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KNOWLEDGE AND ATTITUDE ON COMMON FOOD AND DRUG INTERACTIONS AMONG PRIMARY HEALTH CARE PHYSICIANS IN DAMMAM, AL-KHOBAR, AND QATIF, KINGDOM OF SAUDI ARABIA

Medicine

Dr. Doaa Al-Najim MBBS, Family Medicine Residents R3, MD, SBFM, Saudi Arabia

Dr. Heba Al-Sahhaf* MBBS, Family Medicine Residents R3 MD, SBFM, Saudi Arabia *Corresponding Author

Dr. Nada A. Rahman Al-Bunaian MHPE, Maastricht University HollandResearch coordinator of Saudi Board of Family Medicine Research Methodology course coordinator in SPFM Electronic Portfolio Creator SPFM, MOH-EP Program Director Member of IRB sub-committee MOH-EPPost-Graduate Family Medicine CenterMinistry of Health, Eastern Province, Saudi Arabia

ABSTRACT

This study aimed to assess knowledge and awareness about food and drug interaction (FDI) among 211 PHC physicians in Dammam, Al-Khobar, and Qatif. This cross-sectional study was conducted from 2017 to 2018 and used a modified and valid questionnaire that consists of three parts. Data were analyzed for knowledge and attitude using SPSS. Most of the physicians were found to have a fair knowledge (64.9%); the majority had a positive attitude towards the relationship between drugs and food (89.1%). The significant factors that affected physicians' knowledge were position as consultant and specialist, attendance in FDI courses after graduation, experience in treating or diagnosing patients, and number of years' experience.

KEYWORDS

food-drug interaction, knowledge, attitude, physicians, KSA.

INTRODUCTION

One of the major challenges for family medicine physicians is drug interaction, which has effects on patients' safety and quality of care, both of which are essential aspects of clinical practice. Drug interaction is defined as "a situation in which a substance affects the activity of a drug" (Bushra, Aslam, & Khan, 2011). It involves drug-drug, drug-disease, herbal-drug, and food-drug interaction (National Consumers League, 2013; US Food and Drug Administration, 2013). The incidence of drug interaction ranges from 3% to 30% (Bushra, Aslam, & Khan, 2011; National Consumers League, 2013). Food-drug interaction (FDI) is defined as "physical, chemical, physiologic, or pathophysiologic relationship between a drug and a nutrient, multiple nutrients, food in general, or nutritional status" (Boullata & Armenti, 2010). Another definition of FDI is "an alteration of kinetics or dynamics of a drug or a nutritional element, or a compromise in nutritional status as a result of the addition of a drug" (Otles & Senturk, 2014). There are two types of FDI, namely, pharmacokinetics and pharmacodynamics. Pharmacokinetic FDI has four types: type 1 affects bio-inactivation, type 2 affects absorption, type 3 occurs owing to the physiologic disposition of drugs, and type 4 affects the clearance of drugs (Bushra, Aslam, & Khan, 2011; Genser, 2008; National Consumers League, 2013). Meanwhile, the pharmacodynamic effect is the interaction of foods with medications by altering their pharmacologic action (Ismail, 2009). Timing plays a major role in initiating drug interaction. Some drugs interact with food only if taken at the same time; others interact with food regardless of timing (American Pharmacists Association, 2008). FDI can be affected by risk factors such as age, gender, medical history, number of medications taken, nutritional status, and body composition (Bobroff, Lentz, & Turner, 1999). People who are at increased risk of FDI are characterized by chronic diseases or comorbidities, recent weight loss or dehydration, polypharmacy and long-time use of drugs, and extreme age; physicians should pay particular attention to these categories (Otles & Senturk, 2014).

