

ASSESSMENT OF THE ATTITUDE AND KNOWLEDGE OF DRUG-DRUG INTERACTIONS AMONG HEALTHCARE PROFESSIONALS IN PRINCE ABDUL-MOHSIN HOSPITAL IN ALULA, SAUDI ARABIA

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ABSTRACT

Introduction: Drug-drug interactions (DDIs) have over time, received increased attention in various medical fields, due to desired or unwanted effects that they may have on patients. Recognition and identification of DDIs by healthcare professionals (HCPs) is essential in reducing the risk of drug-related problems, and a high cost of healthcare services, Therefore, this study was aimed at assessing the attitudes and knowledge of DDIs among HCPs. We hypothesized that there is a significant weakness in the knowledge background of HCPs towards DDIs. **Methods:** A Descriptive cross-sectional study was conducted between April 2018 until August 2018 in Prince Abdul-Mohsin Hospital. The questionnaire was divided into three sections

(Socio-demographic characteristics - HCPs attitudes- HCP's knowledge of DDI). All statistical analyses were performed using SPSS version 24. **Results:** The mean percentage of items answered correctly assessing the knowledge was 36%. The number of those who did not undergo training programs on DDI was 121(76%). 74 (46.3%) of the respondents had come across DDIs during practice. Textbooks were the most cited information source used by 68(42.5%) of the respondents. **Conclusion:** This study found out that there was a good HCPs attitude about DDI. However, the knowledge of DDIs by HCPs was poor. Inadequate training programs for DDIs in the hospital although the number of those who had come across DDIs during practice was high. Therefore, this required an improvement of up to date DDI

information through reliable information resources for easy use. Improving continuous on-job training to help HCPs to recognize and identify clinically significant DDI.

KEYWORDS: Healthcare professional knowledge, Drug-interactions, Cost analysis, Drug related problem.

1. INTRODUCTION

The term drug-drug interactions (DDIs) refers to an alteration in drug pharmacokinetics, or its effects due to the presence of another drug (Baxter, 2010).

DDIs lead to different clinical and pharmacological responses when drugs are concomitantly taken in combination. These effects are different from those expected when the drugs are individually administered to the patient and could be synergistic, antagonistic, or idiosyncratic (Tatro, 2000).

DDIs have over time, received increased attention in various medical fields, due to desired, reduced, or unwanted effects that they may have on patients. With the increase in the number of drugs taken or administered (polypharmacy), the probability of the interactions also increases (Jankel & Speedie, 1990).

The high rate of prescribed drugs in elderly patients (65-years and older, take a 5 drugs) increases the likelihood of DDI, and thus the danger of the drugs causing these elderly patients to be hospitalized.

Studies have shown that old age, taking a number of medications and comorbid with long hospital stays were recognized as DDIs common predictors (Riechelmann *et al.*, 2005; Doubova *et al.*, 2007; Johnell and Klarin, 2007; Gagne *et al.*, 2008; Nobili *et al.*, 2009).

DDIs may lead to an increase in side effects or decreased effectiveness of the medication. Dutch University Hospital published an article on the common side effects of DDIs and the results were as follows: increased bleeding risk (22.0%), hypotension (14.9%), nephrotoxicity (12.6%) and electrolyte disturbances (10.5%). Moreover, up to 25 .2% cases decreased the effectiveness of the medication due to DDIs. (Zwart *et al.*, 2009).

DDI have been reported to affect millions of patients and contribute to their frequent admissions to hospitals (Lazarou *et al.*, 1998; Juurlink *et al.*, 2003). DDIs raises the cost of

treatment, and consequently increases the budget for healthcare services in the Ministry of Health (Jha *et al.*, 2001).

Philip D. Hansten made some recommendations for drug interaction management to health care providers which include: “improving the knowledge of health care providers, improving computerized screening systems, providing information on patient risk factors, increased use of pharmacogenetic information, more attention to drug administration risk factors, and improving patient education on drug interactions” (Hansten, 2003).

Many technical procedures have been deployed to identify incidence of DDIs. However, many HCPs were found to be lacking the essential knowledge capacity to recognize or identify many potential DDIs. One of the causes of DDI is wrong communication between physicians’ and patients. (Murphy *et al.*, 2004; Ko *et al.*, 2008). Good awareness of the importance effective patient-physician communication that will help to reduce the DDI. (Arumugam, 2015).

