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건강기능식품에 관한 인식도 및 소비양식의 분석

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Analysis of Perceptions and Behaviors Associated with Health Functional Food Use: a cross-sectional survey

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Background: The use of health functional food (HFF) is increasing and will continue to rise worldwide. Concerns about HFF-drug interactions are increasing as HFF are becoming more widely used. Therefore, awareness of consumers' perceptions and behaviors associated with HFF use may help health care providers improve their communications with patients. **Purpose:** The aim of this study was to assess the characteristics, perceptions, and behaviors associated with HFF use in South Korea. **Method:** The online survey was conducted from September 21th to October 7th, 2013. With the aid of Social Network Service (SNS) and google, the questionnaire was posted online on internet website targeting people aged 15 years or older so that self-reported data covering 4 domains were collected from 257 Koreans. **Results:** A total of 257 people responded the questionnaire. Among them, 81.3% reported experiences of HFF use. Female were more likely than male to use HFFs. There were no differences in demographic characteristics between HFF users and non-users in relation to age, education, and household income. Higher level of education was associated with high-level perception of HFF function (OR 3.9, 95% CI 1.48, 10.1) and a positive relationship was observed between the maximum number of HFFs used concurrently and age of the respondents. Among the HFF users, 42.6% reported concurrent HFF-medication use. However 73.3% of them did not disclose their use to physician or pharmacist and only 30.2% were informed about potential drug-HFF interactions. Pharmacy was most commonly reported as the source from which the respondents were informed about potential interactions. **Conclusion:** Many people had used HFF and medications concurrently while not being informed about potential HFF-drug interactions. Pharmacists and physicians should be vigilant for risk of the interactions and actively determine whether the patient is using an HFF before prescribing and administrating medications.

□ Key words - Health functional food, perception, attitude, interaction, survey

The term "health functional foods" refers to a product intended to enhance and preserve the human health with one or more functional ingredients or constituents. In South Korea, the Health Functional Food Act was enacted in 2002 to ensure the safety of health functional foods (HFFs). Every HFF has its own symbolic marker indicating that it has been proven by KFDA. As the constituents of HFFs, some of the nutrients such as vitamins, minerals, etc., and some ingredients such as ginko flavonoid, silymarin, and PGG (Penta-O-galloyl beta-D-glucose), etc. are used. The scope of HFFs was extended to include conventional foods and other diet supplements by revised act in 2008. HFFs fall into 3 categories: nutrient function claim, disease risk claim, and other function claim. Nutrient function claim is related to any physiological role of the nutrients in growth, development and normal functions of the human body. On the other hand, disease risk claim is associated with the reduced risk of developing a disease

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while other function claims are related to any positive contribution to the improvement or preservation of health in the context of the total diet.

In recent decades, there has been a remarkable growth in functional food use worldwide.[1-4] In South Korea also, the use of HFFs has increased rapidly over the past five years and is on the rise. In 2012, HFF sales totaled approximately ₩1.35 trillion and have risen 14.33% annually since 2008.[5] As HFFs become more widely used and the market scales continue to rise, concerns about adverse reactions and drug-HFF interactions are increasing. In recent years, it has been reported that concurrent use of HFFs with medications could raise the potential of pharmacokinetic and/or pharmacodynamic interactions, even therapeutically safe herbs.[6-9] Previously not a few case reports described potential HFF-drug interactions: an intracerebral hemorrhage occurred in a patient who was on chronic warfarin therapy after 2 month-intake of Ginkgo biloba[10]; while a massive intraoperative bleeding was observed with the concomitant use of sevoflurane and Aloe vera.[11]

In fact, HFFs typically have multiple active constituents, thus the likelihood of drug-HFFs interactions or interactions among the various HFF products are increased when compared with the likelihood of interactions between 2 prescription medications.[12] Another risk associated with the use of HFFs is potential for adverse reactions, which may be especially problematic with multiple use or excessive intake of HFFs. It is notable that among 83 raw materials that are approved by Ministry of Food and Drug Safety (MFDS) and listed in the Health Functional Food Code, 37 items are used for both HFF products and drugs. More than 3,000 functional products approved by MFDS are made of the same raw materials as drugs. To make it worse, some of these products fail to inform consumers of Daily intake limit. This increases the risks for excessive intake and adverse reactions as well.

