Evaluation of community pharmacists’ knowledge about drug–drug interaction in Central Saudi Arabia

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**Abstract**

Introduction: Although all implemented and ongoing initiatives, drug-drug interactions (DDIs) are still a global problem. Most published studies about DDIs in Saudi Arabia are carried out in hospital settings. In addition, assessing the knowledge of drug interactions in Saudi Arabia is limited. The aim of our study is to evaluate the knowledge of potential common drug-drug interactions among community pharmacists particularly in Saudi Arabia.

Methodology: A crosses-sectional study utilizing a self-administered questionnaire was conducted among community pharmacy in Riyadh city Saudi Arabia. DDIs’ knowledge was assessed by 26 drug pairs. Community pharmacists were asked to select the DDIs as “contraindication”, “may be used together with monitoring”, “no interaction” and “not sure”.

Results: A total of 283 of community pharmacists completed the survey with response rate of 80.9%. Among the 26 drug pairs only 5 of them were identified correctly by most of the participants. To add more 3 out of the 5 pairs had a cutoff of less than 10% between the correct and wrong answer, meaning there still a majority that couldn’t identify the correct answer. All the 26 pairs had a statistically significant difference between the correct and incorrect answer.

Conclusion: The results of this study showed that knowledge of community pharmacists about DDIs was inadequate. Community pharmacist should have specific courses in drug interactions to cover the most possible interactions that can be seen in this setting.

1. Introduction

Although of the tremendous advance in technology and health sciences, drug interaction is still vexatious for the national health system, and it may lead to deleterious sequelae (Wong et al., 2010). It's estimated that approximately 5% of the adverse effects in hospitals, and around 11% of the prescribed medications in the out-patient settings are attributed to potential drug interactions (Classen et al., 1997; Toivo et al., 2016). Nationally, about 0.6% of all hospital admissions were accounted for drug-drug interactions (DDIs) while in Saudi Arabia almost 7% of all hospital admissions due to drug-related problems were attributed to DDIs, most of these interactions happened among elderly population (Al-Arifi et al., 2014; Becker et al., 2007). The physiological changes that affect pharmacokinetics and pharmacodynamics, and the high incidence of polypharmacy make elderly population vulnerable subjects for potential impact of drug interactions (Hohl et al., 2001).

Beside the DDIs, drug interactions can manifest as drug-disease, or drug-dietary/herbal supplement interactions (Food and Administration, 2011). St. John’s wort, a widely used herbal supplement as an antidepressant, is associated with numerous drug interactions (Zhou and Lai, 2008). Also, drug interactions can be dose or time dependent interactions (Cohen et al., 2008: Schachter, 2005). For example, it’s highly recommended to limit the dose of simvastatin to 20 mg per day when co-administered with amiodipine or diltiazem to halt the incidence of myopathy (Schachter, 2005). It’s also recommended to separate the administration time of oral fluoroquinolones and oral divalent or trivalent cation-containing compounds to prevent the antibiotic failure (Cohen et al., 2008).
2. Methods

2.1. Design

A cross-sectional study was conducted using a self-administered questionnaire. The questionnaire was carried over a period of 6 months from November 2014 to May 2015. This study involved all community pharmacy outlets (including chain and independent pharmacies) in Riyadh city, Saudi Arabia.

2.2. Sample selection

The online calculator (Raosoft Inc) was used to estimate the study sample size. According to a previous study, number of community pharmacies in Riyadh city in August 2013 reached 1700 pharmacies (Al-Arifi, 2013). This study used the rate tolerates of 5%, and 95% confidence levels to give 314 pharmacies. This study involved 350 community pharmacies by a stratified random sampling.

2.3. Survey questionnaire

The questionnaire used was consisted of two sections; the first section was related to demographic data and included age, length of experience and country of graduation. The second section was about assessing the knowledge of CPs about DDIs. The DDIs questionnaire was designed and developed from previous studies that assessed the knowledge of health care professionals about DDIs (Gilligan et al., 2011; Ko et al., 2008; Momo et al., 2006). The questionnaire consisted of 26 drug pairs, those pairs were the most common DDIs found in published literature (Gilligan et al., 2011; Ko et al., 2008; Momo et al., 2006). CPs were asked to classify the DDIs as “contraindication”, “may be used together with monitoring”, “no interaction” and “not sure”. Among the 26 drug pairs, nine were contraindicated (warfarin with cimetidine, sildenafi, with isosorbide mononitrate, pimozide with ketoconazole, itraconazole with quinidine, methotrexate with probenecid, amiodarone with fluconazole, meperidine with phenelzine, alprazolam with itraconazole, and ciprofloxacin with tizanidine). It also contained eleven drug pairs that can be used with monitoring and six drug pairs that had no known interactions. Any correct answer for the DDIs questions was given 1 point. Then scores were calculated by counting all the correct answers with the maximum score of 26.

2.4. Ethical approval

The ethical approval was optioned from The King Saud University’s institutional review board.

