9	6	5,5	10	9,2	7	6,4	11	10,1	23	21,1	19	17,4	28	25,7
Ready cakes	1	0,9	2	1,8	4	3,7	2	1,8	7	6,4	13	11,9	14	12,8	15	13,8	23	21,1	28	25,7
Ice cream	1	0,9	2	1,8	2	1,8	-	-	2	1,8	9	8,3	9	8,3	17	15,6	49	45	18	16,5
Ketchup	3	2,8			2	1,8	6	5,5	10	9,2	10	9,2	11	10,1	14	12,8	19	17,4	34	31,2
Mayonnaise	3	2,8	2	1,8	1	0,9	7	6,4	13	11,9	9	8,3	12	11	12	11	15	13,8	35	32,1
Salad dressing	4	3,7	-	-	6	5,5	6	5,5	5	4,6	5	4,6	6	5,5	12	11	7	6,4	58	53,2
Pudding	-	-	-	-	-	-	-	-	2	1,8	2	1,8	3	2,8	15	13,8	41	37,6	46	42,2
Whipped cream	-	-	-	-	-	-	-	-	1	0,9	1	0,9	1	0,9	6	5,5	28	25,7	72	66,1
Jellies	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1,8	6	5,5	101	92,7
Chips	-	-	1	0,9	1	0,9	1	0,9	4	3,7	9	8,3	10	9,2	25	22,9	10	36,7	18	16,5
• Bullet tablets	-	-	-	-	2	1,8	5	4,6	4	3,7	3	2,8	6	5,5	3	2,8	14	12,8	72	66,1
Frozen potato	-	-	1	0,9	2	1,8	4	3,7	10	9,2	3	2,8	6	5,5	5	4,6	15	13,8	63	57,8

Accordingly, chocolate and biscuits were the most preferred foods while pudding, whipped cream, jellies, chips, bouillon tablets, frozen potatoes were the least preferred ones.(Table4.14.)

Table 4. 15. Average monthly consumption amounts of individuals consuming nutrients and approximate consumption times

	Preparatory class				Third Grade				The whole group			
	Amount		Duration		Amount		duration		amount		Duration	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Instant soup	1	3,28	1,22	1,94	2	6,58	1,34	1,96	2	5,0	1,28	1,95
biscuit	101	114,3	2,68	1,98	112	147,6	4,74	2,15	106	130,14	7,42	2,06
Chocolate	15	10,84	4,07	2,31	9	8,37	5,56	2,05	12	10,14	4,81	2,18
Wafer	5	8	2,56	2,42	4	5,93	4,34	2,63	5	7,6	3,45	2,52
cake	5	7,06	3,1	2,57	3	5,54	3,22	2,94	4	6,45	3,16	2,75
Ice cream	3	5,74	3,61	2,22	2	5,21	4,88	3,19	3	5,49	4,24	2,7
Ketchup	7	10,74	2,31	1,87	4	7,3	2,82	2,65	6	9,4	2,56	2,26
Mayonnaise	8	12,47	2,47	1,91	5	9,5	2,78	2,8	6	11,29	2,62	2,35
Salad dressing	4	8,47	1,31	1,68	5	8,3	1,82	2,3	4	8,36	1,56	1,99
Pudding	1	2,71	2,12	2,19	0,9	1,84	1,88	1,95	1	2,35	2	2,07
Whipped cream	0,4	0,62	1,31	1,82	0,7	2,08	1,22	2,03	0,5	1,48	1,26	1,92
Jellies	0	0,22	0,08	0,38	0,14	0,45	0,26	0,82	0	0,34	0,17	0,6
Chips	3,5	5,1	3,14	2,29	2	2,63	4,42	2,62	2	4,2	3,78	2,45
Bullion tablette	1	4,6	0,73	1,36	2	5,33	1,42	1,83	2	4,97	1,07	1,59
Frozen Potato	3,8	6,51	1,59	2,0	2	4,25	2,1	2,0	3	5,64	1,8	2

Table 4.15. shows the average monthly consumption and duration of the individuals consumed in the questionnaire. Preparatory class (n=3) From the class, ready biscuits and chocolates were consumed at the same time the most. Both classes consumed jellies

and whipped cream the least respectively. Both classes have consumed read biscuits for a long time.

Table 4. 16. Distribution of food consumption according to class

	Preparatory class				Third Grade				The whole group			
	Consumer		Non-consumer		Consumer		Non-consumer		Consumer		Non-consumer	
	n	%	n	%	n	%	n	%	N	%	n	%
Instant soup	21	35,6	38	4,4	18	36	32	64	39	35,8	70	64,2
Biscuits	50	84,7	9	15,3	46	92	4	8	96	88,1	13	11,9
Chocolate	58	98,3	1	1,7	48	96	2	4	106	97,2	3	2,8
Wafer	43	72,9	16	27,1	38	76	12	24	81	74,3	28	25,7
Ready cake	50	84,7	9	15,3	31	12	19	38	81	74,3	28	25,7
Ice Cream	51	86,4	8	13,6	40	80	10	20	91	83,5	18	16,5
Ketchup	45	76,3	14	23,7	30	60	20	40	75	68,8	34	31,2
Mayonnaise	45	76,3	14	23,7	29	58	21	42	74	67,9	35	32,1
Salad dressing	28	47,5	31	52,5	23	46	27	54	51	46,8	58	53,2
Pudding	36	61	23	39	27	54	23	46	63	57,8	46	42,2
Whipped cream	22	37,3	37	62,7	15	30	35	70	37	33,9	72	66,1
Jellies	3	5,1	56	94,9	5	10	45	90	8	7,3	101	92,7
Chips	49	83,1	10	16,9	42	84	8	16	91	83,5	18	16,5
Bullet tablets	16	27,1	43	72,9	21	42	29	58	37	33,9	72	66,1
Frozen potato	31	52,5	28	47,5	15	30	35	70	46	42,2	63	57,8

Table 4.16. shows distribution of food consumption according to classes. Among the questions asked in the questionnaire, the most consumed food is chocolate (97, 2%) (n = 106). The most consumed food consumesin the preparatory class was 86,4% (n = 51), 3rd the class, the most consumed food was chocolate 96% (n = 48). The least preferred food was preparatory 5,1% (n = 3) of the jellies, 3rd the class 10% (n = 5) consumed.

Table 4. 17. Potential risk table of monosodium glutamate for preparation class

Food Name	MCC (mg/kg)	CA (kg/day)	AEA (day/year)	ED (year)	BW (kg)	AED (days)	Potentıal Dose (mg/kg/day)
Instant Soup	10	0,007	18,25	1,22	58	25	0,0003
Ready Biscuit	10	0,065	97,46	2,67	58	77	0,0379
Chocolate	10	0,041	185,44	4,06	58	157	0,0339
Wafer	10	0,028	59,81	2,55	58	69	0,0107
Cake	10	0,032	66,76	3,10	58	55	0,0208
Ice Cream	10	0,045	40,25	3,61	58	37	0,0305
Ketcup	10	0,009	71,72	2,30	58	60	0,0043
Mayonnaıse	10	0,009	83,76	2,47	58	73	0,0044
Salad Sauce	10	0,005	54,69	1,30	58	99	0,0006
Pudding	10	0,015	15,80	2,11	58	20	0,0043
Whipped Cream	10	0,008	5,29	1,30	58	14	0,0007
Jellies	10	0	0,61	0,08	58	12	0,0000
Chips	10	0,105	44,25	3,13	58	42	0,0597
Bullion Tablet	10	0,002	20,91	0,72	58	54	0,0001
Frozen Potato	10	0,059	48,23	1,59	58	65	0,0120

MCC (Maximum chemical concentration)(mg/kg)CA (consumption amount)(kg/day)AEA (annual exposure average)(day/year)ED (exposure duration)(year)BW= body weight (kg)AED (average exposure day) (days)Potential dose(mg/kg/day)

Table 4.18. Potential risk table of monosodium glutamate for preparation class according to. The study compared, instant soup, instant biscuits, instant cakes, chocolate, wafer, ice cream, ketchup, mayonnaise, salad dressing, pudding, whipped cream, jellies, instant soups, bouillon tablets, chips and frozen potatoes with the critical upper limit value determined by Turkish Food Codex with ADI values.Potential doses for preparation class did not exceed ADI (Daily Intake Level) (0-120).

Table 4. 19. Risk table of monosodium glutamate for third grade

Food Name	MCC (mg/kg)	CA (kg/day)	AEA (day/year)	ED (year)	BW (kg)	AED (days)	Potentıal Dose (mg/kg/day)
Instant Soup	10	0,0068	34,40	1,34	59	96	0,0002
Ready Biscuit	10	0,0729	95,94	4,74	59	104	0,0540
Chocolate	10	0,0384	122,04	5,56	59	126	0,0350
Wafer	10	0,0296	58,60	4,34	59	77	0,0166
Cake	10	0,0224	46,44	3,22	59	75	0,0076
Ice Cream	10	0,0416	37,00	4,88	59	46	0,0277
Ketcup	10	0,0068	47,50	2,82	59	79	0,0020
Mayonnaise	10	0,0066	51,18	2,78	59	88	0,0018
Salad Sauce	10	0,005	60,74	1,82	59	132	0,0007
Pudding	10	0,0121	11,92	1,88	59	22	0,0021
Whipped Cream	10	0,0066	9,60	1,22	59	32	0,0004
Jellies	10	0,002	1,68	0,26	59	17	0,0000
Chips	10	0,1029	26,64	4,42	59	32	0,0642
Bullion Tablet	10	0,0041	32,32	1,42	59	77	0,0004
Frozen Potato	10	0,032	26,18	1,20	59	87	0,0020

MCC (Maximum chemical concentration)(mg/kg)CA (consumption amount)(kg/day)AEA (annual exposure average)(day/year)ED (exposure duration)(year)BW= body weight (kg)AED (average exposure day) (days)Potential dose(mg/kg/day)

Table 4. 20. Risk table of monosodium glutamate for third grade according to.the study compared, instant soup, instant biscuits, instant cakes, chocolate, wafer, ice cream, ketchup, mayonnaise, salad dressing, pudding, whipped cream, jellies, instant soups, bouillon tablets, chips and frozen potatoes with the critical upper limit value determined by Turkish Food Codex with ADI values.Potential doses for 3rd class did not exceed ADI (Daily Intake Level) (0-120).

Table 4. 21. Potential risk table of monosodium glutamate for all classes

Food Name	MCC (mg/kg)	CA (kg/day)	AEA (day/year)	ED (year)	BW (kg)	AED (days)	Potentıal Dose (mg/kg/day)
Instant Soup	10	0,007	25,66	1,27	58,7	57	0,0002
Ready Biscuit	10	0,0069	96,76	3,62	58,7	90	0,0046
Chocolate	10	0,039	156,67	4,75	58,7	143	0,0346
Wafer	10	0,029	59,25	3,37	58,7	73	0,0135
Cake	10	0,027	57,44	3,15	58,7	62	0,0134
Ice Cream	10	0,043	38,76	4,19	58,7	41	0,0290
Ketcup	10	0,008	60,61	2,54	58,7	67	0,0031
Mayonnaise	10	0,008	68,81	2,61	58,7	79	0,0031
Salad Sauce	10	0,005	57,46	1,54	58,7	114	0,0007
Pudding	10	0,013	14,01	2,00	58,7	21	0,0030
Whipped Cream	10	0,007	7,26	1,26	58,7	21	0,0005
Jellies	10	0,001	1,10	0,16	58,7	15	0,0000
Chips	10	0,104	36,17	3,72	58,7	37	0,0644
Bullion Tablet	10	0,003	26,14	1,04	58,7	67	0,0002
Frozen Potato	10	0,046	38,11	1,41	58,7	72	0,0058

MCC (Maximum chemical concentration)(mg/kg)CA (consumption amount)(kg/day)AEA (annual exposure average)(day/year)ED (exposure duration)(year)BW= body weight (kg)AED (average exposure day) (days)Potential dose(mg/kg/day)

Table 4. 22. Potential risk table of monosodium glutamate for all classes according to.The study compared, instant soup, instant biscuits, instant cakes, chocolate, wafer, ice cream, ketchup, mayonnaise, salad dressing, pudding, whipped cream, jellies, instant soups, bouillon tablets, chips and frozen potatoes with the critical upper limit value determined by Turkish Food Codex with ADI values.Potential doses for all class did not exceed ADI (Daily Intake Level) (0-120).

