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Developing a Food and Drug Interaction Knowledge Scale for Health Care Professionals: A Validity and Reliability Study

Sağlık Çalışanlarında Besin ve İlaç Etkileşimi Bilgi Düzeyi Saptamaya Yönelik Ölçek Geliştirme: Geçerlilik Ve Güvenirlik Çalışması

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ABSTRACT

Objectives: Health professionals' food-drug interaction knowledge level is related with efficiency of treatment. Given that, it's important to measure the knowledge level. This study aims to develop a scale that can measure food-drug interaction knowledge level of health care professionals and increase awareness on this issue.

Methods: A total of 200 individuals (50 from each profession: medical doctor, nurse, dietician and pharmacist) working in Ankara were selected. The scale consists of 25 items and three options for each: "True", "False" and "I do not know". In the evaluation, each correct answer equals to 1 (one) point, while the others (wrong and absent) equal to 0 (zero). Content validity and item analysis were conducted for the validity, and Cronbach alpha coefficient was measured.

Results: Consequently, 4 items whose total correlation with the total score less than 0.15 were removed from the scale. Item difficulties in the scale vary between 0.20 and 0.96, and average item difficulty of the scale was found to be 0.61±0.18. The scale was evaluated on the basis of quarter points of 21 items. Accordingly, 25th percentile of 21 items was 5.25, 50th percentile was 10.25, and 75th percentile was 15.75. Score classification less than 5 means "low" knowledge level, between 6 and 11 "intermediate", between 11 and 15 "good" and between 16 and 21 "very good".

Conclusions: Hereby, this scale was found to be highly valid and quite reliable to be used in order to determine the food-drug interaction knowledge levels of health care professionals.

Keywords: Food-drug interaction, health personnel, validity and reliability, scale

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ÖZET

Amaç: Sağlık profesyonellerinin gıda-ilaç etkileşimi bilgi düzeyi, tedavinin etkinliği ile ilişkilidir. Bu nedenle bilgi düzeyini ölçmek önemlidir. Bu çalışma, sağlık çalışanlarının gıda-ilaç etkileşimi bilgi düzeylerini ölçebilecek ve bu konudaki farkındalığı artırabilecek bir ölçek geliştirmeyi amaçlamaktadır.

Metot: Araştırma için tesadüfi örnekleme yöntemi ile Ankara'da çalışan toplam 200 kişi (her meslekten 50 kişi: tıp doktoru, hemşire, diyetisyen ve eczacı) seçilmiştir. Ölçek 25 maddeden ve her biri için "Doğru", "Yanlış" ve "Bilmiyorum" olmak üzere üç seçenekten oluşmaktadır. Değerlendirmede her uygun yanıt 1 (bir) puan, diğerleri (yanlış ve bilinmeyen) 0 (sıfır) puana eşittir. Ölçeğin geçerliği için içerik geçerliği ve madde analizi yapılmış ve ayrıca Cronbach alfa katsayısı hesaplanmıştır.

Bulgular: Analizler sonucunda toplam puanla toplam korelasyonu 0,15'in altında olan 4 madde ölçekten çıkarılmıştır. Ölçeğin madde güçlükleri 0.20 ile 0.96 arasında değişmekte olup, ölçeğin ortalama madde güçlükleri 0.61±0.18 olarak bulunmuştur. Ölçek 21 maddelik çeyrek puan üzerinden değerlendirilmiştir. Buna göre 21 maddeden 25'inci yüzdelik dilim 5,25, 50'nci yüzdelik dilim 10,25 ve 75'inci yüzdelik dilim 15,75'tir. 5'ten küçük puan sınıflandırması "düşük" bilgi düzeyi, 6-11 arası "orta", 11-15 arası "iyi" ve 16-21 arası "çok iyi" anlamına gelmektedir.

Sonuç: Sonuç olarak bu ölçeğin sağlık profesyonellerinin gıda-ilaç etkileşimi bilgi düzeylerini belirlemek amacıyla kullanılabilecek oldukça geçerli ve oldukça güvenilir olduğu görülmüştür.