Several studies have explored the magnitude of FDI as well as the awareness of healthcare professionals toward it. A cross-sectional study in India (Benni et al., 2012) that aimed to assess the knowledge, attitude, and awareness toward FDI among 200 physicians showed that the total score of knowledge is higher in professors than junior doctors; however, all of them had a positive attitude toward FDI. They concluded that young healthcare professionals need continuous training in FDI compared with professors. Another cross-sectional study among nurses showed that nurses with more experience have more knowledge on FDI (Enwerem & Okunji, 2015). For nurses with a low level of knowledge, Enwerem and Okunji (2016) recommended continuous education to update their knowledge of the pharmacology of medications. Another study in Oman assessing the role of the pharmacist on the FDI recommended continuous updating of knowledge about FDI and patient counseling (Ismail, 2009). A study of medical students and family medicine residents' knowledge and attitudes regarding drug-nutrient interactions showed slight or insufficient training about FDI in 83% of undergraduates and 80% of residents; both residents and medical students thought that the responsible professional about FDI are the physicians, pharmacists, and dietitians, indicating a direct correlation between the number of residency years and FDI knowledge (Lasswell et al., 1995).

In the Kingdom of Saudi Arabia (KSA), a review article on drug safety focusing on the significance of drug safety and its effect on patient health recommended the provision of adequate counseling by healthcare professionals and concluded that a good relationship between healthcare professionals and patient is one of the most important principles of drug safety (Alshammari, 2016). Francis and Abraham (2014) emphasized the role of pharmacists in improving patient care; clinical pharmacists who have proper knowledge of the pharmacology of drugs can help improve patients' safety. In addition to drug safety advantages, there is an economic advantage to be considered if FDI is reduced. Moradi et al. (2018) reported that a decrease of 1% in drug interaction could decrease the annual costs indirectly by 29,250 USD.

Bushra, Aslam, and Khan (2011) examined knowledge on FDI among patients and healthcare professionals and found a lack of knowledge in both groups. Jarosz and Wolnicka (2011) reported an increased incidence of FDI risk in primary health care (PHC) patients. They also found a low level of patient awareness on FDI, affected by age and educational level. Particularly, more than half of their participants lacked knowledge about taking medications in relation to meals, which can affect outcomes (Jarosz & Wolnicka, 2011). A review of drug-drug and drug-food interactions in patients during treatment of diabetes mellitus showed that diabetic patients are at increased risk of FDI and drug-drug interaction owing to polypharmacy (Sonu, Harikumar, & Navis, 2015). Indeed, FDI can affect patient safety either by side effects or the drug's effectiveness (Ismail, 2009), with patient history, follow up, and awareness of care professionals being influential factors (Benni et al., 2012).

Despite the high incidence level of FDI, which affects patient safety, and its economic burden on patients and the government, there are

limited studies exploring the physician's knowledge and attitude toward FDI and the reasons that affect them in the Middle East. Therefore, the current study aimed to present the level of and measure the association between physicians' knowledge and attitude toward FDI and the factors that affect these. This study focused on FDI from food and drugs taken by mouth, including common medications available in PHC centers in KSA. Specifically, this study was conducted among physicians in PHC centers in Dammam, Al-Khobar, and Qatif. These areas were selected due to limitations in time and resources.

Methodology

The study was conducted in the PHC centers of the Ministry of Health in Dammam, Al-Khobar, and Qatif 2017. All 120, 120, and 60 physicians who work in the 30, 30, and 13 PHC centers in Dammam, Al-Khobar, and Qatif, respectively, were included, except for physicians who held purely administrative work. The researchers adopted the validated self-administered questionnaire in Enwerem and Okunji (2015), modified according to the study objectives. A total of 211 out of 300 physicians participated, for a response rate of 70.3%.

The questionnaire consisted of demographic data of PHC physicians, assessment of PHC physicians' knowledge of FDI, attitude of PHC physicians toward FD. We used a validated questionnaire for part 2 (knowledge) and modified it by deleting medications not available in PHC pharmacies. We used a validated questionnaire for part 3 (attitude) and modified it by changing the scale from binary in opinion to five-point Likert scales to ensure answer accuracy. These modifications were reviewed by five pharmacologists and five family medicine consultants to confirm content validity. The questionnaire was piloted on 32 residents to test the clarity of the items, and it was found that no further changes were required. The Cronbach's alpha for this questionnaire was 0.7. The dependent variables were knowledge and attitude on common FDI. The independent variables were the demographic data of physicians and factors that affect the level of knowledge. The questionnaire data were collected, coded, and checked, and then analyzed using SPSS version 23.0.0. The cut-off point for total knowledge was determined by mean ± SD. The total knowledge score was 16 (mean: 7.78, SD: 2.63). Less than 1 SD: 5.15 (34.4%). More than 1SD: 10.41 (65.13%). We consider a score of less than 5.15 was considered poor knowledge, while a score of more than 10.41indicated good knowledge. The level of knowledge between good and poor knowledge was regarded as fair knowledge. The relationship between the dependent and independent variables was measured by one-way ANOVA and *t*-test. A *p* value of <0.05% was deemed significant. The study was approved by the Institutional Review Board in the Ministry of Health, Eastern Province. Confidentiality and anonymity were ensured. Completion of the questionnaire was regarded as formal consent to participate.