Table 4. 23. Potential dose risk assessment table

	Preparatory class		Third Grade		The whole group	
	Potential risk (mg/kg/day)	ADI mg/kg	Potential risk(mg/kg/day)	ADI mg/kg	Potential risk(mg/kg/day)	ADI mg/kg
Instant Soup	0,0003	0-120	0,0002	0-120	0,0002	0-120
Biscuit	0,0379	0-120	0,0540	0-120	0,0046	0-120
Chocolate	0,0339	0-120	0,0350	0-120	0,0346	0-120
Wafer	0,0107	0-120	0,0166	0-120	0,0135	0-120
Cake	0,0208	0-120	0,0076	0-120	0,0134	0-120
Ice Cream	0,0305	0-120	0,0277	0-120	0,0290	0-120
Ketcup	0,0043	0-120	0,0020	0-120	0,0031	0-120
Mayonnaıse	0,0044	0-120	0,0018	0-120	0,0031	0-120
Salad Sauce	0,0006	0-120	0,0007	0-120	0,0007	0-120
Pudding	0,0043	0-120	0,0021	0-120	0,0030	0-120
Whipped Cream	0,0007	0-120	0,0004	0-120	0,0005	0-120
Jellies	0,0000	0-120	0,0000	0-120	0,0000	0-120
Chips	0,0597	0-120	0,0642	0-120	0,0644	0-120
Bullion Tablet	0,0001	0-120	0,0004	0-120	0,0002	0-120
Frozen Potato	0,0003	0-120	0,0020	0-120	0,0058	0-120

The study compared, instant soup, instant biscuits, instant cakes, chocolate, wafer, ice cream, ketchup, mayonnaise, salad dressing, pudding, whipped cream, jellies, instant soups, bouillon tablets, chips and frozen potatoes with the critical upper limit value determined by Turkish Food Codex with ADI values. Potential doses for all class did not exceed ADI (Daily Intake Level) (0-120).

Table 4. 24. The degree of significance between classes for MSG consumption and potential dosing

	Preparation class (n=59)				Third grade (n=50)				Total (n=109)		Significance	
	Min.	Max.	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.	Mean	Std. Dev.	t	p
MSG amount consumed (g)	0,064	0,58	0,29	0,100	0,065	0,41	0,27	0,081	0,28	0,1	1,6	0,1
The amount of potential consumed (mg/kg/day)	0,0002	0,056	0,013	0,012	0,0001	0,036	0,009	0,007	0,011	0,01	1,8	0,07

Monosodium glutamate consumption was 0,29±0,1 g for preparation class and 0,27± 0,08g for third class. There was no statistically significant difference between the groups (p = 0,1, p>0,05).The potential dose was 0,013± 0,01 mg/kg/dayfor the preparation class and 0,009± 0,007mg/kg/day for the third class. There was no statistically significant difference between the groups for the T test (p = 0,07, p > 0,05),(Table 4.21.).

Table 4. 25. English translations of thequestions about MSG directed to the students

English questions MSG	Turkish guestions MSG
The food additives are only used in packaged foods	Gıda katkı maddeleri sadece paketlenmiş hazır gıdalarda kullanılır.
I believe that it is a must for preserving foods and living conditions.	Gıdaları koruyucu ve yaşam koşullarına göre olmazsa olmazlar arasında olduklarını düşünüyorum.
I believe that food additives are very harmful and they become more harmful to health with technologic developments.	Gıda katkı maddelerinin çok zararlı oldukalrını ve teknolojik gelişmelerle daha da sağlığa zararlı hale geldiğini düşünüyorum.
E-coded food additive are not unhealthy	E kodlu katkı maddeleri sağlığa zarralı değildir.
It would be healthier if additives were not used	Gıda katkı maddeleri kullanılmazsa gıdalar daha sağlıklı olur.
The food additives are carcinogenic.	Gıda katkı maddeleri kanser yapıcıdır.
The use of additives in food is not necessary.	Gıda katkı maddelerinin besinlerde kullanılması gerekli değildir.
I think additives include preservatives and I care about it so much. .	Gıda katkı maddelerinin koruyucu olduğunu düşünüyorum, çok önemsiyorum.
I think additives are very harmful and I avoid consuming them	Gıda katkı maddelerinin çok zarralı olduğunu düşünüyorum ve tüketmekten kaçınıyorum.
The use of monosodium glutamate in children at growth age, pregnant women, breastfeeding women and elderly people	Monosodyum Glutamat içeren besinlerin büyüme gelişme çağınmdaki çocuklarda, gebelerde, emzikli bayanlarda ve yaşlılarda kullanımı sınırlandırılmalıdır.
The taste occurred in mouth after eating food containing monosodium glutamate is named as umami which the fifth taste.	Monosodyum glutamat içeren besinleri yedikten sonra ağızda oluşan umami tad 5. Tat olarak bilinmektedir.
After eating products containing monosodium glutamate, I	Monosodyum glutamat içeren ürünleri yedikten sonra kısa süre

get hungry again in a shorter time.	içinde yeniden acıkıyorum.
I like the taste of products containing monosodium glutamate.	Monosodyum glutamat içeren ürünlerin tadlarını daha çok beğeniyorum.
Products containing Monosodium Glutamate increases my appetite more.	Monosodyum glutamat içeren ürünler iştahımı daha fazla açıyor.
After I eat monosodium glutamate-containing products (chips, ready soups, ready Biscuits, Chocolate, waffles etc.), I feel like I want to eat more.	Monosodyum glutamat içeren ürünleri(cips, hazır çorba, hazır bisküvi, çikolata, gofret vb.) yedikten sonra daha fazla yemek yeme ihtiyacı hissediyorum.
The use of monosodium glutamate containing nutrients must be limited in growing children, pregnant women and elderly.	Özellikle çocukların tükettiği cips, gazlı içecekler, çikolata, dondurma gibi ürünleri alırken gereğinden fazla katkı maddesi içerdiğini düşünerek büyük tereddüt yaşıyorum.
I believe that additives are used in a more controlled way in packaged food instead of foods that are sold short	Katkı maddelerinin, açıkta satılan ürünler yerine ambalajlı ürünlerde daha kontrollü kullanıldığına inanıyorum.
Glutamate can cause symptoms and complaints such as headache, burning on the back, feeling of pressure in the chest, sweating and urticaria.	Glutamat baş ağrısı, ensede yanma, göğüste baskı hissi, terleme, ürtiker gibi belirti ve yakınmalara yol açabilir.
I don't mind consuming foods (ready soup, meatballs Mortar, chicken bouillon, etc.) containing glutamate (MSG) which is used as artificial flavor enhancer.	Yapay lezzeti artırıcı olarak kullanılan Glutamat(MSG) içeren gıdaları(hazır çorba, köfte harcı, tavuk bulyon vb.) tüketmekte sakınca görmem.
I prefer Ready or semi-prepared foods rather than additive-free homemade food	Hazır veya yarı hazır gıdalar yerine katkı maddesi içermeyen ev yapımı gıdaları tercih ederim.

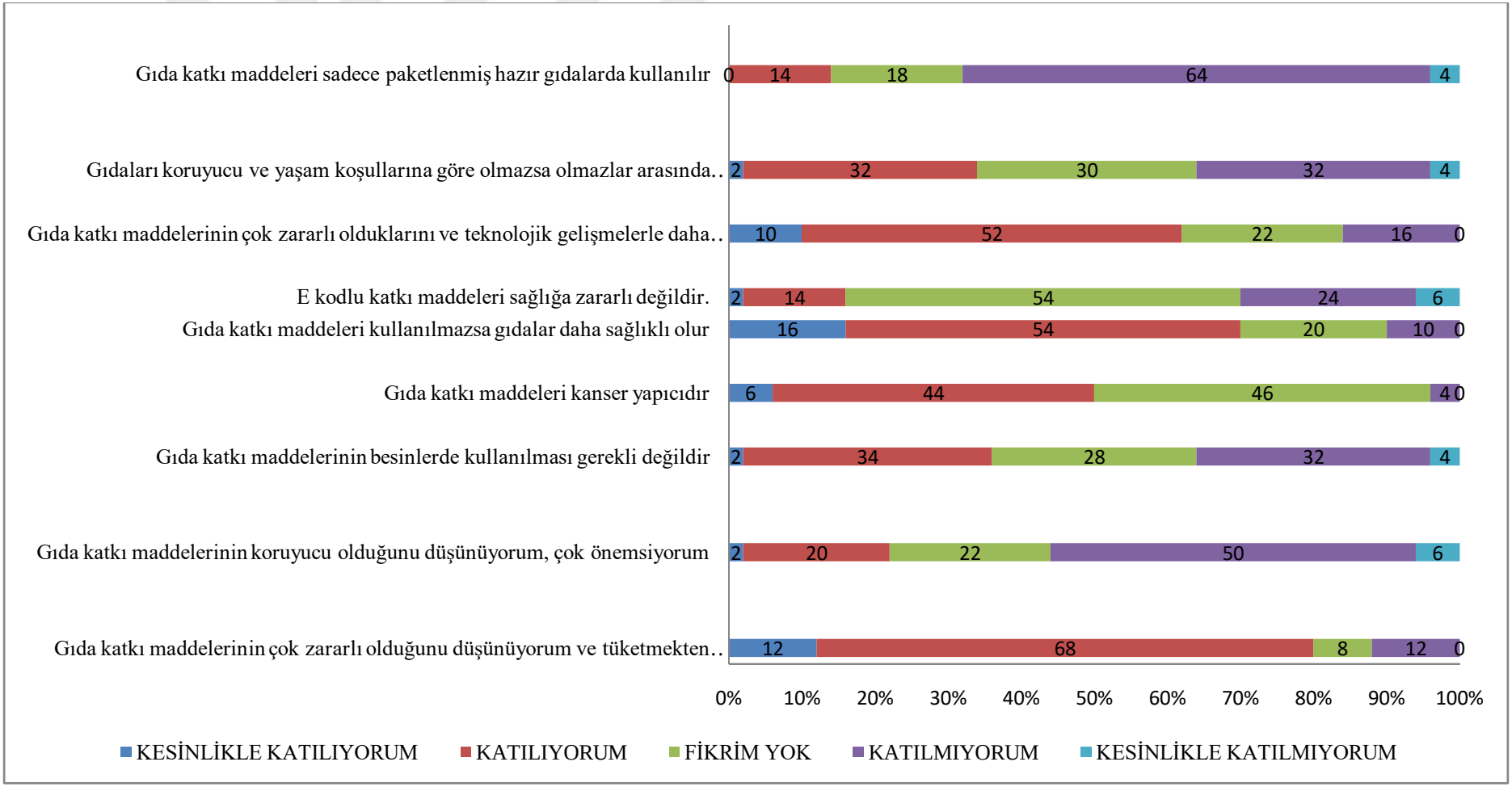


Figure 1 The Opinions of Preparatory Class Students Regarding Monodosium Glutamate-1

This study, the questions were planed in Turkish because they were asked to Turkish students in order to preserve their originality.