Recognition and identification of DDIs by HCPs are essential in reducing the risk of drug-related problems, and a high cost of healthcare services. Therefore, HCPs play a crucial role in the monitoring of potential DDIs and protecting patients’ lives from the potential harm during treatment procedures (Bates *et al.*, 1995; Couris *et al.*, 2000; Izzo *et al.*, 2012).

The issue of DDIs needs more attention in hospitalized patients, with the intention of reducing disease severity, and patient’s comorbidity. There is also an essential need to consider cases of chronic diseases, complex therapeutic regime, and frequent modification in therapy (Zwart *et al.*, 2009). During hospitalization, 17% of all adverse drug events were caused by DDIs (Larki *et al.*, 2018).

The potential clinical consequences of DDIs are usually expected in any drug administration, or treatment process. Therefore, studies that explore the occurrence and clinical importance of DDIs would help HCPs to identify and prevent these interactions. Limited previous studies conducted on DDIs aimed at assessing the attitude and knowledge of DDI among HCPs in the Kingdom of Saudi Arabia and my work enrich this area. We hypothesized that there is a significant weakness in the knowledge background of HCPs towards DDIs. The aim of the present study was to assess the attitude and knowledge of DDIs among physicians, pharmacists, and nurses in Prince Abdul-Mohsin Hospital in Aula.

2. METHODS

2.1 Study design

A descriptive cross-sectional study was conducted to assess the attitude and knowledge of DDI among healthcare professionals (Physicians, pharmacists, and nurses) in Prince Abdul-Mohsin Hospital from April 2018 until August 2018.

2.2 Inclusion and Exclusion Criteria

Inclusion Criteria

- ✓ Male and female physicians, pharmacists, and nurses affiliated to Prince Abdul-Mohsin Hospital, Kingdom of Saudi Arabia.
- ✓ Must have Saudi Health license.
- ✓ Physicians, pharmacists, and nurses who have more than a one-year working experience.

Exclusion Criteria

- ✓ Physicians, pharmacists, and nurses who are not involved in clinical practice (administrative work).

2.3 Data Collection

A self-administered questionnaire was developed after reviewing relevant literature: "Drug interactions– a view on doctors" (Sathish & Bhaskar. 2010) and "Assessment of physician's awareness on DDI and common sources of information in general hospital of Addis Ababa" (Moges, 2013). The questionnaire was divided into three sections: **Section A** (Socio-demographic characteristics) it consisted of 6 questions. **Section B** of the questionnaire was related to HCPs attitudes, regarding DDIs. It consisted of 9 questions. **Section C** focused on HCPs knowledge about the common DDIs.

2.4 Ethical Approval

Ethical Approval was obtained from Riyadh Elm University and General Directorate of Health Affairs of Medina.

2.5 Statistical Analysis

SPSS version 24 used for analysis. Rasch Model was used for measurements the item difficulty and Pearson Chi-Square was used for the comparison between the variables, P-values less than 0.05 were considered as statistically significant.

3. RESULTS

3.1 Demographics

The number of respondents was 160 out of the 230 target HCPs in the hospital, those who responded to the questionnaire 69.5% of the total staff. The majority of the respondents were males 88 (55%) while females were 72 (45%). Non-Saudi respondent number was 90(56.2%), higher than a Saudi respondent 70(43.8%). Regarding the profession, most of the respondents were nurses 76 (47.5%). Most respondents have a bachelor's degree 79(49.3%). Most respondents have practical experience were more than 10years 63(39.4%). Considering the age, most of the respondents age were from 26 to 35 years old 86(53.8%). Table A summarizes all demographic data collected.

3.2 HCPs Attitude of DDI

Regarding Q1, Q8, and Q9 as shown in (Table B) the same answers were 100% of the respondents consider DDIs is an important aspect and all HCPs had the same attitude and thinking they are responsible for reporting DDIs. 19(67.9%) of pharmacists, 32(42.1%) of Nurses and 23(41%) of physicians had come across serious DDI during their practice. Overall, 74 (46%) of the respondents had come across DDIs during practice. Only 39 (24%) out of the 160 respondents attended DDI training programs, 27(69%) out of them attended continuing education while 12(31%) attended workshops and seminars 116 (72.5%) of HCPs were interested in attending training programs. They had different sources of information, 56(35%) of them know about DDI from websites, 4(2.5%) from the pharmacy, 68(42.5%) from textbooks and 27(16.9%) from Pharmaceutical companies. 158(98.75%) of HCPs would like computer software to identify potential DDI interaction.