In spite of the increasing concerns about potential risks of interactions and adverse reactions, the potential risks are often ignored or underestimated. In reality, most of the concurrent users of medication and HFFs fail to report supplement use to their health care providers.[13-16] This may be due to a perceived negative attitude of medical professionals to HFF use and consumers' belief in the safety of natural products.[14] Undisclosed supplement use, combined with the gap in scientific knowledge regarding their effects, creates a potential for patients to be unknowingly put at risk. To avoid potential risks, there is a need to explore the perceptions and behaviors associated with HFFs.

On the other hand, reasons why consumers use HFFs need to be understood in order to improve communication with them and further to prevent delayed diagnosis and/or treatment of the consumers' disease. A previous study found that reasons for dietary supplement use vary a great deal, improving health and wellbeing, overall energy levels, feeling better, and boosting immune systems.[17,18] Some users thought that supplements could prevent cancer, which was associated with delay in seeking medical advice and presentation at an advanced stage of disease.[19,20] The extensive use of dietary supplements among higher risk patients poses a potential safety concern that could be mitigated by pharmacist counseling on the appropriate use of these products.

Knowing differences in demographic, perceptional and behavioral characteristics of consumers would help healthcare professionals counsel with their patients about the appropriate use of HFFs. Therefore, this study was designed to get an analysis about the characteristics, perceptions, and behaviors associated with HFF use among Korean people.

METHOD

Study Design

The online survey was conducted from September 21th to October 7th, 2013. Facebook and Twitter were utilized for recruiting participants. The questionnaire was created with Google Docs and posted on Web site targeting people aged 15 years or older so that self-reported data covering 4 domains were collected: (1) demographics; (2) HFF use; (3) perception of potential drug-HFFs interactions; and (4) attitudes toward HFF labeling information. Demographic characteristics included age, gender, education, and house-

hold income. HFF use included maximum numbers of HFFs used during the same intake period, continuation or discontinuation of HFF intake within the recommended intake period, purposes of HFF intake, information sources for purchasing, and preferred places to purchase. Perception levels of drug-HFF interactions included disclosure of HFF use to their health care providers and concurrent use with drugs. Attitudes toward HFF labeling information included checking the symbol of HFF, identifying the active ingredients, understanding the functionality of the HFF products, and compliance with the instructions. 'Ever Users' was defined as the respondents who had ever used HFF while the respondents who had never used HFF were classified as 'Never Users'. The questionnaire incorporated skip patterns and participants were allowed to leave out questions that were not applicable. The unanswered items were excluded in the analysis.

Statistical Analysis

Data were entered and managed using Microsoft Excel 2010, and later analyzed using SPSS version 21.0. Frequency analysis was used for data on the characteristics of the respondents and to determine the descriptive results. Chi-squared or Fisher's exact tests were performed to determine correlation between characteristics of the respondents and perceptions/behaviors associated with HFF. Multivariate logistic regression analysis including characteristics, perceptions and behaviors was performed in order to explore the variables associated with HFF use. Tests were 2-tailed, and a p value < 0.05 was considered statistically significant.

RESULTS

General characteristics of respondents

A total of 257 people responded the questionnaire. The majority were female (61.9%, 159/257) and graduated college (87.5%, 225/257). Age groups of the respondents were: 63 (24.5%) respondents in 15-25 years old, 104 (40.5%) respondents in 26-35 years old, 47 (18.3%) respondents in 36-45 years old, 22 (8.6%) respondents in 46-55 years old, and 21 (8.2%) respondents over 55 years old. Female were more likely than male to engage in the use of HFFs (84.9% of all female vs. 75.5% male). But it was not statistically significant (OR 1.8, 95% CI 0.97, 3.43). There were no differences in demographic characteristics between HFF users and non-users in relation to age, education, and household income (Table 1).

