Assessment of Knowledge, Attitude, and Practice of Pharmacists towards Drug Interactions in Saudi Arabia

Mohamed S. Imam1,2*, Randa M. Abdel-Sattar3, Othman AlOmeir1, Hussain A. Mahzari4, Sami M. Alhamdhi5, Tariq Y. Alhazmi6, Khalid Y. Hassani7, Amr S. Alamri8, Ali I. Alsubaihi9 and Fahad M. Alotaibi10

1Pharmacy Practice Department, College of Pharmacy, Shaqra University, Saudi Arabia. 2Clinical Pharmacy Department, National Cancer Institute, Cairo University, Saudi Arabia. 3Biomedical Sciences Department, College of Pharmacy, Shaqra University, Saudi Arabia. 4Zulfi General Hospital, Ministry of Health, Saudi Arabia. 5Al-Qawara general hospital, Ministry of Health, Saudi Arabia. 6Fifa General Hospital, Ministry of Health, Saudi Arabia. 7Arar Central Hospital, Ministry of Health, Saudi Arabia. 8King Abdulaziz Medical City, National Guard, Jeddah, Saudi Arabia. 9AlNahdi Pharmacy, Riyadh, Saudi Arabia. 10Dawadmi General Hospital, Ministry of Health, Saudi Arabia.

Authors’ contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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(1) Dr. Asmaa Fathi Moustafa Hamouda, Jazan University, Saudi Arabia.
(2) Troy W Privette Jr, University of South Carolina, USA.
Clement Kabakama, Muhimbili University of Health and Allied Sciences, Tanzania.
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ABSTRACT

Background: Drug interactions, which are generally encountered in medical prescriptions, may lead to severe health issues. Pharmacists in both the public and private pharmacy setting are by profession in a unique position to gain and use their competencies to find and prohibit drug interactions.

*Corresponding author: E-mail: Imammohamed311@gmail.com;
Aim of the Study: To assess knowledge, attitude and practice of pharmacists toward drug interactions in Saudi Arabia.

Materials and Methods: A cross-sectional study was conducted using a self-administered questionnaire.

Results: Two hundred sixty-three pharmacists participated in the survey and results were expressed in frequencies and percentages. The mean age of participant pharmacists was (31.7) years showing a relatively young participant's population. Males were (75.3%), while females were (24.7%). Majority of pharmacists (67.3%) were working in public sector. Half of them had a bachelor's degree in pharmacy as their latest academic degree. Participants' averages of awareness, attitude and practice regarding drug interactions, correct knowledge of drug-drug, drug-food, drug-disease interactions were, (90.7%), (65.3%), (67.7%), (61.7%) respectively. Most (79.8%) of the participants asserted that the notified doctors usually agree with pharmacists' opinion and decision. This percentage indicates a good cooperation when compared to other studies.

Conclusion: Pharmacists' knowledge about drug interactions was inadequate. Lack of knowledge of drug interactions may lead to improper patient counseling and the appearance of adverse effects. There is a need to improve the knowledge and to uplift the level of awareness of pharmacists about the potential drug interactions that are clinically related.

Keywords: Pharmacists; drug-interactions; knowledge; awareness.

1. INTRODUCTION

Drug-drug interactions (DDI) can be specified as the clinical or pharmacological response of a drug combination that is dissimilar from that expected from the known effects of the two drugs when given alone and that may lead to a decrease in efficacy or increase in toxicity. Three levels of DDI severity are minor, moderate and major [1]. Drug interactions may change the pharmacodynamics and/or pharmacokinetics of a drug. The pharmacodynamics interaction may be antagonistic, additive, or synergistic effects of a drug. One of the widely and important sources of medication errors is the drug interactions (DIs) [2].

Food may have negative or positive effects on the bioavailability of the drug and may lead to drug toxicity or therapeutic failure. Food–drug interactions (FDIs) are a serious issue in the medical practice; they may negatively affect the drug’s efficacy, extend the patient's hospitalization or threaten their life [3].