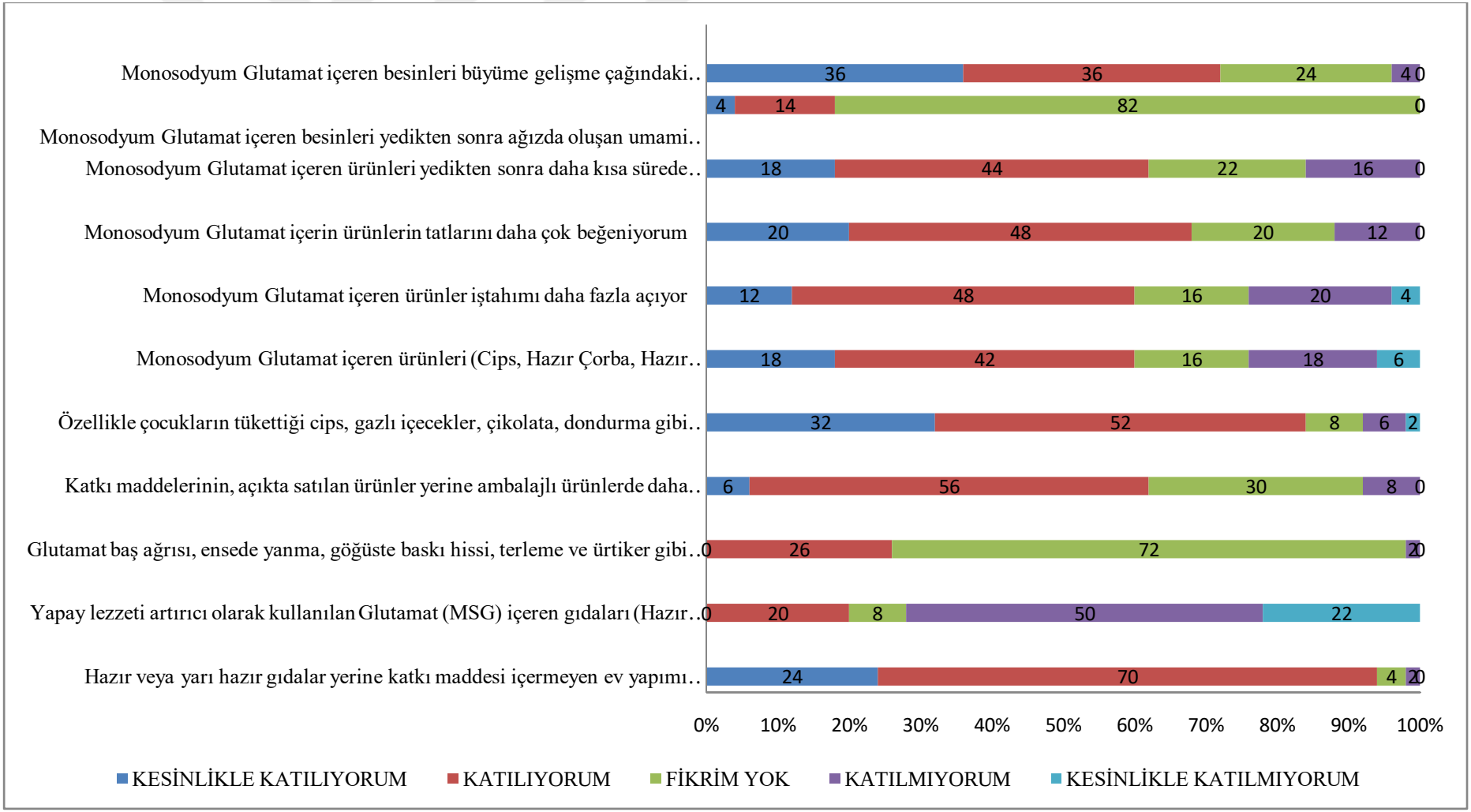


Figure 2 The Opinions of Preparatory Class Students Regarding Monosodium Glutamate-2

This study, the questions were planed in Turkish because they were asked to Turkish students in order to preserve their originality.

Figure 3 The Opinions of Third Grade Students Regarding Monosodium Glutamate-1

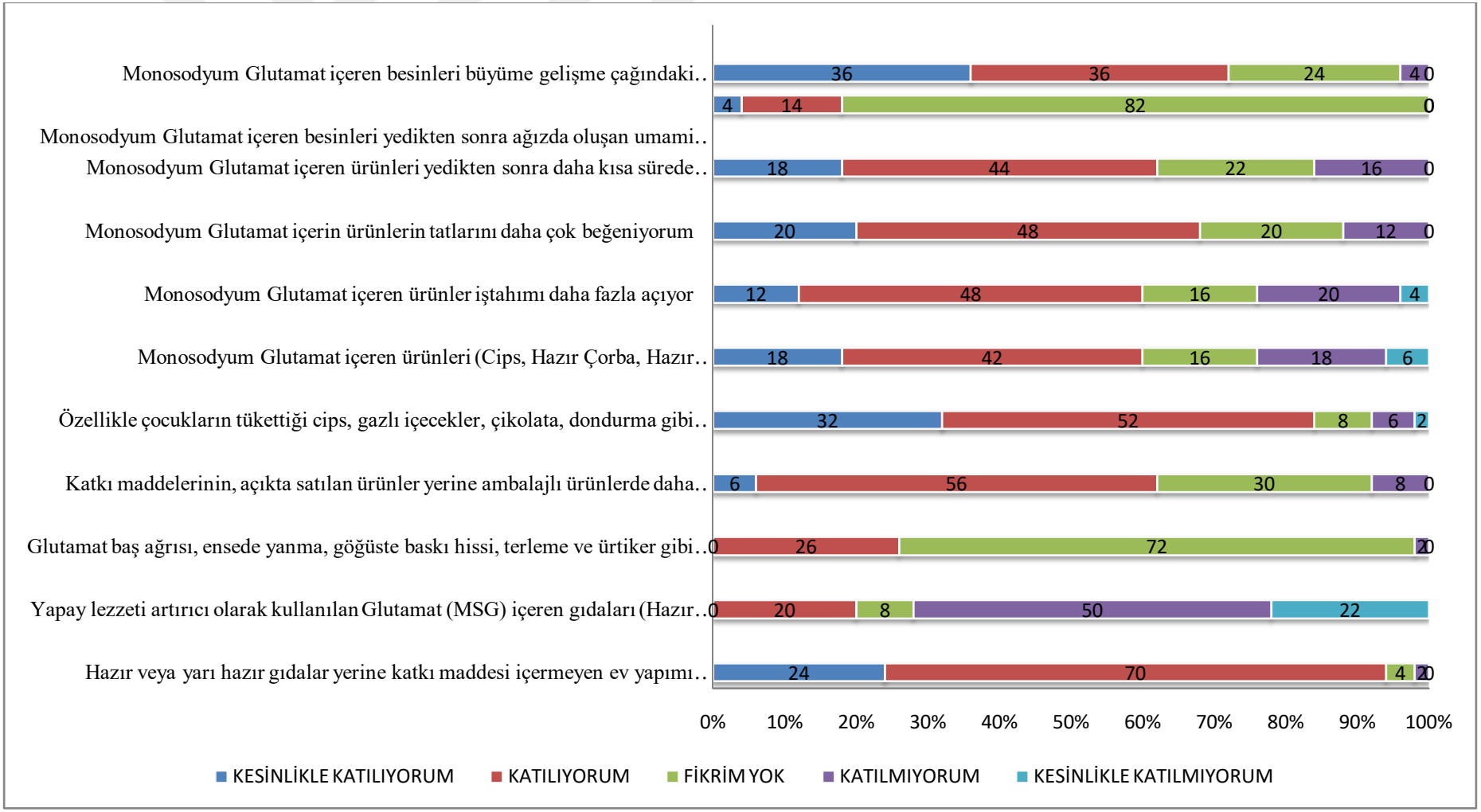


Figure 4 The Opinions of Third Grade Students Regarding Monosodium Glutamate-2

This study, the questions were planed in Turkish because they were asked to Turkish students in order to preserve their originality.

5. DISCUSSION and CONCLUSION

Monosodium glutamate which is used as a food additive in foods as flavoring. In our modernizing society, the consumption of ready food has become a popular culture among individuals. Therefore, people are much more exposed to additives such as MSG in these foods.The positive and negative effects of the additives used on human health have been an important topic of discussion for many years**.** In this study, we assessed whether the students in third grade and preparatory class in Nutrition and Dietetics Department of Yeditepe University had awareness regarding the monosodium glutamate and we made a risk analysis. Afterwards we compared the potential risks with recommended ADI values.

The study included from the preparatory class 94,9 % (56) female individuals, 5,1% (3) male individuals,from the third class 92 % (46) female individuals from and 8% (4) male individuals. The reason for the fact that the ratio of women to men was higher in both classes was that the Department of Nutrition and Dietetics is predominantly the preferred section of women.While the mean age of all individuals was average 20,27 ± 2,35 the mean BMI of women was 20,8 ± 2,95 kg /m² and the mean BMI of men was 24,6 ± 3,39 kg/m². The mean BMI of the whole group was value of 21,09 ± 3,11 kg/m², according toit was found to be of normal weight by WHO standards.The emergence of hormonal and psychological changes especially in female students and the increasing interest of students in body images and a widespread movement of having by age *a thin body* among women in recent years may be the main reason of this situation (106). The fact that men perform activities to increase muscle mass may be due to their desire to have a shaped body in determining BMI value of 24,6 kg/m²,When the BMI values of the whole group were examined in Table 4.7, 16,5% (n=18)were thin (BKI <18,5 kg/m²) while 3,7% (n=4) were obese (BKI>30,0 kg/m²). According to a study by Turkey Nutrition and Health Survey (TNHS), adult obesity prevalence over 18 was 30,3 % (41 % female, 20,5 %male), morbid obesity was2,9 % (women 5,3 % men %0,7 %) (108, 109).In our study group the prevalence of obesity by age was found to be lower than Turkey's standards.

Yıldırım B.(2018) found the mean BMI of 21,0 ± 2,9 kg/m² in his study conducted on university students in 2018 (110). A study by Vassigh G.(2012) conducted at Hacettepe University, the mean BMI values were found to be 23,3 ± 3,4 kg / m² in

males and 20,9 ± 2,6 kg / m² in females (111). In this study Body Mass Indexes were found to be in the normal range in terms of their weights, as was the case in many previous studies on university students.

The fast-food style of the students in the university age, the fast-food style of eating, sedentary life, the increase in packaged product consumption and unhealthy food preferences are associated with some related diseases. In this study, the most common diseases are allergy 18,3% (n=20), anemia 17,4% (n=19) and constipation 12,3% (n=14). Factors in the emergence of anemia is high among students, a source of iron the fact that it survives enough nutrients, and interfere with the body's absorption of iron, tea, coffee consumption due to the increased number of can be considered.This study found high constipation; it can be caused by the low consumption of fruits and vegetables and the high consumption of packaged products. Depression ($\chi 2$=5,1, p=0,04) was statistically significant in third graders compared to prep class students.. As mentioned above, depression is a disease diagnosed by the doctor for the situation, students are not diagnosed with depression, expressed only in depression, pessimism and anxiety in the future can interpret as. When we compare the disease status with the frequency and amount of use of products containing monosodium glutamate in packaged products, it is thought that the products consumed have no relation to chronic diseases, although the quantity added in the products is usually not stated explicitly.

Considering the instant soup consumption, preparatory class consumed bowl/month 1±3,28 (0,007 L/day) average for 1,22±1,9 years and third grade students consumedbowl/month 2±6,58 (0,0068L/day) average for 1,34±1,96 years. Regarding the bullion tablets use, preparatory class used 1±4,6 (0,002g/day) average for packet/month 0,73±1,36 years while third grade students used for packet/month2±5, 33 (0,0041g/day) averages for 1,42±1,83 years.Ready-to-eat soup consumption is very close to each other in both classes. There was no statistically significant difference for ready-to-eat soup consumption. There was no statistically significant difference in the use of bulion tablets, even though it was slightly higher for third grade students studying in the classroom.

In the risk analysis study conducted by Kaya I. (2011) in a district in Istanbul, the potential risk calculations made on the basis of the recommended maximum limit were found to be 0.0004 mg/kg for instant soup and 0.0002 mg/kg for bouillon tablets (4). When the frequency of consumption of university students within this study was compared, the reason why it is high is that they are more oriented towards ready-made

foods. According to data of MUMSAD, 1.9 million instant soup bowls were consumed in Turkey in 2015. Turkey's instant soup market grew 17 percent in 2015, reaching 220 million pounds (112). There is a rapid increase in the consumption of ready-to-eat soup in the country.