Table 1. Characteristics of the respondents.

Characteristic		No. (%) of Ever Users (n=209)	No. (%) of Never Users (n=48)	No. (%) of total (n=257)
Sex	Male	74 (35.4)	24 (50.0)	98 (38.1)
	Female	135 (64.6)	24 (50.0)	159 (61.9)
Age (year)	15-25	49 (23.4)	14 (29.2)	63 (24.5)
	26-35	84 (40.2)	20 (41.7)	104 (40.5)
	36-45	43 (20.6)	4 (8.3)	47 (18.3)
	46-55	18 (8.6)	4 (8.3)	22 (8.6)
	56	15 (7.2)	6 (8.3)	21 (8.2)
Education	Middle school graduate	3 (1.4)	1 (2)	4 (1.6)
	High school graduate	22 (10.5)	5 (10.4)	27 (10.5)
	College graduate	184 (88.0)	41 (85.4)	225 (87.5)
	Not reported	-	1 (2)	1 (<1)
Household income (million won, monthly average)	< 2	95 (45.5)	25 (52.1)	120 (46.7)
	2-4	71 (34.0)	7 (14.6)	78 (30.4)
	4-6	23 (11.0)	8 (16.7)	31 (12.1)
	> 6	18 (8.6)	3 (6.3)	21 (8.2)
	Not reported	2 (<1)	5 (10.4)	7 (2.7)

'Ever Users' indicates the respondents who have ever used HFF; 'Never Users' indicates the respondents who have never used HFF.

As the reasons for non-use of HFFs, 'needlessness' (45.9%, 22/48) and 'doubt on effectiveness' (43.8%, 21/48) were reported most frequently while 'cost' (6.3%, 3/48) was rarely reported. The subjects who had never used HFFs rated themselves as being in very good (10.4%), good (52.1%), or fair health (37.5%) while no subjects rated themselves as being in poor health.

HFF Use

Of 209 respondents who had engaged in using HFFs, 108 (51.7%) reported 1 HFF; 69 (33.0%) reported 2 HFFs; 16 (7.7%) reported 3 HFFs; and 15 (7.2%) reported ≥ 4 HFFs as the maximum number of HFF products used at the same time. 1 (0.5%) subject did not report. A positive relationship was observed between the maximum number of HFFs used concurrently and age of the respondents. As the age of the respondents increased, greater number of HFFs was used concurrently: users of 1.6 HFFs were 15-35 years old while users of 1.7 HFFs were 36-45 years old and users of 2.3 HFFs were over 45 years old, respectively (arithmetic mean was used for the maximum number of HFFs in each group). (Figure 1). However no significant association was found between the maximum number of HFFs used concurrently and sex, education level, or monthly household income.

Importantly, of 100 (47.8%, 100/209) respondents who had used several products at the same time, only 25 (25%, 25/100) had been informed about potential HFF-HFF interactions.

Purposes of using HFFs were 'improvement of health' (86.6%, 181/209), followed by 'prevention of disease' (12.0%, 25/209) and 'treatment of disease' (1.4%, 3/209). Compared to the respondents who graduated middle school or high school, the respondents who graduated college were more likely to use HFF for the purpose of 'improvement of health' rather than 'prevention of disease' or 'treatment of disease': 89.1% (164/184) of all the respondents who graduated college school vs. 68.0% (17/25) of all the respondents who graduated middle school or high school (OR 3.9, 95% CI 1.48, 10.1).

Family, relatives and friends were the most important sources of recommendations of HFF product use (56.0%),

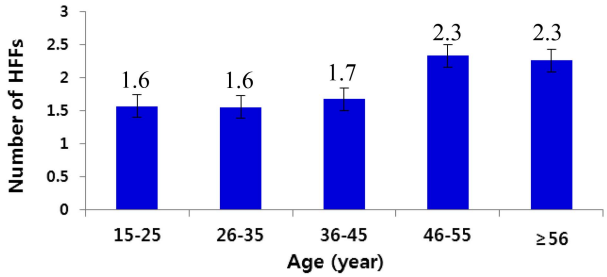

Fig. 1. The maximum number of HFFs used concurrently and age of the respondents. Arithmetic mean was used for the maximum number of HFFs in each age group.