Anahtar Kelimeler: Gıda ilaç etkileşimi, sağlık çalışanı, geçerlik ve güvenirlik, ölçek)

1. Introduction

Drug is a substance used to alter or examine the physiological systems or pathological conditions for the benefit of the patient [1]. However, drugs must be taken carefully. Otherwise, patients may suffer from vital risks [2, 3]. The pharmacokinetics and pharmacodynamics of drugs are importantly influenced by food. That's because the ingredients of foods may have an effect to modulate the efficacy of drug components [4]. However, taking drugs during an illness can raise the risk of food and drug interaction. Therefore, it is important to prevent food-drug interaction through a healthy diet and careful drug use [5]. While some foods and nutrients affect the drug absorption, transport, metabolism and excretion, drugs may affect the nutrient metabolism and nutritional status of the individual, as well [6]. In addition, since the general nutritional status of an individual affects the level of carrier proteins in blood, drug transport may also be affected [7, 8].

If necessary attention is not paid, food-drug interaction may adversely affect the absorption and bioavailability of nutrients and/or drugs, and the nutritional status of individuals. While the isocaloric differences in carbohydrate and fat intake do not have a significant effect, protein intake causes remarkable differences in metabolic rate and clearance of the drug. Dietary protein support accelerates drug metabolism and increases its clearance, on the other hand, carbohydrate support has an opposite effect [9]. Pulpy nutrients can bind to bile acids, and particularly reduce or delay the absorption of lipophilic drugs. In addition, high-pectin nutrients also delay drug absorption [10]. Moreover, consumption of dairy products with tetracycline creates drug and calcium chelate and decreases their absorption [11]. The use of anticonvulsant drugs such as phenobarbital and phenytoin may deter the metabolism of various vitamins such as folic acid, vitamin B12 [12]. During warfarin use, a vitamin K-rich diet causes a decrease in drug activity [13].

In summary, nutrient-drug interaction may reduce the therapeutic effect of the drug or cause toxicity [14]. In particular, the information that healthcare professionals of all drug groups involved in treatment processes have both positive and negative effects on the treatment process directly. In this context, it is important that health care providers have sufficient knowledge about food and drug interaction. Thus, it can be ensured that patients are properly informed about food-drug interaction.

However, due to lack of a standard measurement scale to determine food-drug interaction knowledge level, the studies conducted to determine the knowledge level of health care providers yield subjective results [15-17], and this necessitates the use of a standard scale. This study aims to determine the food-drug interaction knowledge levels of health care providers and to develop a reliable and valid scale.

2. Material and Method

Target population of the study consists of physicians, nurses, dietitians and pharmacists who work as health care providers in Ankara. In the application of the scale in literature, it is recommended that the number of samples should be at least 5-10 times the number of items in the scale [18]. Therefore, working with 200 individuals was found to be more suitable as this study was initiated with 25 items at first. In order to eliminate inter-professional changes, 50 people from each occupational group were included in the study.

The permission was taken from Gazi University Ethics Commission for the study by the acceptance dated 15/06/2017- and numbered E.86927.

Development Process of Food-Drug Interaction Knowledge Scale and Data Collection

In order to measure the food-drug interaction knowledge level, a literature review was conducted [19-21] and some items were received from experts. After providing sufficient information about the subject, the draft scale form consisting of 29 items was presented to 20 experts with three options including “Appropriate”, “Appropriate but should be reviewed” and “Not Appropriate”.

After taking the consistent comments of the experts (a minimum of PhD level), necessary corrections were made on the draft scale including 25 items. Participants have three options for each item: “True”, “False”, “I do not know”. The content validity of the scale was ensured by obtaining the expert opinion for the scale form [22]. In addition, since the aim of the scale is to measure knowledge levels of participants, item analysis was applied to examine the relation of the items with the whole scale. Item discrimination index (rj) and item difficulty index (pj) were examined within the scope of item analysis [23].

Item discrimination index is used for qualitative separation of individuals with items. The higher is the total scale score of individuals who answer an item correctly, the higher their item discrimination becomes [24]. Item discrimination results vary between (-1) and (+1). Accordingly, if item discrimination value of an item is between (-1) and (+0.15), it must be removed from the scale; if the value is between 0.16 - 0.19, it must be used after a review; if between 0.20 - 0.30, it can be used; if between 0.31 - 0.40, it is accepted as a good item, and if above 0.41, it is accepted as very good.