3.3 Correlation between socio-demographics data with attitude and knowledge

As shown in table (C), the result showed that, no correlation between attitude and Socio-demographics data (P - values >0.05) except with age (p -value 0.03, there was correlation with age and source of information) and the result showed that no correlation between knowledge and demographic data with p -values >0.05 .

3.4 Assessment of item difficulty by Rasch Model

Item difficulty values for Pharmacists ranged from (-3.6 to 3.59), Nurses range from (-0.001, 0.38) and Physician range from (-0.08 to 2.7), the Positive value indicates a high difficult question to answer, while the negative value indicates an easy question (see Table D).

3.5 HCPs knowledge of DDI

The total score test of all HCPs as displayed in Table (E), were as follow: Physicians (5.48 ± 2.82) 36.5%, Pharmacists (5.39 ± 1.83), Nurses (5.31 ± 2.88) 35.5%. and all HCPs were as mean $5.39 \pm$ SD 2.68 mean Score Percentage 36%. There was no significant difference in test score among HCPs. (F-test =0.06, P-value=0.94).

Table A: Descriptive statistics of Demographic variables.

Demographic Variable	Frequency	Percentage
Gender		
Male	88	55%
Female	72	45%
Nationality		
Saudi	70	43.8%
Non-Saudi	90	56.2%
Profession		
Pharmacist	28	17.5%
Nurses	76	47.5%
Physician	56	35%
Qualification		
Diploma	57	35.6%
Bachelors	79	49.3%
Master	15	9.3%
PhD	9	5.6%
Experiences		
1- 3 years	15	9.4%
3-6 years	44	27.5%
6-10 years	38	23.8%
More than 10years	63	39.4%
Age		
Less than or equal 25 years	5	3.1%
From 26 to 35 years old	86	53.8%
From 36 to 45 years old	39	24.4%
More than 45 years	30	18.8%

Table B: HCPs attitude towards drug-drug interactions.

Profession	Q1) Do you consider drug-drug interaction to be an important Aspect?		Q8) Do you think health care professionals are responsible to reporting drug-drug reactions		Q9) The HCPs responsible for reporting DDIs are:				
	Yes	No	Yes	No	all	Physician	Pharmacist	Nurses	Don t now
Pharmacists	28(100%)	0	28(100%)	0	28(100%)	0	0	0	0
Nurses	76(100%)	0	76(100%)	0	76(100%)	0	0	0	0
Physicians	56(100%)	0	56(100%)	0	56(100%)	0	0	0	0
Totals	160(100%)		160(100%)		160(100%)				

Profession	Q2) In your practice, have you come across any serious drug-drug interaction?		Q3) Have you undergone any DRUG-drug interaction/adverse drug reaction training program?		Q4) If your answer to question no. 3 is Yes, what type of training have you attended?	
	Yes	No	Yes	No	Continuing Education	Workshops, Seminars
Pharmacists	19(67.9%)	9(32.1%)	7(25%)	21(75%)	6(85.7%)	1(14.3%)
Nurses	32(42.1%)	44(57.9%)	21(27.6%)	55(72.4%)	15(71.4%)	6(28.6%)
Physicians	23(41%)	33(59%)	11(19.6%)	45(80.4%)	6(54.5%)	5(45.5%)
Totals	74(46.3%)	86(53.7%)	39(24%)	121(76%)	27(69%)	12(31%)

Profession	Q5) Are you interested in attending any training on drug-drug interaction		Q6) Which is your prime source of information on drug-drug interaction?				Q7) Would you like computer software that helps you to identify any potential drug-drug interaction?	
	Yes	No	Textbooks	Website	Pharmaceutical companies	Pharmacy	Yes	No
Pharmacists	22(78.6%)	6(21.4%)	6(21.4%)	16(57.1%)	4(14.3%)	0	28(100%)	0
Nurses	48(64%)	27(36%)	33(43.4%)	21(27.6%)	17(22.4%)	3(3.9%)	74(97.4%)	2(2.6%)
Physicians	46(82.1%)	10(17.9%)	29(51.8%)	19(33.9%)	6(10.7%)	1(1.8%)	56(100%)	0
Totals	116(72.5%)	44(29.5%)	68(42.5%)	56(35%)	27(16.9%)	4(2.5%)	158(98.7%)	2(1.25%)

Table C: Correlation between socio-demographics data with attitude and knowledge.