followed by internet (18.2%), and TV, radio, or newspapers (14.4%). In contrast, only 8.1% of the respondents reported pharmacists and doctors as sources of recommendations for using. On the contrary, most HFF products were bought from department stores, supermarkets, or HFF shops (40.7%), followed by pharmacies (23.0%) and internet (18.7%). Home shopping company, pyramid selling, and door-to-door sales were less frequently used to purchase HFF products (7.2%, 5.7%, and 4.8%, respectively). 'Quality' was the most important influencing factor for the respondents choosing those places (31.6%), followed by 'price' (26.3%), 'detailed explanation about the products' (24.0%), and 'acquaintance' (13.9%). If the products were bought from acquaintance, price and quality of the products were not considered. When the participants were asked whether they continued taking the HFF products they purchased during the recommended period of intake or discontinued taking within the period, 43.19% (90/209) reported continuation; 45.0% (94/209) reported discontinuation; and 12.0% (25/209) did not answer. Among the 184 respondents, female showed higher risk for discontinuation than male (55.7% of all female vs. 43.5% of all male), but it was not statistically significant (OR 1.6, 95% CI 0.89, 2.98) (Table 2).

Common reasons for discontinuation were 'effective but inconvenient intake' (61.7%, 58/94), 'lack of efficacy' (28.7.0%, 27/94), and 'side effects' (6.4%, 6/94).

Further analysis using multivariate logistic regression found that either the maximum number of the HFFs used concurrently or the purposes of using HFFs failed to affect compliance with the duration of intake.

Table 2. Behaviors associated with HFF purchase and intake.

Variables		No. (%) of respondents (n=209)		
		Male	Female	Total
Sources of recommendation	Family/friends	48 (23.0)	69 (33.0)	117 (56.0)
	Internet	13 (6.2)	25 (12.0)	38 (18.2)
	TV/radio/newspaper	6 (2.9)	24 (11.5)	30 (14.4)
	Pharmacist/doctor	5 (2.4)	12 (5.7)	17 (8.1)
	pyramid selling	1 (<1)	2 (0.9)	3 (1.4)
	Door-to-door sales	1 (<1)	0 (0)	1 (<1)
	Not reported	-	3 (1.4)	3 (1.4)
Purchasing place	Department stores/ supermarkets/HFF shop	34 (16.3)	51 (24.4)	85 (40.7)
	Pharmacy	13 (6.2)	35 (16.7)	48 (23.0)
	Internet	18 (8.6)	21 (10.0)	39 (18.7)
	Pyramid selling	3 (1.4)	12 (5.7)	15 (7.2)
	Door-to-door sales	4 (1.9)	8 (3.8)	12 (5.7)
	Home shopping company	2 (0.9)	8 (3.8)	10 (4.8)
Factors affecting purchasing place	Quality	19 (9.1)	47 (22.5)	66 (31.6)
	Price	26 (12.4)	29 (13.9)	55 (26.3)
	Detailed explanation about the product	19 (9.1)	31 (14.8)	40 (23.9)
	Acquaintance	7 (3.3)	22 (10.5)	29 (13.9)
	Refundability	3 (1.4)	3 (1.4)	6 (2.9)
	Data unavailable	-	3 (1.4)	3 (1.4)
Compliance with the duration of intake	Continued taking	39 (18.7)	51 (24.4)	90 (43.1)
	Discontinued taking	30 (14.4)	64 (30.6)	94 (45.0)
	Not reported	5 (2.4)	20 (9.6)	25 (12.0)

Perception of potential drug-HFF interactions

Among those who reported experiences of HFF use, 42.6% (86/209) reported concurrent HFF-medication use. Of 86 respondents, 46.5% (40/86) reported concurrent OTC-drug use; 49.4% (44/86) reported concurrent prescription drug use; and 2.3% (2/86) reported both concurrent OTC-drug use and prescription drug use. It is important to notice that most of the concurrent HFF-medication uses (73.3%, 63/86) were not informed to a hospital physician, nurse, or pharmacist and only 30.2% (26/86) of the respondents who used HFF and medications concurrently were informed about potential drug-HFF interactions. As the sources from which the respondents were informed about potential interactions, pharmacy (34.6%, 9/26) was reported most commonly, followed by hospital (26.9%, 7/26), salesperson (11.5%, 3/26), and others (19.2%, 5/26) that had no relation with their purchases.