Table 4.21.the average daily body weight for MSG consumption was 0,29±0,1g for prep class and 0,27±0,081g for third class. On average MSG consumption was found very close to each other in each class and a statistically significant difference was found between the groups (p= 0,1, p>0,05). The number of chips consumption was 83,1% (n=49), the third grade was 84% (n=42), respectively (table 4.16).

Soup consumption rate was 35,6% (n = 21) for the preparation class and 36% (n = 18) for the third class (Table 4.16.). The proportions of soups and chips consumed were similar between groups as in MSG.

The consumption rate of bouillon tablets was 27,1% (n = 16) for the preparation class and 42% (n = 21) for the third class (Table 4.16.). In other words, although the preparation class is not statistically significant, it consumes more MSG, while the consumption rate of bouillon tablets is higher than the third classes. This may be due to the fact that students prefer meat/chicken bouillon as a flavor factor in practical cooking due to the fact that the courses are more intensive.

Ketchup consumption rate (preparation class n = 45 76,3%, third class n = 30 60%), mayonnaise consumption rate (preparation class n = 45 76,4%, third class n = 29 58%), chocolate consumption rate (preparation class n = 58, 98,3%, third class n = 48, 96%)
MSG consumption was higher in the preparatory class than in the third grade (soup 4.17 L/day in the preparatory class, 0,006 L/day in the third grade) (Table 4.17. and Table 4.18.). Soup consumption of the preparation class as well as the consumption rate higher than the third grade.

The average dose of potential doses was 0,013 ± 0,012 mg/kg / day for the preparation class and 0,009 ± 0,007 mg/kg / day for the third class (Table 4.21.). Although the third grades were not statistically significant compared to the prep classes (p = 0,07), they were exposed to less potential doses.

Potential doses (0,013±0,012 mg/kg/day and 0,009±0,007mg/kg/day) for preparation and third grade did not exceed ADI (Daily Intake Level) (0-120). Although there is no statistically significant difference, it can be said say that the potential dose of the preparation class is higher than the third class. Although the level of information about MSG does not appear different, third-graders may not increase their knowledge

about MSG, but they may be taught about healthy nutrition, balanced nutrition, and lead to healthier snacks by making them less prone to these foods.

In this respect, when we look at the individual potential doses of nutrients, soup, ketchup and mayonnaise were found to be higher in the preparation class than in the third class (Table 4.17). In the third grade, the potential dosage for chips, bulion tablets, chocolate, biscuits is higher when compared with the preparation class (Table 4.18). This creates a balance in the total potential exposure.

Consumption amount, consumption rate, potential dose and MSG consumption amounts are considered to vary depending on a certain factor. The higher the potential dose of the students in the preparatory class compared to the students in the third grade, the higher the number of packs in the foods they consume and the higher the weight of MSG. Even if the consumption rate of the third grade students was high, the potential dose and MSG amount were lower than the prep class. Considering that the third classes received training on the subject, we can say that they reduce the amount of consumption. As the preparatory class did not receive training on the subject yet, there was no awareness of consumption amounts, as expected, they consumed too much in quantity.

In this case, 88% of the students who were studying in the 3rd grade were staying at home while 59,3% of students in preparatory class were at home. It was found to be statistically significant ($p = 0,002$, $p < 0.05$ $x^2 = 11,84$).The increase in the preference of staying at home may have caused third grade students to for MSG-containing products because they are fast and practical, considering that food preparation and cooking techniques are long for students.

Considering the working situation, the daily working hours ($x = 0,7$) of the 3rd year students were higher ($x = 0,06$) ($p = 0,02$, $p < 0,05$) than the students who were studying in the preparatory class and it may be directed towards ready-to-eat foods outside of the house. Considering that the study hours of the 3rd classes were also higher compared to the preparatory classes, the decrease in the time allocated for cooking and the need for practical solutions increased the tendency towards consumption of prepared food.

In this study in preparatory class 98,3% ($n = 58$) consumed chocolate and 83,1% ($n = 49$) consumed chips, while of the students in third grade 96% ($n = 48$) consumed chocolate and 92% ($n = 46$) consumed ready biscuits. In the whole group, 97.2% ($n = 106$) consumed chocolate and 88,1% ($n = 96$) consumed biscuits the most. We can say

that almost the entire group consumed chocolate, they may prefer chocolate because it is easy to find between meals and gives pleasure as they eat. According tothe TÜDER 2010 data, the most common foods in our country are ice cream, followed by chocolate and biscuits (113). In this study, consumption of chocolate and biscuits is in the first place in a similar way. Considering the monthly amount, in preparatory class the most consumed foods are chocolate and chips asmonth15±10,84 package (0,041g/day) for 4,07±2,31 years and month3,5±5,1 package (0,105g/day) average 3,14±2,29 years (0,105g/day) while in third grade students, it was month9±8,37 package of chocolate foraverage 5,56±2,05 years (0,0384 g/day) and month112±147,64 package of biscuits for average month4,74±2,15 (0,0729) years. Their BMI remained the same despite consuming unhealthy foods.

The most preferred in the beverage group as snack preference was tea, coffee (70,6%) fruit juice (45%) milk and ayran (27,5%). According to a study carried out about tea, 90.1% of the respondents stated that tea consumption was in the top three. 42,1% of the first three consumers consumed Turkish coffee. According to TNSH 2015 results, the frequency of instant fruit juice consumption was found to be 10,1% (109). The juice consumption frequency in our study was significantly higher compared to Turkey in general. The most preferred food group was dried fruits (47,7%), cakes, cookies, biscuits (43,1%) and chocolate cake (36,7%). According to TNSH 2015 data, the frequency of daily nuts consumption was 15% (109). At the end of the research, it was seen that the students consumed more readily and easily accessible foods and they did not consume more fruits and vegetables. While the consumption of tea and coffee was quite high in individuals, the consumption of milk and freshly squeezed fruit juice was as low. Considering the frequency of food consumption university students generally did not have adequate and balanced nutrition because they did not have a regular home life and do not have a healthy diet.

In this study; instant soup, instant biscuit, instant cake, chocolate, wafer, ice cream, ketchup, mayonnaise, salad dressing, pudding, whipped cream, jellies, instant soups, bouillon tablets, chips and frozen ready potatoes were investigated because of the monosodium glutamate contain.

The study compared, instant soup, instant biscuits, instant cakes, chocolate, wafer, ice cream, ketchup, mayonnaise, salad dressing, pudding, whipped cream, jellies, instant soups, bouillon tablets, chips and frozen potatoes with the critical upper limit value determined by Turkish Food Codex with ADI values. Potential risk calculations for

chips in the preparatory class based on the highest limit recommended were 0,09797 mg/kg/day for chips, while chips value for the 3rd grade students were 0,0642 mg/kg/day, while the potential risk value of the whole group was found to be 0,0644mg/kg/day. None of them exceeded the ADI value. None of the other comparable food groups exceeded ADI. In this study, the reasons for low MSG intake values were attributed to the fact that the foods do not contain monosodium glutamate (noodles, dashi soup, smoked fish, etc.) as much as Chinese cuisine.

The questions posed to students at the level of knowledge about monosodium glutamate are given in Figure 1,2,3,4.

47,5% the prep class students stated that they had no idea, while 34% of the 3rd grade students agreed for "It is not necessary to use food additives in food." (p: 0,02, p<0,05). A statistically significant difference was found between the groups (p: 0, 02, p<0,05). In other words, while third classsupported 'it is not necessary to use food additives in food, the preparatory classes did not have any ideas about the subject.

46% the third grade students sad that they had no idea while 62,7% stated that "Food additives are cancerous. A statistically significant difference was found between the groups (p = 0,000, p <0,05). Considering that they were not educated in the subject, they may think that some of the food additives (nitrite and nitrate) are cancerous.

83,1% the students stated that they had no idea while 54% of the thirds graders said that "E coded substances are not harmful for health. Individuals in both classes do not have any ideas about the question.

55,9% the students in preparatory class stated that they agreed the statement that "Food additives become more harmful in parallel with technological developments" while 52,0% students studying in third grade agreed. The students in both classes think that food additives become more harmful in parallel with technological developments.

47,5% the preparatory students agreed the statement that "I prefer home-made food without additives to ready-made or half ready-made" while 70% of the students studying in third grade agreed. They strongly agreed that homemade foods should be consumed by students in the preparatory class for the question posed. There was a statistically significant difference between the groups (p = 0,005, p <0,05). It is thought that the third year students should receive nutritional education and know the damages of the additives such as cancer-makers are distinctive in their choice of home-made food.

78% the students studying in the preparatory class stated that they had no idea to the statement “Monosodium glutamate can cause headaches, nuchalgia, chest pressure, sweating and urticaria.” while 72% of third graders had no idea. Both groups had no idea about the question posed about monosodium glutamate. The physiological effects of monosodium glutamate on individuals were not known in either class.

35,6% the preparatory class students had no idea while 56,0% of the thirds graders agreed with the statement that ‘I believe that additives are used more controlled in packaged products instead of open products. Individuals in the preparatory class were not aware of the consumption of packaged products while the thirds grade students were aware that the consumption of packaged products was more controlled compared to the products sold in the open, it is thought that the nutritional education they received contributes. A statistically significant difference was found between the groups ($p = 0,01$, $p < 0,05$).

59,3% the students in preparatory class certainly agreed while 58,0% of third graders agreed with the statement that “Naturally produced food and drinks are healthier than those produced with artificial support.” A statistically significant difference was found between the groups ($p = 0,001$, $p < 0,05$). Improvement of production processes in factories make third grade students to consider that the food produced with artificial support is not that bad compared to the preparatory class. The increase in their knowledge level allows them to distinguish whether they are good or bad at the subject of additives.

96,6% the students in preparatory class stated that they had no idea and 82,0% stated that they had no idea to the statement “The taste in mouth occurred after eating foods containing monosodium glutamate is named umami, which is the 5^{th} taste.” Students studying in both classes did not have any idea about umami. Umami taste which is known as 5^{th} taste did not provide any awareness in students.

“After eating products containing monosodium glutamate (chips, instant soup, instant biscuits, chocolate,wafers etc.),I feel the need to eat more food”,“Products containing monosodium glutamate increase my appetite more ”,”I like the flavors of the products containing Monosodium Glutamate more”,“I'm hungry again soon after eating products containing monosodium glutamate” (Figure 1,2,3,4)

No significant difference was found to the statement “Monosodium glutamate containing foods must be restricted to children at growth age, pregnant, breastfeeding

women and elderly people. As the level of education increased, no awareness was observed regarding level of knowledge about monosodium glutamate.

Similarly, a face to face study conducted with 1000 university students by Yurttakul M. et al. (2005) showed that 8,6%, 18,2%, 52%, 17,9% and 1,1% respectively they did not have any about the effects of additives on health, that additives were completely harmful, some additives were harmful, additives were no harmful when correctly used and additives were harmful when used for a long time. In the same study, the students 23,8% said that they did not buy foods with E code while 20,9 % defined E coded products as "carcinogenic food additives" and 2,6% stated they threw away foods with E code (31). According to the study conducted on 1000 university students revealed that they had some idea about this issue because of the students 62,7% agreed the statement that "food additives are carcinogenic", 55,9% agreed that " Food additives are very harmful and they become more harmful in parallel with technological developments" and 59,3% certainly agreed that "Naturally produced food and beverages are more healthier than those produces with artificial substances"(31).