Item difficulty is the percentage of correct answers given to an item. Average item difficulty of a scale is calculated by dividing the total item difficulty by the number of items [25]. Item difficulty results vary between 0 and 1. If the result is between 0.8 - 1, the items are very easy; if between 0.4 - 0.59, they are intermediate; if between 0.2 - 0.39, they are difficult, and if lower than 0.19, they are accepted as very difficult.

An internal consistency analysis was performed to determine the reliability of the scale. Cronbach’s alpha coefficient was taken as a reference in the internal consistency analysis. If alpha coefficient value is between 0.80 - 1.00, reliability of the scale is accepted to be highly reliable; if between 0.60 - 0.80, accepted to be very reliable, and if between 0.40 - 0.60, its reliability is accepted to be low. If alpha coefficient value is between 0.00 - 0.40, the scale is not reliable.

After the validity and reliability analyses, 4 items were removed from the scale, as their item discrimination values were under 0.15.

Statistical analyses were made by means of SPSS (IBM SPSS Statistics 22) package program. Item difficulty and item discrimination indexes were examined.

Item difficulty index (pj) was evaluated on the basis of the number of correct answers. Item discrimination index was evaluated according to the correlation of each item with the total scale score. A Shapiro-Wilks normality test was used to determine whether the total scale score had a normal distribution. Thereby, the parametric Pearson Correlation analysis was employed as the scores had normal distribution.

3. Results

General Information about Participants

The ratio of the participants who have bachelor's degree is 65.5%, the ratio of who have master's or similar degree is 26.5%, and 4.5% of ratio have doctorate and similar degree. Additionally, 3.5% of the participants are either associate professors or professors. The percentage of 40.4% of the male participants is medical doctor, and 34.6% is pharmacist. In addition, 31.1% of the female participants is nurse, while 27.7% is dietician. The distribution of physicians and pharmacists by gender includes a similar number of participants. However, the number of female participants is higher than that of males according to the distribution of nurses and dieticians by gender (Table 1).

Content Validity Level of the Scale

The draft scale which was prepared on the basis of the literature in order to measure the food-drug interaction knowledge levels with 29 items was reviewed by 20 experts in terms of its language and content. After the remarks of the experts, 4 items were removed from the draft (Appendix-1).

Table 1: Distribution of participants by demographic attributes.

Attributes	Male (n:52) Number (%)	Female (n:148) Number (%)	Total (n:200) Number (%)
Educational Background/Title			
Bachelor	28 (53.9)	103 (69.6)	131 (65.5)
Master	18 (34.6)	35 (23.6)	53 (26.5)
PhD	0 (0)	9 (6.1)	9 (4.5)
Assoc. Prof.	1 (1.9)	1 (0.7)	2 (1)
Prof.	5 (9.6)	0 (0)	5 (2.5)
Occupation			
Medical Doctor	21 (40.4)	29 (19.6)	50 (25)
Nurse	4 (7.7)	46 (31.1)	50 (25)
Dietician	9 (17.3)	41 (27.7)	50 (25)
Pharmacist	18 (34.6)	32 (21.6)	50 (25)

In this study, it was found that the median value of the scale score of all participants was at "good" classification by 13 points. In general, the knowledge level of health professionals is in the range of "moderate" and "good".

Table 2: Median values of the scores depending on occupational groups

Profession	**Median**	**Upper-Lower**	χ^2	**p**
Physician (n=50)	15	6-20	33,745	<0,001
Nurse (n=50)	11	1-16		
Dietician (n=50)	14,5	3-21		
Pharmacist (n=50)	13	4-21		
Total (n=200)	13	1-21		

According to table 2, physicians received the highest score (15); afterwards dieticians (14,5), pharmacists (13) and nurses (11) followed, respectively. The median results of the scale total score according to the occupations of the participants were statistically significant ($p<0.001$). Furthermore, the difference between nurses and all other occupational groups was significant based on the comparison between occupational groups ($p<0.01$).

Item Analysis

Item discrimination (rj) and item difficulty indexes (pj) were calculated to determine the validity of the items in the scale.