Attitudes toward HFF labeling information

Of 209 respondents who had experiences of HFF use, 77.5% (162/209) revealed that they did not know the symbol of HFF and had never checked the symbol while purchasing; 12.9% (27/209) had known the symbol but had never checked; only 8.1% (17/209) reported that they had known and had checked. No significant association was found between sex or education level and the behavior of checking the symbol of HFF.

63.6% (133/209) of the respondents reported that they had identified the compounds of the HFF products while purchasing and 72.2% of them (96/133) responded they could understand the functionality of the compounds. As reasons for the respondents not to identify the compounds, ‘inability to understand’ (43.4%, 33/76) and ‘needlessness due to the previous attested efficacy by acquaintance’ (40.8%, 31/76) were most common. Differences in sex, age, and education levels did not affect the respondents’ attitude toward ‘identifying compounds’.

Of 209 respondents who engaged in the use of HFF,

85.6% (179/209) reported that they had adhered to the instruction of frequency and dosage. As reason for non-compliance, 'difficulty adhering' was most common (64.3%, 18/28). 35.7% (10/28) of the non-compliance reported that the instruction was not important to adhere. No significant relationship was found between non-compliance and sex, age, or education level.

69.9% (146/209) of the respondents, regardless of their age, reported that font size of labeling content on the package of functional foods was too small making it difficult to read. However, 68.4% (143/209) of the respondents reported that they could understand the labeling content after reading.

DISCUSSION

This study investigated the demographic, perceptional and behavioral characteristics of HFF users and HFF non-users in South Korea. In present study, 81.3% of the respondents reported that they had ever engaged in the use of HFF. When compared to previous investigations describing that in 2006 in South Korea, 62% of adults had taken any dietary supplement (DS) in the last 12 months,[21] it is suggestive that there has been an increase in the use of HFF since 2006, even though the rate cannot be directly compared due to the different period monitored for HFF use and the difference in the definition between DS and HFF. The present study found that a larger proportion of the HFF users were female. This finding was similar to the results from the previous studies.[22-24] It is thought that the higher rates of HFF use among women is related to their greater use of health care in general. On the other hand, no differences regarding age, household income, and education were found between HFF users and non-users. The impact of education on supplement use is controversial. In the previous studies, dietary supplement use was higher in adults with higher levels of education.[25-27] However, a recent study revealed that there was no difference in education levels between HFF users and non-users.[28]

More than half of the respondents who had never used HFF ranked their own health as 'good or better' and around half of them reported that using HFF was not needed due to their good health. 'Needlessness' and 'doubt on effectiveness' were stated as the main reasons for non-use of HFF rather than 'cost'. These findings are similar to those from the previous research by Niva, in which a general lack of interest or knowledge about functional foods, high price and not seeing any reasons to use the products were the most common reasons for non-use of functional food in Finland.[29] However, in present study, 'cost' was of little importance among the non-users.

In present study, the respondents who had higher level of education tended to use HFF for the purpose of 'improvement of health' rather than 'prevention or treatment of disease'. This is suggestive evidence of higher level of education associated with high-level perception of HFF function. Understanding function of HFF is emphasized. Malik and Gopalan revealed that use of complementary and alternative medicine (CAM) resulted in delay in seeking medical advice for breast cancer, considerably.[30] The present study found that family and friends influenced most importantly the respondents' decision-making regarding HFF use. This finding is supported by other studies published previously.[31,32] Department stores, supermarkets, and HFF shops were the most preferred places to purchase HFF products, followed by pharmacy and internet. 'Quality' was reported the most important influencing factor to choose those places, followed by 'price' and 'detailed explanation about the products'.