According to a cohort study conducted by Chinese Health and Nutrition Surgery (CHNS) on Chinese adult individuals aged between 18 and 65, the relationship between overweight and MSG was investigated. In the study conducted with 48857 people in 5,5 years, the average MSG consumption was found to be 1,8g/day. The study found that the intake in males was higher in females; high MSG intake was found to be higher in patients with high BKI value, high total energy and sodium intake, and individuals with low physical altitude and higher individual income (114).Again this study, MSG consumption and serum leptin concentration were examined in 669 Chinese adult subjects. In 2006, fasting blood test was applied to the participants. When examined, the average leptin level was 7,2 g/mL. Each 1 gram increase in MSG intake increased serum leptin concentration by 0,45 g/mL. In other words, MSG uptake increased serum leptin level (114).

In a study conducted in 2008, 1528 people participated in a Vietnamese study stated that MSG was associated with overweight, 20 age subjects were taken and 3 doses of MSG were taken for 24 weeks, BMI value was referenced as 23,0 kg/m² for overweight individuals. Multiple logistic regression analysis showed that weight-related factors were age, residence area, occupation, physical activity status, energy intake, carbohydrates, saturated fat and animal protein intake. There was no significant relationship between MSG intake and overweight (115).

A study in China investigated the relationship between sleep apnea and MSG intake in normal-weight individuals. The study started in 2002 with the participation of 1227 people and continued until 2007. MSG intake increased the rate of snoring in men from 46,5% to 56% (p = 0,110). In women, it increased from 18,1% to 28,2%. For normal weight participants, MSG intake was positively associated with snoring and sleep breathing problems (116).

In another study examining the relationship between MSG intake and headache, MSG used in combination with food in 1,5 and 3,5 grams of capsules did not have a significant effect on headache. The dosage of MSG in drinks and soups has been shown to have a significant effect on headache (116).

In order to investigate the relationship between MSG intake and asthma, 1486 men and women in China participated in the study. The study was carried out between 2002 and 2007. It was found that 14% of the sample had asthma. There is a significant positive relationship between the traditional food pattern (rice, wheat flour and vegetables) and asthma. No relationship was found between macho (rich in meat and alcohol), 'sweet tooth' (cake, milk, and yogurt), 'rich vegetables' (on whole grains, fruits and vegetables) and asthma. Although there was a positive correlation between 'traditional' food intake and asthma among Chinese adults, no significant relationship was found between MSG intake and asthma (117).

In a study investigating the relationship between MSG intake and metabolic syndrome in Thailand, 324 people from rural families participated in the study. MSG was given as the sole source for use in food preparation for 10 days. Energy and nutrient intake were evaluated in terms of physical activity and tobacco smoking. The prevalence of overweight and obesity (BMI $\geq$ 25 kg/m^2), insulin resistance (HOMA-IR> 3) and metabolic syndrome (ATP III criteria) were evaluated according to daily MSG intake. The prevalence of metabolic syndrome was significantly higher with the highest MSG intake. In addition, every 1 g increase in MSG intake significantly increased the risk of having metabolic syndrome (118).

As a result, one of the most important reasons why a particular food is attractive to the consumer is related to the taste of that food. Therefore, in today's modern societies, consumers' interest in foods of different flavors has led manufacturers to use flavor enhancers. Hence, flavor enhancers, especially monosodium glutamate, are widely used throughout the world. When the nutritional education students (3rd grade) compared with the students who did not (preparatory class), there was no significant result in their

knowledge level. When comparing students who were receiving nutrition education and who were going to receive the education, it was observed that the increase in the knowledge about nutrition did not cause a change in the frequency of consumption in this period and consumption of these products could not be reduced because of the difficulty of school and the decrease in regular nutrition habit.

When the use of additives and their food MSG amount to be added to the product according to the Turkish Food Codex regulation, the upper limit warning is given, only MSG is used in the label information and the amount of MSG is not written. In addition, food packages are often prepared with misleading characters that do not provide sufficient information about the additives they contain and which mislead the consumer. Although there are various opinions about the toxic effects of MSG, it is a fact that the ADI value and therefore the codex limit value are very important for MSG as in many food additives. Therefore, control of the amount of MSG added to food is essential for public health.MSG should not be added to food in high amounts and unconsciously, and should not be used, especially because of health risks, especially in case of exceeding the limit values. Sensitive individuals, especially pregnant women and newborns, who are allergic, should not consume foods containing MSG. For this reason, it is very important that the label information of MSG used as an additive indicates that "MSG has been added".

Healthy foods should be sold in schools, canteens, dormitories and cafeterias. Among university students, it should be ensured that beverages such as buttermilk, fruit or milk with high nutritional value should be preferred instead of beverages such as acidic beverages, coffee, instant coffee, which have a high consumption. Nutritional opportunities in the places where the students live should be increased with the cooperation between institutions.

Healthy foods should be easy to find and should be supported by government policies by making them affordable for everyone.

6. REFERENCES

1. Çalışır, Z. and Çalışkan, D. Journal of Ankara Faculty of Pharmacy, 2003. 32 (3): 207-206.
2. Yarsan E., Portakal P. Ekici H., Toxicological Investigation of Food Additives. A.Ü. Institute of Health Sciences. Seminar, 2008.
3. *Food additives and contaminants, Turkish Society of Toxicology, Accessed on 26 February 2019.*http://www.turktox.org.tr/.
4. Kaya İ. Investigation of consumption and health effects of some foods containing food additives in a district in Istanbul: risk analysis of foods. Istanbul, Istanbul University; 2011.
5. Saglam, Ö.F Turkish Food Legislation, Semih Offset, Ankara, 2000.
6. Boğa, A. and Binokay, S. Food additives and their effects on our health. Archive Review Journal, 2010. 19 (3): 141-154.
7. Özer, B. General Food Safety, Access 28 May 2019. www.ggd.org.tr.
8. Monosodyum glutamat - E621 Accessed on 28 May 2019http://www.food-info.net/tr/intol/msg.htm.
9. Cömert, M. Ve Güdek, M., fifth tad : umami *Journal of Tourism and Gastronomy Studies,* 2017. 400-401.
10. Geha, R. S, Beiser A. Ren C, Patterson R, Greenberger P.A, Grammer L, et al. Review of alleged reaction to monosodium glutamate and outcome of a multicenter double-blind placebo-controlled study, Journal of Nutrition, *2000. 130:1058-1062.*
11. Ghirri, A. and Bignetti, E. Occurence and role of umami moleculer in foods. International Journal of Food Sciences and Nutrition, *2012. 63(7):871-881.*
12. Turkish Food Codex Regulation. Accessed on February 26, 2019 http://www.mevzuat.gov.tr.
13. Bağcı, T. "Food Additives and Food Control"; Public Health Basic Information, Gunes Bookstore Ltd. Ankara,1995.
14. Vaclavik V. A. and Christian E. Essential of Food Science. 2008 Springer.
15. Bağcı T. "Food additives and their effects on our health", Hacettepe Medical Journal 1997; 28 (1); 18-23.
16. A. Serpen assessment of food safety in the EU process in Turkey turmoil being experienced yesterday and today. Journal of Performance in Livestock. 2007; Issue: 109.

17. Yurttagül M. A comprehensive research on food additives. Accessed on May 28, 2019 http://www.saglikvakfi.org.tr/html.
18. Yurttagül M, Ayaz A. Additives: Falses and Truths. Hacettepe University, Faculty of Health Sciences, Department of Nutrition and Dietetics, Ankara. 2008. Klasmat Printing House Ankara.
19. Karaali A. Food Additives Legal Regulations. ITU Faculty of Chemistry and Metallurgy, Food Engineering Department. Accessed on February 27, 2019 http://www.gidakat.org.tr)
20. Boyacıoğlu D. What are Food Additives? ITU Food Engineer, Department 2003.
21. Giray H, Soysal A.food safety legislation in Turkey. TAF Preventive Medicine Bulletin 2007; 6: 485-90.
22. Erkmen O, Bozoglu TF. Food Microbiology III:Food Preservation. Ankara: İlke Publishing Company; 2008.
23. Arslan G. Investigation of the usability of food additives and newly made dioximes as food additives. Konya, Selcuk University, Graduate School of Natural and Applied Sciences, Master Thesis, 2011.
24. Feingold BF. Hyperkinesis and learning disabilities linked to the ingestion of artificial foodcolors and flavors. J Learn Disabilities 1976;9:19-27.
25. Feingold BF. Food additives and hyperkinesis: letter to the editor. *J Learn Disabilities* 1977;10:64-6.
26. McCann D, Barrett A, Cooper A, Crumpler D,Dalen L, Grimshaw K, et al. Food additivesand hyperactive behaviour in 3-year-old and8/9-year-old children in the community: a ran-domised, double-blinded, placebo-controlledtrial. *Journal The Lancet* 2007;370:1560-7.
27. Goodman D. Chronic urticaria exacerbated bythe antioxidant food preservatives, butylatedhydroxytoluene (BHT). J *Allergy Clinical Im-munology* 1986;86(4):570-5.
28. Yörük G.N. Danyer E. Food ingredients and general information and definitions, Turkey Clinical J Food Technol-Special Topics Hyg 2016; 2 (2): 1-10.
29. Altuğ, T. Food Additives . İzmir: Meta Printing ; 2001. p.3,17-30,113-24,145-225.
30. IFIC . International Food Information Council. *Food İngredients* Media Guide on Food Safety and Nutrition 2007-2009. Accessed May 2019 http://www.ific.org.tr
31. Yurttagül M, Yücecan S, Ayaz A. One quarter of students do not receive E-coded products '. Ankara. Accessed at May 28, 2019 http://www.gidacilar.net

32. Akbulut, M., Food additives: functions and sources. 1. National Halal and Healthy Food Congress Food Additives: Problems and Suggestions for Solutions Congress Book. 2011. Ankara, Turkey.
33. FAO/WHO, Fact Sheet-*What is JECFA?. Accessed on 28 May 2019*www.fao.org./jecfa/jecfa_2006-02
34. Karaali, A. Artemis Food Additives. Accessed onMay 28, 2019 http://www.gidabil.org.tr
35. Özgen C. How is food allowed to be consumed? 1. National Halal and Healthy Food Congress Food Additives: Problems and Suggestions for Solutions Congress Book. 2011, Ankara, Turkey.
36. Cok İ. (Gazi University Pharmacy Faculty, F. Toxicology Department). Problems of Additives Used in Child Nutrition. Accessed at May 28, 2019 http://www.millipediatri.org.tr
37. Yamaguchi, S. ve Ninomiya, K. Umami and food palatability. *Journal Nutrition.* 2000, 130, 921–926.
38. Lindeman, B., Ogiwara, Y. ve Ninomiya, Y. Tha Discovery of Umami. *Chemical Senses,* 2002, 27: 843-845.
39. Ikeda, K. New seasonings. *Chemical Senses,* 2002, 27 (9), 847–849.
40. Beauchamp, G.K. Sensory and receptor responses to umami: an overview of pioneering work. *The American Journal of Clinical Nutrition*, 2009, 90, 723–727.
41. Ninomiya, K. Science Of Umami Taste: Adaptation To Gastronomic Culture. Flavour, 4(13), 1-5. Biomed Central Accessed at 28 Mayıs 2019 http://www.flavourjournal.com/content
42. Bellisle, F. Glutamate and the UMAMI taste: sensory, metabolic, nutritional and behavioural considerations. A review of the literature published in the last 10 years. *Neuroscience & Biobehavioral Reviews*, 1999 23(3), 423-438.
43. Motarjemi, Y. Encyclopedia of food safety. *Academic Press*, 2013 pp. 466.
44. Yamaguchi, S. The synergistic taste effect of monosodium glutamate and disodium 5-inosinate. *Journal Food Science*,1967 32: 473–478.
45. Rifkin, B. ve Bartoshuk, L.M. Taste synergism between monosodium glutamate and disodium 5-guanylate. *Physiology Behavior*, 1980 , 24, 1169–1172.
46. Kurihara, K. Glutamate: from discovery as a food flavor to role as a basic taste (umami). *The American Journal Of Clinical Nutrition*, 2009, 90 (3), 719–722.
47. Umami Information Center. Accessed on 28 May 2019 https://www.umamiinfo.com/

