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Improvement of knowledge, attitude and perception of healthcare workers about ADR, a pre- and post-clinical pharmacists' interventional study

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ABSTRACT

Purpose: Healthcare workers have a main role in detection, assessment and spontaneous reporting of adverse drug reactions (ADRs), and improvement of their related knowledge, attitude and perception is essential. The goal of this study was evaluation of clinical pharmacists' interventions in improvement of knowledge, attitude and perception of healthcare workers about ADRs in a teaching referral hospital, Tehran, Iran.

Method: Changes in knowledge, attitude and perception of healthcare workers of Imam teaching hospital about ADRs were evaluated before and after clinical pharmacists' interventions including workshops, meetings and presentations.

Results: From the 100 participated subjects, 82 of them completed the study. 51% of the health workers have been aware of the Iranian Pharmacovigilance Center at the ministry of health before intervention and after that all the participants knew this centre. About awareness and detection of ADRs in patients, 69 (84.1%) healthcare workers recognised at least one, and following interventions, it was improved to 73 (89%). Only seven (8.5%) subjects have reported ADRs in before intervention phase that were increased significantly to 18 (22%) after intervention.

Conclusion: Clinical pharmacists' interventions were successful in improvement of healthcare workers' knowledge, attitude and perception about ADRs and spontaneous reporting in our hospital.

ARTICLE SUMMARY

Article focus

- The goal of this study was evaluation of clinical pharmacists' interventions in improvement of knowledge, attitude and perception about adverse drug reactions in a referral teaching hospital, Tehran, Iran.

Key messages

- Our results showed that 91.5% of the healthcare workers of the hospital never reported any adverse drug reaction and 49% were not even aware of the Iranian Pharmacovigilace Center.
- Identifying previously unrecognised adverse drug reactions was the most important goal for adverse drug reaction reporting in before and after the interventions phases of the study.
- Regarding the study results, it was suggested that health systems must have training programmes for their workers about importance, detection, analysis, reporting and fallow-up of adverse drug reactions in the hospital and provide online and telephone line accesses to facilitate adverse drug reactions reporting system.

Strengths and limitation of this study

- To the best of our knowledge, this is the first survey in Iran that have evaluated clinical pharmacists' interventions in improvement of the healthcare professionals' knowledge, attitudes and perceptions regarding adverse drug reaction.
- Our study was done in a single centre with small sample size and short duration between pre- and post-interventions participants' assessment.

INTRODUCTION

Adverse drug reactions (ADRs) are a major cause of morbidity and mortality around the world and have high economic burden on healthcare systems.[1–3] Pharmacovigilance studies are more important for evaluating medication safety following drugs marketing.[4] Healthcare workers, especially medical practitioners, are the principal contributors of ADR reports.[5] Healthcare professionals' knowledge, attitudes and perceptions about ADR have central role in improvement of patients' safety.[1 5 6] There are some concerns about ADR spontaneous reporting by healthcare workers, including ADR importance, do not know how to report and fill the yellow cards, doubt about adverse effect and suspicious drug, lack of time, fear

of legal problems, avoiding paper works and unavailable yellow card.[1 5–7] WHO standards show that the best spontaneous reporting rate is over 200 reports per 1 000 000 populations per year. Consequently, in Iran with a population of over 70 million, it is expected to have at least 14 000 reports per year that unfortunately only 4967 reports per year were sent to the Iranian Pharmacovigilance Center (IPC).[6]

Continuous education of healthcare workers about pharmacovigilance by oral presentations, verbal reminders, providing ADR newsletters by email, mailing and direct distribution for hospital staff, advertisement, increased accessibility of yellow cards, attending of pharmacist in the medical wards and involving actively in education and training of healthcare workers especially nurses and physicians were proposed for improvement of knowledge and attitude of heathcare workers about ADRs.[8–10]

The goal of this study was evaluation of clinical pharmacists' interventions in improvement of knowledge, attitude and perception about ADRs in a referral teaching hospital, Tehran, Iran.

METHOD

In this study, changes in knowledge, attitude (perspective towards ADR and way of saying and doing about that) and perception (awareness or understanding of the ADR) of healthcare workers of the Imam Khomeini Complex Hospital (a tertiary referral hospital with 1200 beds that is affiliated to Tehran University of Medical Sciences, Tehran, Iran) about ADRs were evaluated before and after clinical pharmacists' interventional study. Based on WHO definition, ADR was considered as any noxious, unintended and undesired effect of a drug that occurs at doses used in humans for prophylaxis, diagnosis or therapy. To assess knowledge, attitude and perception of healthcare workers about ADR, a validate questionnaire[1] was used. The questionnaire consisted of a total of 15 questions (five questions for each of the knowledge, attitude and perception). Multiple-choice questions about ADR definition, goals and importance of pharmacovigilance and types of drug-induced reactions that must be reported were used for evaluation of the participants' knowledge. For evaluation of attitude and perception, some cases with drug-induced ADRs were designed and asked from the participants to determine which of them must be reported.