Results

Table 1 presents the demographics of the participants, including work experience consultation with pharmacists at work, attendance in FDI courses after graduation, and experience diagnosing or treating patients for FDI.

Variables	Frequency	Percent
Age **(years)**		
25–35	144	68.2
36–45	43	20.4
46–55	17	8.1
56–65	7	3.3
Gender		
Male	62	29.4
Female	149	70.6
Nationality		
Saudi	184	87.2
Non-Saudi	27	12.8
Job title		
GP	151	71.6
Resident program	19	9.0
Specialist	34	16.1
Consultant	7	3.3
Number of years' experience		
0–5	108	51.2
>5–10	54	25.6
>10–15	25	11.8
>15	24	11.4
Do you consult a pharmacist?		
Yes	163	77.3
No	47	22.3
Total	210	99.5
Missing	1	0.5
Have you attended courses for FDI after graduation?		
Yes	16	7.6
No	195	92.4
Have you diagnosed or treated patient with FDI?		
Yes	77	36.5
No	134	63.5

Table 1 shows that most of the doctors were aged between 25 and 35 years (68.2%), were Saudis (87.2%), and were females (70.6%). The highest percentage of participants were general practitioners (71.6%); around half of them had 0-5 years of experience (51.2%), almost two-thirds of them consulted a pharmacist during their practice (77.3%), a majority of them did not attend any courses about FDI after graduation (92.4%), and (63.5%) never diagnosed or treated patients with FDI.

Figure 1 illustrates the total knowledge score among the participating physicians in PHC centers in Dammam, Al-Khobar, and Qatif, KSA, 2017 (n = 211).

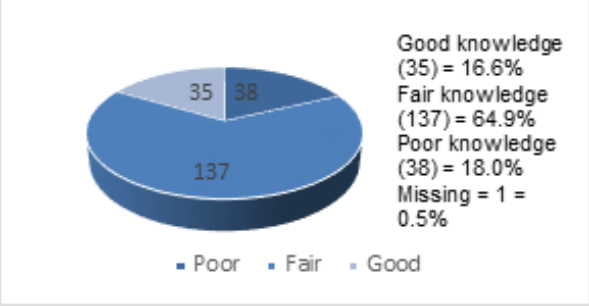

Figure 1 shows total knowledge score of physicians. It can be seen that most of the physicians have fair knowledge (64.9%), 18.0% have poor knowledge, and 16.6% have good knowledge.

Variable	Frequency	Percent
There is an interaction between some drugs and some foods.		
Negative attitude	20	9.5
Neutral	3	1.4
Positive attitude	188	89.1
It is necessary to know about FDI.		
Negative attitude	18	8.5
Neutral	2	0.9
Positive attitude	191	90.5
It is necessary to report FDI according to Saudi Food and Drugs Authority.		
Negative attitude	15	7.1
Neutral	20	9.5
Positive attitude	176	83.4
Patients require counseling regarding FDI.		
Negative attitude	19	9.0
Neutral	23	10.9
Positive attitude	169	80.1
It is imperative to update knowledge on potential FDI of medications.		
Negative attitude	14	6.6
Neutral	10	4.7
Positive attitude	187	88.6
Pharmacist consultation is beneficial.		
Negative attitude	16	7.6
Neutral	18	8.5
Positive attitude	177	83.9

Table 2 shows that the majority of the participants had a positive attitude towards the relationship between drugs and food (89.1%), considered it necessary to know about FDI (90.5 %), reported FDI according to Saudi food and drugs authority (83.4%), believed that each patient requires counseling regarding FDI (80.1%), deemed it imperative to update their knowledge on potential FDI (88.6%), and

considered it beneficial to consult a pharmacist during their practice (83.9%).