48. Mouritsen, O.G. ve Styrbæk, K. Umami. Unlocking the secrets of the fifth taste. New York: *Columbia University Press*. 2012.
49. Kurihara, K.Umami the fifth basic taste: history of studies on receptor mechanisms and role as a food. flavor, *Biomed Research İnternational*, 2015 4(13), 1-5.
50. Ikeda, K. On the taste of glutamate. *The 8th International Congress Of Applied Chemistry*. Washington New York, 1912, 147.
51. Kurihara, K. ve Kashiwayanagi, M. Physiological Studies On Umami Taste. *The Journal Of Nutrition*. 2000,130 (4),931–934.
52. Ninomiya, K. Natural occurrence. *Food Reviews International 1998,* 14: 177–212.
53. Rassin, D. K., Sturman, J. A.ve Gaull, G. E. Taurine and other aminoacids in milk and other mammals. *Early Human Development*, 1978, 2, 1–13.
54. Bellisle F. Nutritional effects of umami in the human diet. *Food Rev Int*, 1998 14, 309-319.
55. Noguchi, M., Arai, S., Yamashita, M., Kato, H., Fujimaki, J. Isolation And Identification of acidic oligopeptides occurring in a flavor potentiating fraction from a fish protein hydrolysate. *Journal Agricultural Food Chemistry*, 1975, 23(1), 49–53.
56. Schlichterle-Cerny, H. ve Amado`m, R. Analysis of taste-active compounds in an enzymatic hydrolysate of deamidated wheat gluten. *Journal Agricultural Food Chemistry* , 2002, 50(6), 1515–1522.
57. Lioe, H.N., Apriyantono, A., Takara, K., Wada, K., Naokı, H. ve Yasuda, M. (2004). Low molecular weight compunds responsible for savory taste of ındonesian soy sauce. *Journal Of Agricultural And Food Chemistry*, 2004, 52(19),5950–5956.
58. Kaneko, S., Kumazawa, K., Masuda, H., Henze, A. ve Hofmann, T. Molecular and sensory studies on the umami taste of japanese green tea. *Journal of Agricultural and Food Chemistry*, 2006, 54(7),2688–2694.
59. Rotzoll, N., Dunkel, A. ve Hofmann, T. Quantitative studies, taste reconstitution, and omission experiments on the key taste compounds in morel mushrooms. *Journal Agricultural Food Chemistry*, 2006, 54(7),2705–2711.
60. Drake, S.L., Carunchia Whetstine, M.E., Drake M.A., Courtney, P., Flinger, K., Jenkins, J., ve Pruitt, C. Sources of umami taste in cheddar and swiss cheeses. *Journal Food Science*, 2007, 72(6), 360–366.
61. Niijima, A., Togiyama, T., Adachi, A. Cephalic-phase insulin release induced by taste stimulus of monosodium glutamate (umami taste). *Physiology¬&Behavior*. 1990, 48 (6), 905–908.

62. San Gabriel, A., Nakamura E., Uneyama H., Torii K. Taste, visceral information and exocrine reflexes with glutamate through umami receptors. the journal of medical investigation. *The Journal Of Medical İnvastigation,* 2009, 56, 209–217.
63. Zai, H., Kusano, M., Hosaka, H. Shimoyama,Y., Nagoshi, A., Maeda, M., Kawamura, O. ve Mori, M. Monosodium l-glutamate added to a high-energy, high-protein liquid diet promotes gastric emptying. *The American Journal Of Clinical Nutrition*. 2009, 89 (1), 431–435.
64. Kendig, D.M., Hurst N.R., Bradley Z.L., Mahavadi, S., Kuemmerle, J.F. Lyall, V., DeSimone, J., Murthy K.S. ve Grider, J.R. Activation of the umami taste receptor (T1R1/T1R3) initiates the peristaltic reflex and pellet propulsion in the distal colon. *American Journal Of Physiology Gastrointestinal And Liver Physiolog,* 2014, 307 (11), 1100–1107.
65. Uneyama, H., Kawai, M., Sekine-Hayakawa, Y., Torii, K. Contribution of umami taste substances in human salivation during meal. *The Journal Of Medical İnvestigation,* 2009, 56 Suppl: 197–204.
66. Schiffman, S.S., Miletic, I.D. Effect of taste and smell on secretion rate of salivary ıga in elderly and young persons. *The Journal Of Nutrition, Health&Aging,* 1999, 3 (3): 158–164.
67. Bellisle, F. Experimental studies of food choices and palatability responses in European subjects exposed to the umami taste. *Asia Pacific Journal of Clinical Nutrition,* 2008, 17: 376–379.
68. Masic, U. ve Yeomans, M.R. Umami flavor enhances appetite but also increases satiety. *The American Journal of Clinical Nutrition*. 2014, 100(2):532–8.
69. Bellisle, F., Dalix, A.M., Chappuis, A.S., Rossi, F., Fiquet, P., Gaudin, V., Assoun, M. ve Slama, G. Monosodium glutamate affects mealtime food selection in diabetic patients. *Appetite*, 1996, 26(3):267–275.
70. Appaiah, K.M. Monosodium glutamate in foods and its biological effects. In C.E. Boisrobert, A. Stjepanovic, S. Oh, and H.L.M. Lelieveld (Eds.), *Ensuring Global Food Safety: Exploring Global Harmonization*. Academic Press, London, UK, 2010, pp. 217-226.
71. Freeman, M.Reconsidering the effects of monosodium glutamate: a literature review. *Journal of the American Academy of Nurse Practitioners*, 2006, 18(10), 482-486.
72. Kohlmeier, M. Nutrientmetabolism: structures, functions, and genetics. *Academic Press*, London, UK, 2003, pp. 272-277.

73. Williams A.N, Woessner K.M. Monosodium glutamate allergy: menace or myth? *Clinical and Experimental Allergy*. 2009, 39(5), 640-6.
74. Melcalfe D. D, Sampson H. A, Simon R, A. Food allergy; adverse reactions to food additives, *Blackwell Publishing. 2003. 3(25): 299-301, 342-346.*
75. Löliger, J. Function and importance of glutamate for savory foods. *The Journal of Nutrition*, 2000, 130(4), 915-920.
76. Welbourne, T., and Nissim, I. Regulation of mitochondrial glutamine/glutamate metabolism by glutamate transport: studies with 15N. *American Journal of Physiology-Cell Physiology*, 2001, 280(5), 1151-1159.
77. Bellisle, F. Glutamate and the UMAMI taste: sensory, metabolic, nutritional and behavioural considerations. A review of the literature published in the last 10 years. *Neuroscience & Biobehavioral Reviews*, 1999, 23(3), 423-438.
78. Giacometti, T. Free and bound glutamate in natural products. In L.J. Filer (Eds.), *Glutamic acid: Advances in Biochemistry and Physiology*, Raven Press, New York, 1979, pp. 25-34.
79. Ault, A. The monosodium glutamate story: the commercial production of MSG and other amino acids. *Journal of Chemical Education, 2004*, 81(3), 347.
80. Jinap, S., and Hajeb, P. Glutamate. Its applications in food and contribution to health. *Appetite*, 2010, 55(1), 1-10.
81. Communication on the amendment of the Turkish food Codex communication on sugar. T.C. Official Gazette. Number : 26883. Accessed at 28 May 2019 http://www.resmigazete.gov.tr/eskiler/2008/05/20080522-7.htm
82. Colucci, P. E., & Grovum, W. L. Factors affecting the voluntary intake of food by sheep 6. The effect of monosodium glutamate on the palatability of straw diets by sham-fed and normal animals. *British journal of nutrition*, 1993, *69*(01), 37-47.
83. Rogers, P. J., & Blundell, J. E. Umami and appetite: effects of monosodium glutamate on hunger and food intake in human subjects. *Physiology & behavior*, 1990, *48*(6), 801-804.
84. Bellisle, F., Monneuse, M.O., Chabert, M., Larue-Achagiotis, C., Lanteaume, M.T., Louis-Sylvestre, J. Monosodium glutamate as a palatability enhancer in the European diet. *Physiol Behav*, 1991, 49(5), 869-73.
85. Macho, L., Fickova, M., & Zorad, S. Late effects of postnatal administration of monosodium glutamate on insulin action in adult rats. *Physiological research*, 1999, *49*, S79-85.

86. Bunyan, J., Murrell, E. A., & Shah, P. P. The induction of obesity inrodents by means of monosodium glutamate. *British Journal of Nutrition*, 1976, *35*(01), 25-39.
87. Chevassus, H., Renard, E., Bertrand, G., Mourand, I., Puech, R., Molinier, N., & Bringer, J. Effects of oral monosodium (l)-glutamate on insulin secretion and glucose tolerance in healthy volunteers. *British Journal Of Clinical Pharmacology*, 2002, *53*(6), 641-643.
88. Nagata, M., Suzuki, W., Iizuka, S., Tabuchi, M., Maruyama, H., Takeda, S., ...& Miyamoto, K. I. Type 2 diabetes mellitus in obese mouse model induced by monosodium glutamate. *Experimental Animals*, 2006, *55*(2), 109-115.
89. Corder, R., Saudan, P., Mazlan, M., McLean, C., & Gaillard, R. C. Depletion of hypothalamic growth hormone-releasing hormone by neonatal monosodium glutamate treatment reveals an inhibitory effect of betamethasone on growth hormone secretion in adult rats. *Neuroendocrinology*, 1990,*51*(1), 85-92.
90. He, K., Zhao, L., Daviglus, M. L., Dyer, A. R., Horn, L., Garside, D., Zhu, L., Guo, D., Wu, Y., Zhou, B., and Stamler, J. Association of monosodium glutamate intake with overweight in Chinese adults: the Intermap Study. *Obesity*, 2008, 16(8), 1875-1880.
91. Mallick, H. N. Understanding safety of glutamate in food and brain. *Indian Journal of Physiology and Pharmacology*, 2007, 51(3), 216.
92. Dief, A. E., Kamha, E. S., Baraka, A. M., and Elshorbagy, A. K. Monosodium glutamate neurotoxicity increases beta amyloid in the rat hippocampus: a potential role for cyclic AMP protein kinase. *Neurotoxicology*, 2014, 42, 76-82.
93. Allen, D. H., Delohery, J., & Baker, G. (1987). Monosodium L-Glutamate induced asthma. *Journal Of Allergy And Clinical İmmunology*, 1987, 80(4), 530-537.
94. Geha, R. S., Beiser, A., Ren, C., Patterson, R., Greenberger, P. A., Grammer, L. C. & Corren, J. Multicenter, double-blind, placebo-controlled, multiple-challenge evaluation of reported reactions to monosodium glutamate. *Journal Of Allergy And Clinical İmmunology*, 2000, *106*(5), 973-980.
95. Woessner, K. M., Simon, R. A., & Stevenson, D. D. Monosodium glutamate sensitivity in asthma. *Journal Of Allergy And Clinical İmmunology*, 1999, *104*(2), 305-310.
96. Yang, W. H., Drouin, M. A., Herbert, M., Mao, Y., & Karsh, J. The monosodium glutamate symptom complex: assessment in a double-blind, placebo-controlled, randomized study. *Journalof Allergy and Clinical Immunology*, *99*(6), 757-762. glutamate symptom complex. *J Allergy ClinImmun*, 1997, 99, 757-762.

97. Tarlo, S. M., & Sussman, G. L. Asthma and anaphylactoid reactions to food additives. *Canadian Family Physician*, 1993, *39*, 1119.

98. Bojanić, V., Bojanić, Z., Najman, S., Savić, T., Jakovljević, V., Najman, S., & Jančić, S. Diltiazem prevention of toxic effects of monosodium glutamate on ovaries in rats. *Gen Physiol Biophys*, 2009, *28*,149-154.

99. Özbenli, T., Patogenezi.Nineteen May University Medical Journal.,1994, 11(1): 59-66.