Questions of attitude Towards Drug-drug interaction	Gender	Qualification	Practice	Age	Nationality	Experience
Q2) In your practice, have you come across any serious drug – drug interaction?	r=0.125 P=0.121	r=-0.101 P=0.203	r=0.132 P=0.098	r=0.127 P=0.109	r=-0.142 P=0.073	r=0.084 P=0.253
Q3) Have you undergone any DRUG-drug interaction/adverse drug reaction training program?	r=-0.030 P=0.713	r=-0.037 P=0.643	r=-0.059 P=0.465	r=-0.079 P=0.320	r=0.031 P=0.696	r=0.025 P=0.752
Q4) If your answer to question no. 3 is Yes, what type of training have you attended?	r=0.000 P=0.99	r=0.022 P=0.786	r=-0.026 P=0.747	r=-0.109 P=0.172	r=-.008 P=0.924	r=0.021 P=0.795
Q5) Are you interested in attending any training on drug – drug interaction?	r=-0.001 P=0.993	r=-0.048 P=0.551	r=0.040 P=0.619	r=0.050 P=0.530	r=-.027 P=0.740	r=-0.029 P=0.721
Q6) Which is your prime source of information on drug – drug interaction?	r=-0.102 P=0.207	r=-0.08 P=0.822	r=0.025 P=0.753	r=0.170* P=0.03 *	r=-0.061 P=0.442	r=-.062 P=0.439
Knowledge	r=0.110 P=0.170	r=0.073 P=0.358	r=0.110 P=0.169	r=0.084 P=0.289	r=-0.073 P=0.356	r=-0.079 P=0.322

r Correlation value, P-Value considered Not significant if > 0.05 *(Significant Correlation)

Table D: Assessment of item difficulty by Rasch Model.

HCPs DDI Items	Item Difficulty		
	Pharmacists	Nurses	Physicians
1. Acetaminophen with codeine + amoxicillin	-3.63*	-0.44	-1.81*
2. Simvastatin + itraconazole	2.37	2.07	1.95
3. Enoxaparin + Clopidogrel	1.73	1.38	0.89
4. Metformin + Ciprofloxacin	-0.49	0.06	-0.25
5. Metformin + erythromycin	-1.042	-0.0011	-1.20
6. Nitroglycerin + sildenafil	0.05	0.38	0.26

7. lisinopril + Furosemide	0.68	-0.06	0.26
8. Atenolol + ranitidine	-1.25	-0.58*	-0.08
9. Allopurinol + Pyrazinamide	2.83**	1.29	1.20
10. omeprazole + Clopidogrel	2.37	2.6**	2.29
11. Dextromethorphan + Diclofenac	0.17	0.51	-0.08
12. Meloxicam + Methylprednisolone	2.83	1.22	1.95
13. Simvastatin 40 mg + Amlodipine	3.59	2.07	2.71**
14. Perindopril + Spironolactone	0.86	0.25	1.80
15. Fentanyl + Linezolid	1.25	1.55	2.11

Table E: HCPs Knowledge Test Score evaluation.

Professions	N	Mean \pm SD	Mean Score Percentage
Physicians	56	5.48 \pm 2.82	36.5%
Pharmacists	28	5.39 \pm 1.83	36%
Nurses	76	5.31 \pm 2.88	35.5%
All HCPs	160	5.39 \pm 2.68	36%

4. DISCUSSION

The present study conducted to evaluate the attitude and knowledge of HCPs toward DDI among pharmacists, nurses, and physicians in Prince Abdul-Mohsin Hospital in Aula. To achieve this, the study identified socio-demographic characteristics of HCPs, the attitude of HCPs and tested HCPs knowledge about DDIs. Cronbach's Alpha was used to test the reliability of the questionnaire which included 15 items measure the knowledge of DDI, the result showed that, the questionnaire was reliable with Cronbach's alpha =0.7. Our finding of the results are matching with previous studies of Ko *et al.*, (2008) were 0.98 and Moges, (2013) were 0.90. Since the value was above 0.67, means the questions were valid and no modifications have been carried out (Taber, 2017).

HCPs in the present study had a low score on the DDI knowledge questions with an average of 36% (Mean 5.39 \pm SD 2.68) correct responses. This is lower than the studies conducted in the USA by Glassman *et al.*, (2002) and Ko, (2007) and higher than the study conducted in Ethiopia by Moges, (2013), which reported correct responses of 44%, 42.7%, and 33.3% respectively. The score test of each group was physicians (5.48 \pm 2.82) 36.5%, pharmacists (5.39 \pm 1.83) 36%, and nurses (5.31 \pm 2.88) 35.5%. Anova test was used to test if there any significant difference in mean of test scores among HCPs (pharmacists, physicians, and nurses) the result showed that: there was no significant differences in test score among HCPs. (F-test =0.06, P-value=0.94).