Item Discrimination Index

It was found out that item discrimination values of the items varied between (-0.83) and 0.585, and the correlation of four items (I5, I12, I15 and I24) with total score was lower than (+0.15) (Table 2). For this reason, these items were removed from the scale. Correlation of the other 21 items with the total score of the scale was within the desired range and significant ($p<0.01$).

Item Difficulty Index

Item difficulty index values of the 21 acceptable items are given in Table 2. The table shows that item difficulty values of the items vary between 0.20 and 0.96. According to the item difficulty classification, I1, I2 and I19 are very easy. I9, I10, I16, I17, I18, I21, I22, I23 and I24 are easy. I3, I4, I7, I11, I13 and I20 are intermediate. Lastly; I6, I8 and I14 are difficult.

Table 3: Correct answer rates of each item (p_i) and item-total correlation coefficients (r_j)

Item	p_j	r_j	Item	p_j	r_j
I1	0.96	0.306	I14	0.31	0.477
I2	0.81	0.372	**I15***	0.73	**0.086**
I3	0.58	0.429	I16	0.67	0.501
I4	0.54	0.313	I17	0.63	0.466
I5*	0.76	**-0.83**	I18	0.72	0.422
I6	0.20	0.294	I19	0.86	0.450
I7	0.56	0.417	I20	0.60	0.469
I8	0.38	0.487	I21	0.70	0.479
I9	0.71	0.453	I22	0.79	0.564
I10	0.75	0.300	I23	0.68	0.514
I11	0.40	0.280	**I24***	0.82	**0.060**
I12*	0.82	**0.088**	I25	0.62	0.585
I13	0.55	0.348			

Reliability Level of the Scale

For reliability analysis of the scale, Cronbach's alpha coefficient was calculated and found to be 0.731. After the determination of the item difficulty index and item discrimination index by means of item analysis and removal of 4 items, reliability of the remaining 21 items were examined again and found to be 0.787. This result showed that the developed scale was more reliable.

Validity and reliability analysis results of the improved scale proved that it was appropriate for the study. In order to evaluate the scale scores, the results were classified by quarter values in 4 levels including low, intermediate, good and very good (Table 3).

Table 4: Classification of the Scale by Scores

Score	Classification
0-5	Low
6-10	Intermediate
11-15	Good
16-21	Very Good

If the number of correct answers is between 0 - 5, participants' knowledge level is low; if 6 - 11, their level is intermediate; if 11 - 15, their level is good, and if 16 - 21, they have a very good knowledge level.

The validity and reliability analysis results showed that the latest version of the scale consisting of 21 items can be used to measure the food-drug interaction knowledge levels of health care providers. The latest version of the scale is available in Appendix-2.

4. Discussion and Conclusion

This study aims to develop a scale to determine food-drug interaction knowledge levels of health care providers. Medical doctors, nurses, dieticians and pharmacists were selected for the study. This study has shown that the scale has an intermediate difficulty according to the item difficulty index. According to the item difficulty and Cronbach's α coefficient, this developed scale is highly feasible to measure the food-drug interaction knowledge levels of health care providers.

Items related to fasting status are better known. However, it seems that the substances related to the effect of high fiber are in the middle or difficult range. The effect of macronutrient content of the meal on drug bioavailability and toxicity is less known. In addition, the effect of the carbohydrate and fat content of the meal is known less than the effect of the protein content. Besides, questions about hypertension treatment, electrolyte balance and mineral metabolism were answered more easily.

Because of very low item discrimination indices, I5, I12, I15 and I24 were removed. These items were asked as reverse question, ironically that may be the reason why these items' discrimination indices were found low.

The interaction of vitamin K with anticoagulants is well known [26, 27]. However, in our study, that's known at an intermediate level. Similar to our study, in Radwan's study (2018), the interaction of monoamine oxidase inhibitor with fermented foods is easily known. Albeit, in Radwan's study (2018) the items about digoxin with high fiber and levodopa with protein-rich food is correctly answered by ~%60 [27], in our study is signed as intermediate based on item difficulty classification.

In many studies, it's demonstrated that the healthcare professionals have inadequate food-drug interaction knowledge [27-29]. In fact, it is reported that none of the participants could properly define drug side effect, including drug interaction, as well [28]. In a study Moinuddin et al. (2018) indicated that medical doctors, pharmacists, nurses, dentists and technicians were not sufficiently aware of the undesirable effects of drugs [30]. Moreover, the knowledge level of nurses about drug treatment errors was found responsible for approximately 10% of patients who had serious health problems due to treatment mistakes [31]. Considering these studies, the health care professionals have inadequate knowledge about food-drug interactions, which confirmed our starting point.