100. Öner, N., Güncan. Ö., Yoysal, E., Headache in adolescent and children Step., 2003, 12(8) : 298.

101. Moreno, G., Perelló, Gaıllard, R. C., Spınedı, E., Orexin a stimulates hypothalamic-pituitary-adrenal (HPA) axis function, but not food intake, in the absence of full hypothalamic NPY- ergic activity. Endocrine, 2005, 26 : 99-106.

102. Chaparro-Huerta, V., Rıvera-Cervantes, M.C., Torres-Mendoza, B.M., Beas-Zarate, C. Neuronal deathand tumor necrosis factor-alpha response to glutamate-induced excitotoxicity in the cerebral cortex of neonatal rats. Neurosci. Lett., 2002, 333:95-98.

103. Farmobı, E.O., Onyema, O.O., Monosodium glutamate-induced oxidative damage and genotoxicity in the rat: Modulatory role of vitamin C, vitamin E and quercetin. Hum. Exp. Toxicol., 2006, 25 : 251-259.

104. Pavlovıc, V., Pavlovıc, D., Kocıc, G., Sokolovıc, D. And Jevtovıc-Stoımenov, T., et al., Effect of monosodium glutamate on oxidative stres and apoptosis in rat thymus. Mol. Cell, Biochem., 2007, 303 :161-166.

105. Yazıcıoğlu Y, Erdoğan S, SPSS applied scientific research methods. detail publishing, 2004.

106. Detels R, Beaglehole R, Lonsang M.A, Gulliford M. Environmental and Occupational Health Sciences. 8: The science of human exposures to contaminants in the environment. *Oxford Textbook of Public Health* 5thedition. 2009, P 872-893.

107. Report of the Twenty-Ninth Session of the Codex Committee on Food Additives and Contaminants. Appendix 4, 36. Netherlands, CAC, 1997.

108. Pekcan, G. Nutrition in adolescent nutrition, Clinical Child form*. 2004 4:1:38-47.*

109. Pekcan, G. ,Şanlıer N. , Baş M. at all. , Turkey Nutrition Guide 2015(TNSH), Alban İdentification, Ankara 2016.

110. Yıldırım B. *The comparasıon of dıet qualıty of 1. and 4. grade students nutrıtıon and dıetetıc department and another department students ın yeditepe unıversıty*. İstanbul, Yeditepe University; 2018.

111. *Vassigh G. Evaluation of physical activity and healthy nutrition indexes of university students*, Hacettepe University, Institute of Health Sciences, Ankara 2012.

112. Yurdagül M.Ready-to-eat soup market rea. Accessed on 28 May 2019 http://www.mumsad.org.tr

113. Cengiz, A. *Consumption of junk food and TÜDER 2010*, Accessed on 28 May 2019 http://www.tuder.net.)

114. *He K, Du S, Xun P, Sharma S, et al.* Consumption of monosodium glutamate in relation to incidence of overweight in Chinese adults: China Health and Nutrition Survey (CHNS)1–3, *Am J Clin Nutr* 2011;93:1328–36.

115. Thu Hien VT, Thi Lam N, Cong Khan N, Wakita A, Yamamoto S, Monosodium glutamate is not associated with overweight in Vietnamese adults. Public Health Nutrition, 2013 May; 16(5):922.

116. Zumin S, M.D, Ph.D , Gary A, at al. Association between monosodium glutamate intake and sleep-disordered breathing among Chinese adults with normal body weight, *Nutrition* 29 (2013) 508–513.

117. Shi Z, Yuan B, Wittert GA, Pan X, Dai Y, et al. Monosodium glutamate ınтake, dietary patterns and asthma in chinese adults. Plos One (2012) 7(12): e51567.

118. Insawang, T., Selmi, C., Cha'on, U., et al. Monosodium glutamate (MSG) intake is associated with the prevalence of metabolic syndrome in a rural Thai population, *Nutrition & Metabolism* 2012, 9:50.

7. APPENDICES

7.1. Curriculum Vitae

Kişisel Bilgiler

Adı	Sümeyye	**Soyadı**	BULUT
Doğum Yeri	ALMUS/TOKAT	**Doğum Tarihi**	05.10.1992
Uyruğu	T.C.	**TC Kimlik No**	43642918456
E-mail	sumeyye.bulut@hotmail.com	**Tel**	05316991485

Öğrenim Durumu

Derece	Alan	Mezun Olduğu Kurumun Adı	Mezuniyet Yılı
Doktora			
Yüksek Lisans			
Lisans	Beslenme ve Diyetetik	**Ankara Üniversitesi**	2014
Lise	Fen Bilimleri	**Safranbolu Lisesi**	2009

Bildiği Yabancı Dilleri	Yabancı Dil Sınav Notu (#)
YÖKDİL	50

#Başarılmış birden fazla sınav varsa(KPDS, ÜDS, TOEFL; EELTS vs), tüm sonuçlar yazılmalıdır

İş Deneyimi (Sondan geçmişe doğru sıralayın)

Görevi	Kurum	Süre (Yıl - Yıl)
Diyetisyen	Tuzla Şifa Park Polikliniği	2018-(devam ediyor)
Kurum Diyetisyeni	Bezmialem Tıp Fakültesi Hastanesi	2015-2017

Bilgisayar Bilgisi

Program	Kullanma becerisi
Microsoft Office Programları	İYİ
BEBIS, SPSS	İYİ

*Çok iyi, iyi, orta, zayıf olarak değerlendirin

Bilimsel Çalışmaları
SCI, SSCI, AHCI indekslerine giren dergilerde yayınlanan makaleler

7.2. Ethical

T.C. YEDİTEPE ÜNİVERSİTESİ

Sayı : 37068608-6100-15- 1603
Konu: Klinik Araştırmalar
Etik kurul Başvurusu hk.

14/02/2019

İlgili Makama (Sümeyye Bulut)

Yeditepe Üniversitesi Tıp Fakültesi Biyokimya ve Klinik Biyokimya Anabilim Dalı Prof. Dr. Serdar Öztezcan'ın sorumlu olduğu **"Yeditepe Üniversitesi Beslenme ve Diyetetik Bölümü Hazırlık ve 3. Sınıfta Okuyan Öğrencilerin, Monosodyum Glutamat İçeren Besinlerin Tüketim Sıklığının Ölçülmesi ve Bilgi Düzeylerinin Karşılaştırılması"** isimli araştırma projesine ait Klinik Araştırmalar Etik Kurulu (KAEK) Başvuru Dosyası (**1573** kayıt Numaralı KAEK Başvuru Dosyası), Yeditepe Üniversitesi Klinik Araştırmalar Etik Kurulu tarafından **13.02.2019** tarihli toplantıda incelenmiştir.

Kurul tarafından yapılan inceleme sonucu, yukarıdaki isimi belirtilen çalışmanın yapılmasının etik ve bilimsel açıdan uygun olduğuna karar verilmiştir (**KAEK Karar No: 955**).

Prof. Dr. Turgay ÇELİK
Yeditepe Üniversitesi
Klinik Araştırmalar Etik Kurulu Başkanı

RE: Yüksek lisans tezi besin tüketim sıklığı formu izni

İrem Cebioglu <irem.cebioglu@yeditepe.edu.tr>
22.10.2018 Pzt 10:59
Siz

Sümeyye merhaba,

Tabi ki kullanabilirsin. Çalışmanda başarılar dilerim.

Sevgiler.

-----Original Message-----
From: sümeyye bulut [mailto:sumeyye.bulut@hotmail.com]
Sent: Thursday, October 18, 2018 3:10 PM
To: irem cebioglu <irem.cebioglu@yeditepe.edu.tr>
Subject: Yüksek lisans tezi besin tüketim sıklığı formu izni

Merhaba İrem Hocam,

Yeditepe Üniversitesinde tez aşamasındayım. Serdar hocanın öğrencisiyim. Tezimin konusuyla ilgili size başvurmam gerektiğini söylemişti. Konu olarak "Yeditepe Üniversitesi Beslenme ve Diyetetik Bölümünde okuyan, "hazırlık sınıfı" ve "3. sınıf" öğrencilerinde "Monosodyum Glutamat" içeren besinlerin tüketim alışkanlıkları ve bilgi düzeylerinin ölçülmesi" üzerine bir tez yapmak istiyorum. Sizin yüksek lisans tezinizde kullandığınız MSG için olan" besin tüketim sıklığı formunu" izniniz olursa kendi tezimde kullanmak istiyorum.

İyi çalışmalar.

7.3. Survey

BİLGİLENDİRİLMİŞ ONAM FORMU

Değerli katılımcı

Yeditepe Üniversitesi öğretim üyesi Prof. Dr Serdar Öztezcantarafından yürütülen, Yeditepe Üniversitesi Klinik Uygulamalar Etik Kurulları'nın sayılı onayı ile izin verilen ***"Yeditepe Üniversitesi Beslenme ve Diyetetik Bölümü "Hazırık ve 3.Sınıf"Ta Okuyan Öğrencilerin, "Monosodyum Glutamat" İçeren Besinlerin Tüketim Sıklığının Ölçülmesi ve Bilgi Düzeylerinin Karşılaştırılması"*** *başlıklı araştırmaya katılımınız rica olunmaktadır.*

Bu araştırmaya tamamen kendi iradenizle, herhangi bir zorlama veya mecburiyet olmadan gönüllü olarak katılımınız esastır. Lütfen aşağıdaki bilgileri okuyunuz ve katılmaya karar vermeden önce anlamadığınız herhangi bir husus varsa çekinmeden sorunuz.

Beslenme, insanın hayatını idame ettirebilmesi için en temel ihtiyaçlardan birisidir. 2000'li yıllara geldiğimiz şu dönemde, elli yıl öncesiyle kıyasladığımızda beslenme alışkanlıklarının neredeyse tamamen değiştiğini söyleyebiliriz. Günümüzde hem zaman darlığından, hem pratik olduklarından, hem de çekici görüntüleri nedeniyle, üzerinde çok da fazla düşünmeden tükettiğimiz hazır yiyeceklerle, doğal besinlerden hızla uzaklaşıyoruz. Gıdalarda bulunan kimyasal maddelere bakıldığında gıda katkı maddeleri en çok denetlenen gruptur, çünkü toplumdaki her birey bilerek veya bilmeyerek doğumdan ölüme kadar tükettiği her hangi bir besinle gıda katkı maddesine maruz kalabilmektedir. Besinlere daha hızlı ve daha kolay ulaşmak popüler kültürün bir parçası haline gelmiştir. Paketli satın alınan ürünlerdeki etiket bilgileri çok önemlidir. Birçok üründe gıda katkı maddesi kullanılmaktadır. Monosodyum glutamat en çok kullanılan gıda katkı maddesidir. Üniversite çağındaki gençlerde paketli ürün tüketimi, normal aile ortamındaki yaşantılarına göre, ürün tüketimi daha fazladır. Bu dönemde monosodyum glutamat içeren besinlerin tüketim alışkanlıklarının ne düzeyde olduğu, monosodyum glutamat içeren besinlerin tüketim sıklığının ölçülmesi ve bu konudaki bilgi düzeylerinin karşılaştırılması bu çalışmada amaçlanmıştır.

Araştırmaya gönüllü olarak katıldığınızda kişisel özelliklerinizin yanı sıra, monosodyum glutamat içeren tüketim alışkanlığınız ve besin tüketim sıklığınız ile ilgili soruları içeren anket formunu doldurmanız yeterli olacaktır. Anket formu dışında vücut bütünlüğünüzü tehlikeye sokacak herhangi bir fiziksel müdahale bulunmamaktadır. Soruları eksiksiz olarak yanıtlamanız sonuçların güvenilirliği açısından son derece önemlidir.