The reasons behind the low score for the DDI knowledge assessment might be due to the inadequate training programs for HCPs, and this emerged through the attitude result where the percentage of those who did not undergo training programs on DDI and adverse drug reaction were 121(76%). There is no doubt that improving the knowledge and awareness of DDIs through continuous training and education prevented potential DDIs Incidence. A cross-sectional prospective pretest-posttest study conducted on the pharmacy, medical, and nurse practitioner students at the University of Arizona found, significantly better awareness on a DDI knowledge assessment following a 45-minute educational program. Pretest knowledge for pharmacy, medical and nurse practitioners were (11, 5, and 4 out of 15, respectively) improved to (14,14, and 14) post the test. (Harrington et al., 2011).

Respondents attitude toward DDIs was evaluated by using 9 question. Results showed that 100% of the respondents consider DDIs is an important aspect and all HCPs had the same attitude and thinking they are responsible for reporting DDIs. This gives us an indication that HCPs are highly aware of the importance of DDIs and reporting to avoid it in the future, which is comparable to the finding by Tokka & Ahmad (2017), which showed high level of awareness, attitude, and practice of respondents about drug interactions. 74 (46%) of the respondents had come across DDIs during practice, which indicates the potential high incident of the DDI in the patients and this result is lower than the study conducted in Ethiopia by Moges,(2013). Our study found the training program underwent on DDI was 39(24%) It indicated as training courses are inadequate and not included all HCPs although. 116 (72.5%) of HCPs are interested in attending DDI programs which is comparable to the finding by Sathish & Bhaskar (2010).

Textbooks were the most cited information source used by 68(42.5%) of the respondents followed by websites which were used by 56(35%) of the respondents. 27 (16.9%) of the respondents reported Pharmaceutical companies as source of DDI information. 4 (2.5%) of the respondents were using Pharmacy as a source of DDI information.

This study found that no correlation between attitude and Socio-demographics data except with age and no correlation between knowledge and demographic data. This is comparable with the study by Carithers, (2011) they found no significant association between DDI information sources and DDI knowledge level. Therefore, the use of the website to detect DDIs is considered effective since you can search for relevant information and updated at any time via digital technology sources. The study has shown 4 (2.5%) of the respondents were

using Pharmacist as source of DDI information, it may be the reason for the low percentage of who seek information from the pharmacy that did not have a drug information center and Shortage in the number of pharmacists in the hospital. The benefits of drug information services are contribution to reducing the DDI and providing the correct drug information to HCPs. (Umashankar *et al.*, 2017).

The high percentage 158(98.75%) respondents would like computer software to identify potential DDI reaction is higher than the studies conducted in India by (Sathish & Bhaskar, 2010).

5. RECOMMENDATIONS

For healthcare professional and Hospital administration

- The study shows that there is a weakness in the knowledge and training programs in the hospital about DDI. Therefore, continuous on-job training should be improved through a workshop and lectures to train all HCPs.
- Establish a drug information center in the hospital to improve all HCPs knowledge on medication use through answering drug-related questions and education.
- Due to the high incidence of potential DDIs in the hospital, should there be a software program screening to help HCPs to identify any potential DDI.
- Urge HCPs to use reliable information resources informs safe and consistent practice. Many software packages automatically check for drug interactions. Micromedex, Lexicomp, and Up to Date all provide interaction checkers. More detailed information on interactions and their management is available from specialized texts and databases such as Stockley's Drug Interactions.

For Researchers

Further research on HCPs with large sample size and multicenter should be conducted. Considering, the impact of improved drug information sources and DDI training program on DDI knowledge.

6. CONCLUSIONS

The DDIs knowledge surveyed for HCPs in this study revealed that HCPs generally had poor knowledge and no significant difference in DDIs knowledge test score among (Pharmacists, Physicians, and Nurses).

HCPs were highly aware of the reporting and importance of DDIs. Although the number who had come across DDIs during practice was high, the training programs for HCPs on DDI were inadequate. Furthermore, this study found that there was a significant difference in information source on the DDI among HCPs, but there were no correlations between the source of information and knowledge of HCPs. Textbooks were the most cited information source used by respondents and pharmacy was the least cited information source used of DDI information.

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Conflict of interest

None declared.

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