In studies conducted by Benni et al. (2012) and Oğuz et al. (2015), it was shown that the more the graduation level, the better the knowledge [17, 32]. By the way, Hanafi et al. (2014) proved that the knowledge of nurses was raised at the end of the training [33]. Benni et al. (2012) pointed out professors obtained significantly the highest score and the knowledge of graduates and interns was found inadequate [17]. The findings of study by Oğuz et al. (2015) have demonstrated that bachelor-degree nurses had better knowledge than the ones with high school and associate degrees [32]. Likewise, in this study we have found out a positive correlation between the educational background and knowledge levels of the health care providers. It is proved that knowledge level increases in direct proportion to educational background; however, results are not statistically significant ($r=0.175$, $p=0.700$). Consequently, it is noticed that there is a positive correlation between educational background and knowledge level. Therefore, it is important for health professionals to keep their knowledge on food-drug interaction up-to-date in terms of patient health.

Enwerem and Okunji (2015), examined the correlation between the knowledge level of nurses and difference in working period significantly, but the correlation was not linear [34]. In another study, it was found that the food-drug interaction knowledge levels of nurses whose service had a clinical pharmacologist was better than the other nurses who didn't have a pharmacologist in their department [35]. According to the results of our study, there was a negative correlation between the knowledge levels and working period ($r=-0.054$, $p=0.468$). It may be considered that younger professionals have higher scores as their knowledge is current, or professionals have failed to improve themselves during their term of office. This proves that health care professionals must extend and update their professional knowledge through training activities after their graduation.

The fact that the items were not asked in parallel with specialization of physicians is a major limitation for study. Because physicians are specialized with strict boundaries, general questions did not work well for medical doctors.

An assessment instrument about food-drug interaction such as a test, scale, etc. is required to evaluate the knowledge levels of health care providers. These tools should be familiar to health workers by the basic pharmacology and drug metabolism, and will help better understand the nutrient interaction. Although there are studies conducted in Turkey and in the world, there is still a need for a standard scale. For this reason, this scale has been prepared to determine the food-drug interaction knowledge levels of health care providers. Thus, it is possible to measure the knowledge levels of professionals and prevent patients from false treatments by setting training programs, where necessary.

Declaration of Ethical Code

In this study, we undertake that all the rules required to be followed within the scope of the "Higher Education Institutions Scientific Research and Publication Ethics Directive" are complied with, and that none of the actions stated under the heading "Actions Against Scientific Research and Publication Ethics" are not carried out.

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EK

Appendix-1: Draft Scale Form prepared for the Participants

NAME SURNAME:	UNIVERSITY:
OCCUPATION:	GRADUATION YEAR:
GENDER:	GRADUATION AGE: .... Years
MARITAL STATUS:	EMPLOYER:
TITLE:	TOTAL LENGTH OF SERVICE:

Items	**True**	**I do not know**	**False**
1. The fasting status of an individual does not change effectiveness of a drug. *(Bireyin aç veya tok olması alınan ilacın etkinliğini değiştirmez)*			
2. Some antiulcer drugs, such as sucralfate, should be taken on an empty stomach as they bind to the protein in the nutrients. *(Sükralfat gibi antiülser etkili bazı ilaçlar besinlerdeki proteine bağlandığı için açken alınmalıdır)*			
3. Energy restricted diets may increase sensitivity of certain stimulant drugs such as amphetamine. *(Enerji kısıtlaması yapılan diyetler amfetamin gibi bazı uyarıcı ilaçların duyarlılığını artırabilir)*			
4. Taking a lipophilic drug with high fatty food/meal increases toxicity of the drug. *(Lipofilik ilaçlar yağ içeriği yüksek besin/öğünle birlikte alındığında ilacın toksisite riski artar)*			
5. A high-carbohydrate diet reduces the excretion of certain anti-asthma drugs such as theophylline. *(Yüksek karbonhidratlı beslenme Teofilin gibi bazı antiastım ilaçların atılımını azaltır)*			
6. Propranolol having antihypertensive effect increases the bioavailability of drugs, if taken with a high-carbohydrate meal. *(Antihipertansif etkili Propranolol yüksek karbonhidratlı bir öğünle alındığında ilacın biyoyararlanımı artar)*			
7. High fiber diets bind bile and diminish acids, and thus increases excretion of some drugs. *(Yüksek posalı diyetler safra asitlerini bağlayıp kaybına neden olarak bazı ilaçların atılımını artırır)*			
8. High fiber and pectin foods delay absorption of some drugs such as digoxin. *(Yüksek posalı ve yüksek pektinli besinler Digoksin gibi bazı ilaçların emilimini geciktirir)*			
9. In general, a protein-poor diet causes a decrease in half-life of drugs and plasma clearance by decreasing albumin levels. *(Genel olarak proteinden fakir diyetle beslenme albümin düzeyinin düşmesine neden olarak ilaçların yarılanma ömrünün azalmasına ve plazma klirensinin düşmesine sebep olur)*			
10. Due to the components found in its chemical structure, grapefruit juice increases the blood concentration of calcium channel blocker drugs such as Felodipine. *(Kimyasal yapısında bulunan bileşenler nedeniyle greyfurt suyu, Felodipin gibi kalsiyum kanal bloker ilaçların kan konsantrasyonunu artırır)*			
11. Chemotherapeutic drugs' bioavailability increases with grapefruit juice. *(Kemoterapötik ilaçlar greyfurt suyu ile biyoyararlanımı artan ilaçlardan bazılarıdır)*			
12. Taking caffeinated drinks with antiosteoporosis drugs containing bisphosphonates at the same time increases the absorption and effectiveness of the drug. *(Kafeinli içeceklerin bifosfonatları içeren antiosteoporoz ilaçlarla birlikte alınması ilacın emilimini ve etkinliğini artırır)*			
13. Vegetables containing vitamin K such as broccoli, cabbage, spinach, etc. increase the efficacy of warfarin-containing anticoagulant drugs. *(K vitamini içeren sebzeler (brokoli, lahana, ıspanak vb.) Varfarin içeren antikoagülan ilaçların etkinliğini yükseltir)*			

14. Taking Parkinson's disease drugs such as Levadopa, Methyldopa with protein-rich foods decreases the absorption of the drug. *(Parkinson hastalığında kullanılan Levadopa, Metildopa gibi ilaçlar proteinden zengin besinlerle birlikte alındığında ilacın emilimi azalır)*			
15. Some antibiotics such as tetracycline and ciprofloxacin bind to calcium, magnesium, iron and zinc, and increase absorption of both drug and mineral. *(Tetrasiklin ve Siprofloksasin gibi bazı antibiyotikler kalsiyum, magnezyum, demir ve çinko ile bağlanarak hem ilacın hem de mineralin emiliminin artmasına neden olur)*			
16. Anticonvulsant drugs such as phenobarbital and phenytoin may disrupt folic acid, vitamin D and vitamin K metabolism. *(Fenobarbital ve Fenitoin gibi antikonvülsan ilaçlar folik asit, D vitamini ve K vitamini metabolizmasını bozabilir)*			
17. Antacid group drugs such as sodium bicarbonate reduce calcium absorption. *(Sodyum bikarbonat gibi antiasit grubu ilaçlar kalsiyum emilimini azaltır)*			
18. As antihypertensive drugs containing ACE inhibitors cause hyperkalemia, they should not be consumed with foods rich in potassium such as bananas and green leafy vegetables. *(ACE inhibitörleri içeren antihipertansif ilaçlar hiperkalemiye sebep olduğu için muz, yeşil yapraklı sebzeler gibi yüksek potasyum içeren besinlerle birlikte tüketilmemelidir)*			
19. Long-term use of steroids adversely affects calcium metabolism. *(Uzun süreli steoroid kullanımı kalsiyum metabolizmasını olumsuz etkiler)*			
20. Cyclosporin-containing immunosuppressive drugs may increase blood pressure by increasing the sodium and water retention in the body. *(Siklosporin içeren immünosupresif ilaçlar vücutta sodyum ve su tutumunu artırarak kan basıncı artışına neden olabilir)*			
21. Drugs such as thiazides and loop diuretics trigger hypokalemia by increasing potassium excretion. *(Tiazid' ler ve Loop diüretikleri gibi ilaçlar potasyum atımını artırarak hipokalemiyi tetikler)*			
22. Antacids and proton pump inhibitors adversely affect iron absorption by changing gastric pH. *(Antiasitler ve Proton pompa inhibitörleri mide pH' sını değiştirerek demir emilimini olumsuz yönde etkiler)*			
23. Monoamine oxidase inhibitors (MAOI) cause a hypertension crisis, if taken with high tyramine-containing foods such as processed and aged cheese, fermented salami, fermented sausage, sausage, chicken and calf liver. *(Monoamin oksidaz inhibitörleri (MAOI) yüksek tiramin içeren besinlerle (işlem görmüş eski peynir çeşitleri, fermente edilmiş salam, sucuk, sosis, tavuk ve dana ciğeri) birlikte alındığında hipertansiyon krizine yol açar)*			
24. Statin group antihyperlipidemic drugs increase the absorption of fat-soluble vitamins. *(Statin grubu antihiperlipidemik ilaçlar yağda eriyen vitaminlerin emilimini artırır)*			
25. Antidiabetic drugs with metformin active substance negatively affect the absorption of vitamin B12. *(Metformin etken maddeli antidiyabetik ilaçlar B_{12} vitamininin emilimini olumsuz etkiler)*			