The prevalence of potential FDIs is variable in different countries and it ranges from 6 to 70% [4-6]. Food may change the bioavailability of drugs by introducing some changes in the GI physiology such as GI motility, gastric pH, gastric emptying, transport proteins such as P-glycoprotein and the activity of the metabolizing enzymes. Moreover, food components may chelate or bind to the active pharmaceutical ingredients [7].

Drug–disease interactions (DDIs) are conditions whereby a new drug treatment elicits the preexisting medical condition. It may also indicate the ability of a newly prescribed drug to lead adverse effects similar to one of the patient's diseases conditions [8]. In addition, the most recurrent interactions between the prescriptions studied included treatment with non-steroidal anti-inflammatory drugs (NSAIDs) in hypertensive patients and chronic heart failure patients and co-administration of ACE inhibitors and non-steroidal anti-inflammatory drugs [9].

Pharmacists, especially in the community setting are on the front line to detect DDIs. In addition, the evaluation of drug interaction knowledge in the kingdom of Saudi Arabia seems missing. The Evaluation of and then improving the knowledge of potential common DDIs among pharmacists by implementing helpful programs could limit the incidence of harmful effects, emergency visits, hospitalizations, and health cost [10].

1.1 Aims of Study

To assess knowledge, attitude and practice of pharmacists towards drug interactions in Saudi Arabia.

2. MATERIALS AND METHODS

2.1 Study Design

A cross-sectional study was carried using the self-administered questionnaire. The questionnaire was performed over a period of 7
months from April to October 2018. This study involved pharmacists in Saudi Arabia.

2.2 Sample Size Calculation
The online calculator (RaosoftInc) was used to estimate the study sample size (263 pharmacists) and this based on total number of pharmacists licensed to practice (Saudi commission for health specialties, 2018). This study used the rate tolerates of 5% and 95% confidence level to give 263 pharmacists.

2.3 Survey Questionnaire
The questionnaire used contained three sections; the 1st section was related to demographic data including the age, years of practice, area of practice and academic qualification. The second section was related to attitude and practice of participants regarding drug interactions. The third section regarded the evolution of the pharmacist’s knowledge about drug interactions (DIs). Twenty-four (24) selected drug interaction pairs were used to investigate the potential pharmacist’s knowledge about drug interactions (drug-food, drug-drug and drug-disease interactions). They were selected, as they are the most prevalent drug interactions mentioned in medical literature.

2.4 Data Analysis
Data were entered into Excel (Microsoft office) worksheets and then transferred to SPSS (version 26, IBM) for statistical analyses. Categorical analyses of frequencies and cross tabulations were done using the Chi-square and standardized residual analysis in SPSS.

3. RESULTS
This study was conducted from April to October 2018. Two hundred sixty-three pharmacists participated in the survey and results were expressed in frequencies and percentages. The mean age of participant pharmacists was (31.7) years showing a relatively young participant’s population. Males were (75.3%), while females were (24.7%). Majority of pharmacists (67.3%) were working in public sector. Half of them had a bachelor’s degree in pharmacy as their latest academic degree.

4. DISCUSSION
Participants’ attitude and practice towards drug interactions was evaluated. Results showed that around (85.9%) of them had come across drug-interactions during their practice, which confirms the potential high incidence of drug interactions in the patient’s prescriptions which is comparable to other studies [11,12].

Regarding the attitude of the participant pharmacists toward cooperation with the prescribers on drug-interactions in their prescription, most (98.1%) of the participants used to contact the prescribers, before dispensing the prescription, mainly by telephone the prescriber for verification. Most (79.8%) of the participants asserted that the notified doctors usually agreed with the pharmacists’ opinion and decision and without reservations. This percentage indicates a good cooperation when compared to other studies.