Bu formu onaylayarak imzaladığınız takdirde anketteki sorulara vereceğiniz yanıtlar araştırmacılar tarafından değerlendirilecek olup izleyiciler, etik kurul ve kurum haricinde 3. kişilerle paylaşılmayacaktır ve kişisel bilgileriniz gizli tutulacaktır. Bu çalışmanın içinde olmak isteyip istemediğinize tamamen kendi iradenizle ve etki altında kalmadan karar vermeniz önemlidir. Katılmaya karar verdikten sonra, herhangi bir anda sahip olduğunuz herhangi bir hakkı kaybetmeden veya herhangi bir yaptırıma maruz kalmadan istediğiniz zaman ayrılabilirsiniz.

Bilgilendirilmiş Gönüllü Olur Formunda yapılan tüm açıklamaları okudum ve anladım. Konusu ve amacı yukarıda belirtilen araştırma hakkında bilgilendirme yapılarak dilediğim zaman gönüllü olarak katıldığım bu araştırmadan ayrılabilme hakkına sahip olduğum bilgisi sözlü ve yazılı olarak aşağıda adı geçen araştırmacı tarafından yapıldı. Dilediğim zaman ayrılma hakkım saklı kalmak koşulu ile hiçbir baskı ve zorlama olmaksızın bu araştırmaya katılmayı kendi rızamla onaylıyorum.

_____

Katılımcı Adı-Soyadı

_____ _____

Katılımcı İmzası Tarih

_____

Araştırmacı Adı-Soyadı

_____ _____

Araştırmacının İmzası Tarih:

Değerli katılımcı

Aşağıda kişisel özelliklerinizin yanı sıra, "Monosodyum Glutamat" tüketim alışkanlığı ile ilgili bazı sorular bulunmaktadır. Soruları eksiksiz olarak yanıtlamanız sonuçların güvenirliği açısından son derece önemlidir. Sorduğumuz sorulara verdiğiniz yanıtlar gizli tutulup kimseyle paylaşılmayacaktır. Katkı ve işbirliğiniz için şimdiden teşekkür ederiz.

Adınız ve Soyadınız:…….

1)Yaşınız:……..

2) Cinsiyetiniz1) Kadın 2) Erkek

3)Boyunuz.....Kilonuz.....

4) Okuduğunuz bölüm: .....

5) Kaçıncı sınıftanız:……..

6) Çalışıyor musunuz?1) Evet 2) Hayır

7) Evet ise yaptığınız iş:…….

8) Günde kaç saat çalışıyorsunuz? …….

9) Aileniz ile birlikte mi kalıyorsunuz? 1) Evet 2) Hayır

10) Hayır is evde mi yurtta mı kalıyorsunuz:.....

BESLENME ALIŞKANLIKLARI

11) Günde kaç öğün yemek yiyorsunuz?.....

12) Öğün saatleriniz düzenli mi? Evet ( ) Hayır( )

13) Öğün aralarında atıştırma yapıyor musunuz? Evet( ) Hayır( )

14) Evetse atıştırma olarak neleri tercih ediyorsunuz?

Kek, kurabiye, bisküviler ( ) Börek vb.( )

Meyve, meyve suyu ( ) Kolalı içecekler, sade meyveli gazoz vb.( )

Süt, yoğurt, ayran, peynir vb ( ). Çikolata, gofret, pasta, vb tatlı gıdalar( )

Kuruyemiş ( ) Ekmek, galeta, light bisküviler( )

Çiğ sebze ( ) Çay, kahve, Türk Kahvesi ( ) Diğer( )

15) Herhangi bir kronik hastalığınız var mı? Evet ( ) Hayır ( )

Aşağıdaki hastalık ya da belirtilerden geçirdiklerinizi veya şu anda mevcut olanları işaretleyiniz.

1. Hipertansiyon……..( ) 12. Kolit……( )

2. Safra kesesi hastalıkları……( ) 13. Gut(zengin hastalığı)……( )

3. İshal……..( ) 14. Karaciğer hastalığı……( )

4. Gastrit…….( ) 15. Obezite(şişmanlık)……( )

5. Kabızlık……..( ) 16. Kanser ……( ) evetse hangi organ……

6. Ülser……( ) 17. Alerji…….( ) evetse neye karşı……

7. Reflü……( ) 18. Yüksek kolesterol……( )

8. Kansızlık……..( ) 19. Depresyon…….( )

9. Koroner Hastalık…….. ( ) 20. Uyku bozukluğu……..( )

10. Diyabet(şeker hastalığı)…….( ) 21. Nörolojik hastalıklar……( )

22. Diğer…….( )

16. Sizce gıda katkı maddesi nedir biliyor musunuz? Evet( ) Hayır( )

Evetse açıklayınız….....

17. Gıdalarda kullanılan bildiğiniz katkı maddeleri nelerdir? (16. Soruya Evet diyenler cevaplasın.)

……

18.Gıda katkı maddelerinin çok zararlı olduğunu düşünüyorum ve tüketmekten kaçınıyorum.

a) Kesinlikle katılıyorum b)Katılıyorum c)Fikrim yok d) Katılmıyorum e)Kesinlikle katılmıyorum

19.Gıda katkı maddelerinin koruyucu olduğunu düşünüyorum, çok önemsiyorum.

a) Kesinlikle katılıyorum b)Katılıyorum c)Fikrim yok d) Katılmıyorum e)Kesinlikle katılmıyorum

20.Gıda katkı maddelerinin besinlerde kullanılması gerekli değildir.

a) Kesinlikle katılıyorum b)Katılıyorum c)Fikrim yok d) Katılmıyorum e)Kesinlikle katılmıyorum

21.Gıda katkı maddeleri kanser yapıcıdır.

a) Kesinlikle katılıyorum b)Katılıyorum c)Fikrim yok d) Katılmıyorum e)Kesinlikle katılmıyorum.

22.Gıda katkı maddeleri kullanılmazsa gıdalar daha sağlıklı olur.

a) Kesinlikle katılıyorum b)Katılıyorum c)Fikrim yok d) Katılmıyorum e)Kesinlikle katılmıyorum

23.”E” kodlu katkı maddeleri sağlığa zararlı değildir.

a) Kesinlikle katılıyorum b)Katılıyorum c)Fikrim yok d) Katılmıyorum e)Kesinlikle katılmıyorum

24.Gıda katkı maddelerinin çok zararlı olduklarını ve teknolojik gelişmelerle daha da sağlığa zararlı hale geldiğini düşünüyorum.

a) Kesinlikle katılıyorum b)Katılıyorum c)Fikrim yok d) Katılmıyorum e)Kesinlikle katılmıyorum

25.Gıdaları koruyucu ve yaşam koşullarına göre olmazsa olmazlar arasında olduklarını düşünüyorum.

a) Kesinlikle katılıyorum b)Katılıyorum c)Fikrim yok d) Katılmıyorum e)Kesinlikle katılmıyorum

26. Gıda katkı maddeleri sadece paketlenmiş hazır gıdalarda kullanılır.

a) Kesinlikle katılıyorum b)Katılıyorum c)Fikrim yok d) Katılmıyorum e)Kesinlikle katılmıyorum

27.Doğal olarak üretilen yiyecek ve içecekler, suni destekle üretilenlere göre daha sağlıklıdır.

a) Kesinlikle katılıyorum b)Katılıyorum c)Fikrim yok d) Katılmıyorum e)Kesinlikle katılmıyorum

28. Hazır veya yarı hazır gıdalar yerine katkı maddesi içermeyen ev yapımı gıdaları tercih ederim.

a) Kesinlikle katılıyorum b)Katılıyorum c)Fikrim yok d) Katılmıyorum e)Kesinlikle katılmıyorum

29.Yapay lezzeti artırıcı olarak kullanılan Glutamat(MSG) içeren gıdalara(hazır çorba, köfte harcı, tavuk bulyon vb.) tüketmekte sakınca görmem.

a) Kesinlikle katılıyorum b)Katılıyorum c)Fikrim yok d) Katılmıyorum e)Kesinlikle katılmıyorum

30. Glutamat başağrısı, ensede yanma, göğüste baskı hissi, terleme ve ürtiker gibi belirti ve yakınmalara yol açabilir.

a) Kesinlikle katılıyorum b)Katılıyorum c)Fikrim yok d) Katılmıyorum e)Kesinlikle katılmıyorum

31.Katkı maddelerinin, açıkta satılan ürünler yerine ambalajlı ürünlerde daha kontrollü kullanıldığına inanıyorum.

a) Kesinlikle katılıyorum b)Katılıyorum c)Fikrim yok d) Katılmıyorum e)Kesinlikle katılmıyorum

32.Özellikle çocukların tükettiği cips, gazlı içecekler, çikolata, dondurma gibi ürünleri alırken gereğinden fazla katkı maddesi içerdiğini düşünerek büyük tereddüt yaşıyorum.

a) Kesinlikle katılıyorum b)Katılıyorum c)Fikrim yok d) Katılmıyorum e)Kesinlikle katılmıyorum

33.Monosodyum glutamat içeren ürünleri(cips, hazır çorba, hazır bisküvi, çikolata, gofret vb.) yedikten sonra daha fazla yemek yeme ihtiyacı hissediyorum.

a) Kesinlikle katılıyorum b)Katılıyorum c)Fikrim yok d) Katılmıyorum e)Kesinlikle katılmıyorum

34.Monosodyum glutamat içeren ürünler iştahımı daha fazla açıyor.

a) Kesinlikle katılıyorum b)Katılıyorum c)Fikrim yok d) Katılmıyorum e)Kesinlikle katılmıyorum

35.Monosodyum glutamat içeren ürünlerin tatlarını daha çok beğeniyorum.

a) Kesinlikle katılıyorum b)Katılıyorum c)Fikrim yok d) Katılmıyorum e)Kesinlikle katılmıyorum

36..Monosodyum glutamat içeren ürünleri yedikten sonra daha kısa sürede yeniden acıkıyorum.

a) Kesinlikle katılıyorum b)Katılıyorum c)Fikrim yok d) Katılmıyorum e)Kesinlikle katılmıyorum

37. Monosodyum glutamat içeren besinleri yedikten sonra ağızda oluşan umami tat, 5. tat olarak bilinmektedir.

a) Kesinlikle katılıyorum b)Katılıyorum c)Fikrim yok d) Katılmıyorum e)Kesinlikle

katılmıyorum

38. Monosodyum glutamat içeren besinlere büyüme gelişme çağındaki çocuklarda, gebelerde, emzikli bayanlarda ve yaşlılarda kullanımı sınırlandırılmalıdır.

a) Kesinlikle katılıyorum b)Katılıyorum c)Fikrim yok d) Katılmıyorum e)Kesinlikle katılmıyorum

Besin Tüketim Sıklığı Formu: Son zamanlardaki alışkanlıklarınızı düşünerek aşağıdaki yiyecekleri ne miktarda ve ne sıklıkla yediğinizi aşağıdaki tabloya yazın.

BESİN	Her gün	H.da 6 gün	H.da 5 gün	H.da 4 gün	H.da 3 gün	H.da 2 gün	H.da 1 gün	15'te 1	Ayda 1	Hiç	Kaç yıldır?
Yiyecekler(tüketilen miktarı paket cinsinden ifade ediniz.)											
Hazır çorba											
Hazır bisküvi											
Çikolata											
Gofret											
Hazır kek											
Dondurma(ambalajlı)											
Ketçap											
Mayonez											
Salata sosu											
Puding											
Krem şanti											
Jöleler											
Cips											
Bulyon tablet(et suyu/tavuk suyu)											
Dondurulmuş patates											

Hazır çorba: 1 porsiyon/kase= 19 gr

Ketçap ve mayonez : 1 tatlı kaşığı= 10 gr

Hazır bisküvi: 1 tane bisküvi = 6.25 gr

Salata sosu: 1 paket= 10 gr

Puding :1 porsiyon = 22.8 gr

Çikolata, gofret : 1 paket= 38 gr

Krem şanti ve jöleler : 1 paket=4 porsiyon = 22 gr

Hazır kek : 1 paket = 35 gr

Cips: 1 paket =124 gr

Bulyon tablet: 1 adet= 10 gr

Dondurma: 1 paket = 52 gr Dondurulmuş patates: 1 tabak:=100 gr