Items Removed:

* Half-life and distribution of lipid-soluble drugs are higher than that of water-soluble drugs.
* High protein diet reduces the half-life of some anti-inflammatory drugs such as Antipyrine.
* Antituberculosis drugs such as isoniazide inhibit conversion of vitamin B6 to its active form.
* Corticosteroids such as Prednol, Decort, Deltacortil increase blood glucose levels.
* Corticosteroids increase urinary nitrogen excretion.

Items Added:

* Antidiabetic drugs with metformin active substance negatively affect the absorption of vitamin B12.

Appendix-2: Food-Drug Interaction Knowledge Level Scale

NAME SURNAME:
OCCUPATION:
GENDER:
MARITAL STATUS:
TITLE:

UNIVERSITY:
GRADUATION YEAR:
GRADUATION AGE: .... Years
EMPLOYER:
TOTAL LENGTH OF SERVICE:

Items	**True**	**I do not know**	**False**
1. The fasting status of an individual does not change effectiveness of a drug. *(Bireyin aç veya tok olması alınan ilacın etkinliğini değiştirmez)*			
2. Some antiulcer drugs, such as sucralfate, should be taken on an empty stomach as they bind to the protein in the nutrients. *(Sükralfat gibi antiülser etkili bazı ilaçlar besinlerdeki proteine bağlandığı için açken alınmalıdır)*			
3. Energy restricted diets may increase sensitivity of certain stimulant drugs such as amphetamine. *(Enerji kısıtlaması yapılan diyetler amfetamin gibi bazı uyarıcı ilaçların duyarlılığını artırabilir)*			
4. Taking a lipophilic drug with high fatty food/meal increases toxicity of the drug. *(Lipofilik ilaçlar yağ içeriği yüksek besin/öğünle birlikte alındığında ilacın toksisite riski artar)*			
5. Propranolol having antihypertensive effect increases the bioavailability of drugs, if taken with a high-carbohydrate meal. *(Antihipertansif etkili Propranolol yüksek karbonhidratlı bir öğünle alındığında ilacın biyoyararlanımı artar)*			
6. High fiber diets bind bile and diminish acids, and thus increases excretion of some drugs. *(Yüksek posalı diyetler safra asitlerini bağlayıp kaybına neden olarak bazı ilaçların atılımını artırır)*			
7. High fiber and pectin foods delay absorption of some drugs such as digoxin. *(Yüksek posalı ve yüksek pektinli besinler Digoksin gibi bazı ilaçların emilimini geciktirir)*			
8. In general, a protein-poor diet causes a decrease in half-life of drugs and plasma clearance by decreasing albumin levels. *(Genel olarak proteinden fakir diyetle beslenme albümin düzeyinin düşmesine neden olarak ilaçların yarılanma ömrünün azalmasına ve plazma klirensinin düşmesine sebep olur)*			
9. Due to the components found in its chemical structure, grapefruit juice increases the blood concentration of calcium channel blocker drugs such as Felodipine. *(Kimyasal yapısında bulunan bileşenler nedeniyle greyfurt suyu, Felodipin gibi kalsiyum kanal bloker ilaçların kan konsantrasyonunu artırır)*			
10. Chemotherapeutic drugs' bioavailability increases with grapefruit juice. *(Kemoterapötik ilaçlar greyfurt suyu ile biyoyararlanımı artan ilaçlardan bazılarıdır)*			
11. Vegetables containing vitamin K such as broccoli, cabbage, spinach, etc. increase the efficacy of warfarin-containing anticoagulant drugs. *(K vitamini içeren sebzeler (brokoli, lahana, ıspanak vb.) Varfarin içeren antikoagülan ilaçların etkinliğini yükseltir)*			
12. Taking Parkinson's disease drugs such as Levadopa, Methyldopa with protein-rich foods decreases the absorption of the drug. *(Parkinson hastalığında kullanılan Levadopa, Metildopa gibi ilaçlar proteinden zengin besinlerle birlikte alındığında ilacın emilimi azalır)*			
13. Anticonvulsant drugs such as phenobarbital and phenytoin may disrupt folic acid, vitamin D and vitamin K metabolism. *(Fenobarbital ve Fenitoin gibi antikonvülsan ilaçlar folik asit, D vitamini ve K vitamini metabolizmasını bozabilir)*			
14. Antacid group drugs such as sodium bicarbonate reduce calcium absorption. *(Sodyum bikarbonat gibi antiasit grubu ilaçlar kalsiyum emilimini azaltır)*			
15. As antihypertensive drugs containing ACE inhibitors cause hyperkalemia, they should not be consumed with foods rich in potassium such as bananas and green leafy vegetables.			