Table 1. Pharmacists’ demographic characteristics

| Demographic              | Frequency | Percentage |
|--------------------------|-----------|------------|
| Gender                   |           |            |
| Male                     | 198       | 75.3%      |
| Female                   | 65        | 24.7%      |
| Age group                |           |            |
| 21-25                    | 30        | 11.4%      |
| 26-30                    | 116       | 44.1%      |
| > 31                     | 117       | 44.5%      |
| Academic qualification   |           |            |
| Pharm D                  | 104       | 39.5%      |
| Bachelor                 | 132       | 50.2%      |
| Master                   | 20        | 7.6%       |
| PhD                      | 7         | 2.7%       |
| Year of practice         |           |            |
| 1-3 years                | 117       | 44.5%      |
| 4-6 years                | 94        | 35.7%      |
| > 6 years                | 52        | 19.8%      |
| Area of practice         |           |            |
| Public                   | 177       | 67.3%      |
| Private                  | 86        | 32.7%      |
Table 2. Attitude and practice of pharmacists regarding drug interactions

| Attitude and Practice                                      | Frequency | %  |
|------------------------------------------------------------|-----------|----|
| Was drug interactions part of your undergraduate course studies? | Yes 213   | 81% |
|                                                           | No 50     | 19% |
|                                                           | Total 263 | 100%|
| Have you ever come across cases of drug-interaction during your practice? | Yes 263   | 85.9%|
|                                                           | No 37     | 14.1%|
|                                                           | Total 263 | 100%|
| Before dispensing any drug, do you consider its potential interactions? | Yes 138   | 90.5%|
|                                                           | No 25     | 9.5% |
|                                                           | Total 263 | 100%|
| Do you usually ask your patient about the prescription, Over the Counter, drugs and food supplements, herbal medication he/she is using or intends to use? | Yes 210   | 79.8%|
|                                                           | No 53     | 20.2%|
|                                                           | Total 263 | 100%|
| Do you usually contact doctors when there is a drug-interaction in their prescriptions? | Yes 202   | 76.8%|
|                                                           | No 61     | 23.2%|
|                                                           | Total 263 | 100%|

Table 3. Pharmacists’ reaction and Media of contact, and inter-professional communion with prescribers, when informed of obvious drug interactions in their prescriptions

| Attitude and Practice                                      | Frequency | %  |
|------------------------------------------------------------|-----------|----|
| If yes, what is the way you usually use to contact doctors? | Telephone 153 | 58.2% |
|                                                           | Sending back the patient 46 | 17.5% |
|                                                           | Meeting him/her personally 41 | 15.6% |
|                                                           | Other facilities 18 | 6.8% |
|                                                           | Total 258 | 98.1%|
| Doctor’s acceptance to opinion pharmacists when pointing to a drug-interaction in their prescriptions. | Agree 210 | 79.8% |
|                                                           | Disagree 20 | 7.6% |
|                                                           | Verify it first 33 | 12.5% |
|                                                           | Total 236 | 100%|
| Pharmacists’ reaction, when the prescriber insists on dispense the prescription as it is, without any change, though it contains clear drug-interaction. | Dispense as it is 65 | 24.7% |
|                                                           | Warning the patient and dispense as it is 103 | 39.2% |
|                                                           | Warning the patient and refuse to dispense it 95 | 36.1% |
|                                                           | Total 236 | 100%|

Table 4. Pharmacists’ general awareness and knowledge about drug-interactions

| Awareness and knowledge of drug-interactions. | Frequency | %  |
|------------------------------------------------|-----------|----|
| Do you know that some drug-interactions can be fatal? | Yes 238 | 90.5% |
|                                                           | No 25     | 9.5% |
|                                                           | Total 263 | 100%|
| Have you ever used a handbook or software program to check drug-interaction before dispensing? | Yes 236 | 89.7% |
|                                                           | No 27     | 10.3%|
|                                                           | Total 263 | 100%|
| Do you agree that, the drug-interaction must be given more time and attention during undergraduate pharmacy studies? | Yes 241 | 91.6% |
|                                                           | No 22     | 8.4% |
|                                                           | Total 263 | 100%|
| Is it important that doctors and pharmacists update their knowledge about drug-interactions? | Yes 239 | 90.9% |
|                                                           | No 24     | 9.1% |
|                                                           | Total 263 | 100%|