Table 3 shows a statistically significant association between total score knowledge and being a consultant and specialist, number of years' experience attendance in any FDI courses after graduation and experience treating or diagnosing FDI in PHC centers in Dammam, Al-Khobar, and Qatif, KSA, 2017 (n = 211).

Variables	Mean ± SD	F*	P
Job title		7.715	**0.000**
GP	7.39 ± 2.43		
Resident program	7.37 ± 2.45		
Specialist	9.30 ± 2.97		
Consultant	10.29 ± 2.14		
Number of years' experience		2.282	**0.032**
0–5	7.29 ± 2.47		
5–10	8.35 ± 2.41		
10–15	8.60 ± 3.06		
15	7.88 ± 3.04		
	Mean ± SD	T**	P
Consultation with pharmacist		0.305	0.760
Yes	7.81 ± 2.57		
No	7.68 ± 2.90		
Attendance in FDI course after graduation		2.133	**0.034**
Yes	9.13 ± 2.96		
No	7.68 ± 2.58		
Diagnosis or treatment of FDI		3.365	**0.001**
Yes	8.58 ± 2.96		
No	7.34 ± 2.50		

Discussion

In terms of the total knowledge score, most of the physicians had fair knowledge (64.9%). However, there was a higher proportion of physicians who had poor knowledge (18.0%) than those who had good knowledge (16.6%), with a mean score of 7.78 and SD of 2.63 out of a total score of 16. Related research in this area has been conducted on nurses in different units, in which all groups scored fair in knowledge (Enwerem & Okunji, 2016), and on nurses with different levels of experiences, might due to they study about it in medical colleges, continuous professional training about it in postgraduate and guidebook available in PHC clinic in KSA. (Enwerem & Okunji, 2015).

Meanwhile, the majority of participants had a positive attitude toward the relationship between drugs and foods (89.1%). This finding is supported by data from the US Food Drug Administration, which suggested that the positive attitude may be attributed to PHC physicians following international guidelines. The large proportion of PHC physicians indicating support for knowing about FDI and reporting FDI to the Saudi food and drug authority may be explained by the attitude towards a reporting system in KSA, which is related to respecting the policy in PHC centers in KSA.

The participants also reported it is imperative to update knowledge on potential FDI and that each patient requires counseling regarding FDI. Such attitude, which is similar to that of physicians in other countries, could be because of access to updated evidence-based websites. The awareness of the importance of patient counseling is reflected in patient satisfaction, safety, and quality of care.

The participants also indicated that consulting pharmacists in their practice is beneficial (83.9%). Collaboration between physicians and pharmacist in family practice has an overall positive effect, and PHC physicians recognize they can provide accurate and professional health care through collaboration. The statistically significant association (p <0.000) between total score knowledge and being a consultant and specialist (mean =10.29, 9.30, respectively) could be due to the higher level of experience, clinical exposure to patients, an extended period of continuous learning, and attendance in conferences entailed in the practice of PHC physicians. Further, the statistically significant association (p = 0.032) between total score knowledge and the number of years' experience demonstrates an inverse relationship between the two, which could be due to newly graduated physicians having more up-to-date knowledge that is useful in their practice. The statistically significant association (p = 0.034) between total score knowledge and attendance in FDI courses after graduation may be explained by the fact that the courses attended were updated and comprehensive. Lastly, more than a third of the PHC physicians in this study had diagnosed or treated FDI complications. Previous studies have shown a relationship between knowledge and diagnosis of FDI. In KSA, PHC centers require accreditation with the Saudi Central Board for Accreditation of Healthcare Institutions.

Conclusion

This study showed that PHC physicians in PHC centers in Dammam, Al-Khobar, and Qatif, KSA, had fair knowledge and positive attitude regarding FDI. The data provide empirical evidence to the association between the job title, years of experience, attended courses, experience diagnosing patients with FDI complications, and total knowledge of PHC physicians.

One of the limitations of the study is its small sample size. This study was conducted in the eastern province, and only among PHC physicians, excluding physicians working in hospitals. Nonetheless, it is a pioneering work on FDI in KSA. The participation of family medicine physicians from three major cities in the eastern province sheds light on the quality of family medicine in PHC centers across the kingdom.