(ACE inhibitörleri içeren antihipertansif ilaçlar hiperkalemiye sebep olduğu için muz, yeşil yapraklı sebzeler gibi yüksek potasyum içeren besinlerle birlikte tüketilmemelidir)			
16. Long-term use of steroids adversely affects calcium metabolism. *(Uzun süreli steoroid kullanımı kalsiyum metabolizmasını olumsuz etkiler)*			
17. Cyclosporin-containing immunosuppressive drugs may increase blood pressure by increasing the sodium and water retention in the body. *(Siklosporin içeren immünosupresif ilaçlar vücutta sodyum ve su tutumunu artırarak kan basıncı artışına neden olabilir)*			
18. Drugs such as thiazides and loop diuretics trigger hypokalemia by increasing potassium excretion. *(Tiazid' ler ve Loop diüretikleri gibi ilaçlar potasyum atımını artırarak hipokalemiyi tetikler)*			
19. Antacids and proton pump inhibitors adversely affect iron absorption by changing gastric pH. *(Antiasitler ve Proton pompa inhibitörleri mide pH' sını değiştirerek demir emilimini olumsuz yönde etkiler)*			
20. Monoamine oxidase inhibitors (MAOI) cause a hypertension crisis, if taken with high tyramine-containing foods such as processed and aged cheese, fermented salami, fermented sausage, sausage, chicken and calf liver. *(Monoamin oksidaz inhibitörleri (MAOI) yüksek tiramin içeren besinlerle (işlem görmüş eski peynir çeşitleri, fermente edilmiş salam, sucuk, sosis, tavuk ve dana ciğeri) birlikte alındığında hipertansiyon krizine yol açar)*			
21. Antidiabetic drugs with metformin active substance negatively affect the absorption of vitamin B12. *(Metformin etken maddeli antidiyabetik ilaçlar B_{12} vitamininin emilimini olumsuz etkiler)*			

Items Removed:

* A high-carbohydrate diet reduces the excretion of certain anti-asthma drugs such as theophylline.
* Taking caffeine drinks with antiosteoporosis drugs containing bisphosphonates increases the absorption and effectiveness of the drug.
* Some antibiotics such as tetracycline and ciprofloxacin bind to calcium, magnesium, iron and zinc, and increase absorption of both drug and mineral.
* Statin group antihyperlipidemic drugs increase the absorption of fat-soluble vitamins.
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