Respondent’s average of awareness= 90.7%

Despite all ongoing and implemented initiatives, DDIs are still an international problem. DDIs identification is varied according to the practice setting. In a hospital pharmacy, for example, there are various methods that may help in recognizing drug interactions and preventing them such as attainable scientific resources and electronic systems [13-15]. In most community pharmacies in the kingdom of Saudi Arabia, these tools are not available. Also, many
Medication safety standards are not available in this setting yet. The deficiency of electronic systems in the community pharmacy setting has a remarkable effect on both patient and medication safety. Subsequently, most of the medication safety standards are based on pharmacist's knowledge only.

**Fig. 1. Pharmacists' knowledge of drug-drug interactions**

- Is there Drug-drug interaction between the Cyclosporine with Pantoprazole?
- Is there Drug-drug interaction between the Colchicine with Fluconazole?
- Is there Drug-drug interaction between the Captopril with Fluoxetine?
- Is there Drug-drug interaction between the Azithromycin with Citalopram?
- Is there Drug-drug interaction between the Warfarin with Atorvastatin?
- Is there Drug-drug interaction between the Metronidazole with Phenytoin?
- Is there Drug-drug interaction between the Aspirin with Ibuprofen?
- Is there Drug-drug interaction between the Sildenafil with Nitrates?

**Fig. 2. Pharmacists' knowledge of drug-food interactions**

- Is there Drug-food interaction between the Levodopa with high-protein diets?
- Is there Drug-food interaction between the Vardenafil with high-fat meal?
- Is there Drug-food interaction between the Tetracycline (oral) with dairy products?
- Is there Drug-food interaction between the Simvastatin with Grapefruit juice?
- Is there Drug-food interaction between the Itraconazole (solution) with Food?
- Is there Drug-food interaction between the Griseofulvin with Low fat meals?
- Is there Drug-food interaction between the Ciprofloxacin with Dairy product?
- Is there Drug-food interaction between the Warfarin with Green leafy vegetables?
The results of the present study declared that the knowledge of pharmacists about DDIs was inadequate. Electronic and education systems can help pharmacists in detecting such interactions easily which is comparable to other studies in Saudi Arabia [16].

Regarding drug-food interactions, the most common interactions involved questions in the knowledge part of the collection data tool and the pharmacists were asked to answer them. Most of the pharmacists thought that they had enough information regarding this issue. But they did not appear to have the adequate knowledge to realize a number of these interactions. In comparison to other studies there is improvement in pharmacist’s knowledge regarding FDIs [17].

Regarding drug-disease interaction the use of calcium channel blockers (Amlodipine) in patients suffering from congestive heart failure (CHF), the correct responses were (41.4%) which is the lowest percentage in this issue. These results showed the poor knowledge of pharmacists toward drug-disease interactions, especially for heart disease, which is comparable to other studies [12].

5. CONCLUSION AND RECOMMENDATION

In conclusion, pharmacist’s knowledge about all drug interactions was insufficient and inadequate. The deficiency in drug interaction knowledge may lead to the appearance of adverse effects and improper patient counseling. Therefore, there is a need to improve the knowledge and to uplift the level of awareness of pharmacists about all the potential drug interactions that are clinically related. Finally, pharmacists still need more training and education programs about drug interactions in order to be more competent to improve patient’s therapeutic outcomes and supply better pharmaceutical care.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely
no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

The research protocol was approved by research ethics committee, Pharmacy College, Shaqra University, Dawadmi, Saudi Arabia (Approval number: 1/38/39 Dated (19/11/2017).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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