The study proposes the following recommendation Future studies may include different levels of health provider centers from the entire kingdom. Patients may also be included in the cross-sectional design, as well as considerations for the food culture of the various regions in KSA. As for policy-related proposals, a primary concern is the continuing professional development on FDI, including pharmacologist counseling. In PHC centers, the awareness of PHC physicians on FDI may be increased by utilizing related mobile applications. Meanwhile, patient awareness may be increased by the provision of clear prescriptions on drugs and manual instructions on the drugs and food that interact when taken together.

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Appendix: Questionnaire

I. Demographic data

Sector: 1) Dammam 2) Qatif 3) Al-Khobar

Health care center:

1. Your age:

(1) 25–35 years old (2) 36–45 years old (3) 46–55 years old (4) 56–65 years old

2. Sex: (1) Male (2) Female

3. Nationality: (1) Saudi (2) Non-Saudi

4. Job title:

(1) General practitioner (2) Program resident
(3) Family medicine specialist (4) Family medicine consultant

5-Number of years' experience:

(1) 0–5 (2) >5–10
(3) >10–15 (4) >15

If 0–5 years, please indicate:

(1) <6 months (2) >= 6 months

How many patients do see per day?

6. -Have you ever consult a pharmacist?

(1) Yes (2) No

7. -DO you attended any courses for FDI after graduation?

(1) Yes (2) No

8. Have you ever diagnosed or treated a patient with FDI?

(1) Yes (2) No

II. Food and drug interactions knowledge
Please encircle the appropriate option.

Questions	(1) Yes	(2) No	(3) I do not know
9. Should patients on drugs like metronidazole avoid alcohol?	1	2	3
10. Should patients avoid taking alcoholic beverages with antihistamines?	1	2	3
11. A patient on NSAIDs should avoid consuming large amount of caffeine (tea, coffee, and chocolates).	1	2	3
12. Should a patient avoid taking milk and dairy products, iron-rich food, and supplements with tetracyclines?	1	2	3
13. Should a patient on MAO inhibitors avoid cheese, processed meats, legumes, wine and beer, fava beans, and fermented products?	1	2	3
14. Grapefruit juice increase serum level of statin when taken more than one glass of grapefruit, do you agree?	1	2	3
15. Long-term consumption of garlic/ginger along with warfarin should be avoided. Do you agree?	1	2	3
16. Drugs like griseofulvin should be taken with a fatty diet. Do you agree?	1	2	3
17. Should a patient on thyroid replacement for hypothyroidism must avoid foods like Brussels sprouts, turnips, cauliflower, millet, and cabbage?	1	2	3

Choose all that apply. (You can choose more than one choice in questions 9 to 19.)

18. Effects of food drug interaction (FDI) which taken just orally depend on:

(1) Drug dosage (2) Person's age
(3) Health status (4) I do not know.

-With relation to the timing of food intake, encircle the correct option.

(19) Omeprazole / ranitidine, antihistamines should be taken (before / with / after/ I do not know)
(20) Metformin should be taken (before / with / after / I do not know)
(21) NSAIDs are advised (before / with / after/ I do not know)
(22) Thyroid hormones replacement (before / with / after/ I do not know)

23. At what level do the food / beverages interfere with the drug commonly?

(1) Absorption (2) Distribution
(3) Metabolism (4) Excretion
(5) I do not know

24. Which age group of patients do you think are at a greater risk for FDI?

(1) <1 year old (2) 1–4 years old (3) 5–14 years old
(4) 15–45 years old (5) 46–59 years old (6) >= 60 years old
(7) I do not know.

III. Please select the number that matches your opinion in the following.

Questions	(1) Strongly Disagree	(2) Disagree	(3) Neither Agree nor Disagree	(4) Agree	(5) Strongly Agree
25. There is a relationship between some drugs and some foods.	1	2	3	4	5
26. It is necessary to know about FDI.	1	2	3	4	5
27. It is necessary to report FDI according to Saudi Food and Drugs Authority.	1	2	3	4	5
28. Each patient requires counseling regarding FDI.	1	2	3	4	5
29. It is imperative to update knowledge on potential FDI of medications.	1	2	3	4	5
30. Pharmacist consultation is beneficial.	1	2	3	4	5

Suggestion:

31. How can awareness regarding FDI be improved? Do you have any suggestions?

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