2.5. Data analysis

The data were entered into SPSS software version 24 for analysis. Both descriptive and analytic statistics were applied. For descriptive analysis, results were presented as numbers, percentages, and mean (±SD). The Kruskal-Wallis test was used to determine differences between CPs demographic data in knowledge scores at a significance level of 0.05.

3. Results

A total of 283 CPs returned the survey with response rate of 80.9%. About two-third of the participants were between 25 and 35 years old. About half of respondents have an experience in the field of pharmacy for less than 10 years. More than one-third of respondents have been graduated from schools of pharmacy in Egypt (Table 1).

3.1. Knowledge of community pharmacist of DDIs

The responses of the 26 DDIs knowledge questions are summarized in Table 2. The study found that the lowest correct response of DDIs was between amiodarone and fluconazole (16.3%) and the highest was between sildenafil and isosorbide mononitrate (74.6%). In most of incorrect responses “may be used together with monitoring” were chose more by 8 times followed by “shouldn’t be used together” by 6 times.

Unfortunately, among the 26 drug pairs, only five of them were identified correctly by most of the participants. To add more 3 out of the 5 pairs had a cutoff of less than 10% between the correct and wrong answer, meaning there still a majority that couldn’t identify the correct answer. All the 26 pairs had a statistically significant difference between the correct and incorrect answer (Table 3).

There were no significant differences were found between age groups, years of practice and country of graduation in knowledge score of DDIs (p > 0.05) as showed in Table 4.

| Table 1 | Demographic characteristics of the study participants (n = 283). |
|---------|---------------------------------------------------------------|
| Demographic data | Number of participants | Percentage (%) |
| Age | | |
| 25–35 | 182 | 64.3 |
| 36–45 | 80 | 28.3 |
| 46–55 | 12 | 4.2 |
| Years of practice | | |
| less than 10 years | 142 | 51.8 |
| 11–20 | 120 | 43.8 |
| 21–30 | 9 | 3.3 |
| 31–40 | 3 | 1.1 |
| Country of graduation | | |
| Egypt | 191 | 67.5 |
| Sudan | 7 | 2.5 |
| Yemen | 48 | 17 |
| Saudi Arabia | 11(3.9) | 3.9 |
| Others | 8(2.8) | 2.8 |

* Numbers and percentage don't add up to total (100%) due to missing data.
4. Discussion

Despite all implemented and ongoing initiatives, DDIs are still an international problem. Identifying any DDIs is varied based on the practice setting. In an inpatient setting for example, there are different tools that can help in identifying drug interactions and preventing their harm such as electronic systems and accessible scientific resources (Hazlet et al., 2001; Indermitte et al., 2007; Magnus et al., 2002). These tools are not available in most community pharmacies in Saudi Arabia. In addition, many medication safety standards are also not available in this setting yet in the country such as look-alike sound-alike and high alert medications list. The lack of electronic systems in community pharmacy setting has a serious impact on both medication and patient safety. Therefore, most of these medication safety standards are carried out by pharmacists’ knowledge only.

Based on this study findings, there is a significant lack of information about the major DDIs and other minor interactions. Despite the fact that most of these included medications in this study are available in community pharmacies, most of participated pharmacists could not identify these interactions nor prevent their potential harmful risk. An intervention study was conducted in United
States among future health care professionals including pharmaci-
cists and medical students reported that they still did not identify
potential DDIs after an educational session (Hincapie et al., 2012).
Another cross-sectional study carried out in United States aimed to
explore the impact of educational program on DDIs knowledge of
health care professionals (medical students, pharmacy and nurs-
ing). It revealed that their knowledge scores before educational
program were low where students did not classify all DDIs, but
after intervention their knowledge scores significant improved
(Harrington et al., 2011). Moreover, Yu et al. did survey in Singa-
pore among prescribers to assess their knowledge about DDIs. The
researchers concluded that prescribers did not identify potent-
tial DDIs. However, the lowest percentage was 18.2% for warfarin
with cimetidine and the highest percentage of correct answer
was 81.2% for paracetamol with amoxicillin (Ko et al., 2008). In
addition, most of these medications can be dispense without a pre-
scription, which diminishes the first safety line (the physician).

The need for an electronic system that can detect any DDIs or
allergies is essential in the community pharmacy setting. By
exploring the country’s transformation plan, e-prescription plan
will be introduced soon and along with that community pharma-
cies should have electronic systems that can provide different
safety tools (Indermitte et al., 2007; Patel et al.; Stock et al.,
2008). In addition, community pharmacies should have specific
courses in drug interactions to cover the most possible interactions
that can be seen in this setting. Also, community pharmacists
should complete specific number of continuous education hours
in patient and medication safety in this setting annually. Furthe-
more, available and accessible scientific databases and resources
should be available for all community pharmacists to check for
interactions or any other safety or efficacy measurements. Further
studies to investigate the impact of electronic systems and other
safety requirements implementation in community pharmacies
in Saudi Arabia are required to help improving patient and medica-
tion safety in this setting.

In conclusion, the results of this study showed that knowledge
of community pharmacists about DDIs was inadequate. Further
continues education and electronic systems can help CPs in detect-
ing such interactions easily.

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