In the first phase of the study, the clinical pharmacists (three persons) attended in different medical wards of the hospital and invited from all healthcare workers (medical students, nurses, physicians and pharmacist) to participate in the study. From whom those had enough time and were happy with our programme schedule asked to fill the questionnaire. Then, the participants were invited to attend in an educational programme (clinical pharmacists' interventions) in the hospital. Clinical pharmacists' interventions included training workshops (providing lectures and group discussion, 3 h/week for four consecutive weeks) and continuously providing information at the hospital morning case report section (every other day for 1 month) about ADR importance, seriousness, preventability, necessity of reporting and spontaneous reporting system and its advantages. In the workshop, they learnt to fill a yellow card and emphasised on reporting any suspected reaction regardless of uncertainty about the causality. After 3 months, the same questionnaire was filled again by the participants in the educational programmes. Effects of clinical pharmacists' interventions in improvement of knowledge, attitude and perception of the participants about ADR were evaluated by comparing their responses to the questions before and after interventions. All data were analysed by Statistical Package for Social Sciences (SPSS) software V.16.0. Results were reported as frequency, and for comparing the before and after intervention's results, we used cross tabulation and χ^2 test. Values <0.05 were considered as significant.

RESULTS

From 136 healthcare workers that were positive for our invitation, only 100 persons attended in the educational programmes regularly and from them 82 questionnaires

Table 1 Reasons that cause ADR not be reported

Reason	Before intervention	After intervention	p Value
Uncertain association between reaction and drug	18 (22)	17 (20.7)	1
Unimportant to report	13 (15.9)	11 (9)	0.30
Well known that do not need to be reported	21 (25.6)	16 (19.5)	0.23
Unaware of the existence of a national ADR reporting system	17 (20.7)	15 (18.3)	0.62
Did not know importance of reporting	12 (14.6)	10 (12.2)	0.69
Did not know how to report	20 (24.4)	12 (14.6)	0.02
Lack of time	11 (13.4)	16 (19.50)	0.18
Lack of financial reimbursement	2 (2.4)	2 (2.4)	1
Fear of legal liability	2 (2.4)	2 (2.4)	1
Yellow card not available	16 (19.5)	9 (11)	0.04
Reporting system is too technical	18 (9.8)	14 (4.9)	0.12
Not enough information from the patient	82 (100)	3 (3.7)	0.0001

ADR, adverse drug reaction.

Table 2 Reaction characteristics that might encourage healthcare professionals to report

Factor	Before intervention	After intervention	p Value
A serious reaction	53 (64.6)	74 (90.2)	<0.001
Unusual reaction	38 (46.3)	66 (80.5)	<0.001
Reaction of a new product	36 (43.9)	46 (56.1)	0.02
Reaction not reported before for a particular drug	36 (43.9)	66 (80.5)	<0.001
Reaction is well recognised for a particular drug	8 (9.8)	31 (37.8)	<0.001
Any reaction (serious or non-serious, well known or new) to an old or new product	7 (20.7)	26 (31.7)	0.004

were filled out both before and after intervention with same name. The questionnaires that were filled only in one phases of the study were excluded. Thirty-five men and 47 women including 7 (8.5%) physicians, 31 (37.8%) residents, 26 (31.7%) interns, 17 (20.7%) nurses and 1 (1.2%) pharmacist participated in the study. We had not any intention to invite senior or junior of the wards and based on the demographic data of the study we had participants from the both groups. Average age of the participants was 30.9 years with SD of 6.7 years.

Fifty-one per cent (n=42) of the healthcare workers were aware of the IPC at Iranian ministry of health before interventions and after that all the participants knew this centre. Four people (4.9%) had attended in an ADR workshop prior to this study. Sixty-nine (84.1%) subjects had recognised at least one ADR before, and following interventions, 73 (89%) cases have identified ADR. Only seven (8.5%) people have reported ADR before intervention that was increased significantly to 18 (22%) by the interventions (p<0.001).

One of the question was designed to determine centre that ADRs were reported previously by the participants. Two (2.4%) responders had sent the ADR reports to the IPC in Tehran, one (1.2%) to the Food and Drug Organization in another city of Iran, one (1.2%) to the manufacture and four (4.9%) to hospital's ADR canter before the interventions and after that reporting to the IPC increased to 17 (20.7%) cases (p<0.001).

Doubt about occurrence of an ADR did not alter with the interventions significantly (63.4% vs 69.5%). Reasons that caused the participants did not report ADR are shown in table 1. The interventions had considerable impact to reduce causes of under-reporting, including did not know how to report (p=0.002), yellow card not available (p=0.039) and lack of enough information about the patient (p<0.0001).

All types of ADR that might promote healthcare professionals for reporting them were improved significantly after clinical pharmacists' interventions (table 2).

The next questions were about healthcare workers' perception about ADR and spontaneous ADR reporting goals. As it is indicated in table 3, our interventions had a significant effect on the participants' total perception about ADR spontaneous reporting.