Regarding compliance with the recommended intake period, female showed higher risk for discontinuation than male, even though this finding did not reach statistical significance. The most commonly cited factor for discontinuation was 'inconvenient to take'. Interestingly, neither the number of the HFFs taken at the same time nor the purposes of using HFFs affect compliance with the duration of intake. In addition, expenditures on HFFs were not significantly associated with income, suggesting that cost is not an appreciable factor in predicting HFF use. This finding was also observed in the study by Levine *et al.*[33]

The attitude toward HFF use was assessed by questions regarding the participant's behaviors of checking symbol

of HFF, identifying the compounds of the HFF products, awareness of the functionality of the compounds. In the present research, more than three-quarters of the respondents did not know the symbol of HFF even though they had ever used HFF. Similar result was observed in the previous survey conducted by KFDA.[24] Nonetheless, more than half of them reported that they identified the compounds of the HFF products and could understand the functionality of the compounds before taking. Most common reason for those who did not identify was 'unable to understand'. Neither age nor education levels affect the respondents' attitude toward 'identifying compounds'. Most of the respondents reported that they had adhered to the instruction of frequency and dosage. However, more than half of the respondents, regardless of their age, reported that font size of labeling content on the package of functional foods was too small making it difficult to read. It is strongly recommended for manufacturers to provide information on not only indications but also contraindications, drug interactions and potential side effects to each package of HFF with font size enough big to read with ease.

It is noteworthy that approximately half of the respondents had experiences of using several HFF products at the same time and only one-fourth of them were informed about potential HFF-HFF interactions. Especially, in the present study, a strong positive relationship was observed between age of the respondents and the maximum number of HFF products that the respondents had used at the same time, implying that the elderly have higher risk for those interactions and overdose due to multiple uses. Additionally, around half of the HFF users reported that they had ever used medications concurrently. Three quarters of them had not disclosed their uses of HFF to physicians or pharmacists and only a third of the concurrent users had been informed about potential drug-HFF interactions. The concerns on little disclosure of patients to their health care providers and poor perception of not only patients but also physicians regarding potential HFF-HFF and HFF-medication interactions have been stressed worldwide.[26,28,33-35] It cannot be stressed strongly enough that pharmacists and physicians must be vigilant for risk of those interactions. In most countries, pharmacists are at the forefront of patient interactions and provide information and guidance to patients about safe and effective use of all medicines. In this study, pharmacy and hospital were most frequently reported as the information providers to those who had used HFF and medications concurrently. Importantly, before prescribing and administrating medications, physicians and pharmacists should actively determine whether the patient is using an HFF and remind him or her to provide information on the HFF product if he or she subsequently begins using an HFF. This study found that older people were more likely to use greater number of HFF products at the same time. Especially, encouraging elderly people to disclose their use of HFF to physicians or pharmacists is an important step toward minimizing any risk associated with the HFF-drug interactions.

There are several limitations in this study. All information was self-reported and several questions missed responses, limiting the ability to examine relationships between variables. Additionally, the study subjects may not represent the entire spectrum of HFF users. The majority of the respondents surveyed were predominantly women and college graduates. Since this study was online survey, the sample most likely represented the eligible population. Nevertheless, the findings of this study provide significant information on demographic, perceptional and behavioral characteristics of HFF users, which help healthcare professionals counsel with their patients about appropriate uses of HFFs and ensure a safe and effective treatment environment.

CONCLUSION

In South Korea, the use of HFF is common. However, most of HFF users did not disclose their use to physicians and pharmacists. In the present study, a substantial proportion of HFF users reported concurrent HFF-drug uses with no perception of potential HFF-drug interactions. Additionally, the finding from this study, a strong positive relationship between age and the number of HFF products used concurrently, suggests that the elderly have higher risk for the interactions and there is a need for greater

communication with healthcare professionals to minimize any risk associated with HFF-drug interactions. Importantly, before prescribing and administrating medications, physicians and pharmacists should be vigilant for risk of the interactions and actively determine whether the patient is using an HFF.

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