Responders' perception about spontaneous reporting was not improved significantly following the clinical pharmacists' interventions (table 4). Fifty-five (67.1%) and 60 (73.2%) subjects believed that it is a professional responsibility at pre- and post-interventional phases of the study, respectively.

Regarding the participants' attitude for reporting ADRs, the question was, in which of the fallowing conditions (carbamazepine-induced agranulocytosis, hypoglycaemia following use of a new hypoglycaemic agent, a new statin-induced myalgia, weight loss following fluoxetine therapy in a young women, amoxicillin-induced skin rash, pedal oedema following amlodipine therapy, bronchospasm following use of new β blocker and a new antiepileptic-induced paraesthesia) you will fill the yellow card? Only reporting of serious reactions such as carbamazepine-induced agranulocytosis was improved by clinical pharmacists' interventions.

The participants' preferred systems to report an ADR have been indicated in table 5. Yellow card, online, telephone and fax were frequently preferred methods for ADRs reporting in this study, respectively (table 6).

Table 3 Healthcare workers' perception about ADR and spontaneous reporting systems' goals, before and after intervention

Goal	Before intervention	After intervention	p Value
To enable safe drugs to be identified	36 (43.9)	46 (56.1)	0.02
To measure the incidence of ADR	39 (47.6)	57 (69.5)	<0.001
To identify factors which might predispose to ADR	35 (42.7)	58 (70.7)	<0.001
To identify previously unrecognised ADRs	56 (68.3)	70 (85.4)	<0.001
To compare ADRs for drugs in similar therapeutic classes	36 (43.9)	52 (63.4)	<0.001
To compare ADRs of same drug from different drug companies	44 (53.7)	44 (53.7)	1

ADRs, adverse drug reactions.

Table 4 Believes about spontaneous reporting, before and after intervention

Believes about spontaneous reporting	Before intervention	After intervention	p Value
Professional responsibility	55 (67.1)	60 (73.2)	0.12
Felt that one report cannot modify the healthcare system	6 (7.3)	6 (7.3)	1
All serious ADRs were recognised before drug marketing	3 (3.7)	1 (1.2)	0.5
Completely aware of what should be reported	4 (4.9)	8 (9.8)	0.06
Yellow cards are too complicated	19 (23.2)	18 (22)	1

ADRs, adverse drug reactions.

DISCUSSION

To the best of our knowledge, this is the first survey in Iran that have evaluated clinical pharmacists' interventions in improvement of the healthcare workers' knowledge, attitudes and perceptions regarding ADR.

Our results showed that 91.5% of healthcare workers of our hospital that participated in the study never reported any ADR and 49% of them were not even aware of the IPC at the first phase of the study and obviously improved after interventions. Iranian pharmacists are more aware about the IPC[6] that may be related to pharmacists' more education about drugs' safety.

Before the clinical pharmacists' interventions, a little (2.4%) of the responders sent ADR reports to the IPC at the ministry of health and after that all the reports have set to this centre. It shows that interventions improve participant information regarding the centre that is responsible for analysing and managing of their reports. In previous research in Shiraz, Iran,[1] 11% of the reports were sent to the IPC.

The considerable numbers of healthcare workers in the present study never reported an ADR that is comparable with other studies.[4 6 11] In the first phase of the study, the main reasons of under-reporting of ADR were in order of had not enough information from the patient, too well known to report, did not know how to report, uncertain association and being unaware of the existence of a national ADR reporting system.

Although there are many studies[12–18] that assess some causes of under-reporting ADR, a little of them have evaluated these barriers in hospitals. Results of a study performed in a tertiary teaching hospital in Barcelona/Spain are similar to our study, and lack of time to report an ADR due to the workload of clinical practitioners was detected as the most important reason to ADR under-reporting. Other causes of under-reporting in that study were lack of information about the spontaneous reporting system, unavailability of yellow cards, doubt of ADR causality assessment and lack of patient confidentiality.[12] Other reasons for under-reporting of an ADR in other studies were diagnosed as uncertain association, too trivial to report, too well known to report, yellow card unavailability, lack of time and not knowing how to report.[13–18]

In the present study, serious and unusual reactions, unreported ADR before and reactions to a new product were selected as more important ADR for reporting by the participants. These are as the same as other studies' results.[4 19–22] We found only one study in that the idea of reporting all kind of ADRs was more often selected by

Table 5 Healthcare workers' attitude for reporting, some instances of adverse drug reaction

Event	Category of reaction	Report before the intervention	Report after the intervention	p Value
Carbamazepine-induced agranulocytosis	Serious	30 (36.6)	74 (90.2)	<0.001
Hypoglycaemia's coma of a new diabetes medication	Serious for a new drug	48 (58.5)	45 (54.9)	0.72
Myalgia with a new statin	New drug	19 (23.2)	20 (14.2)	1
Weight loss after 8 weeks of fluoxetine	Well recognised for a particular drug	69 (7.3)	13 (15.9)	0.14
Rash with amoxicillin after 6-day treatment	Well recognised for a particular drug	18 (22)	12 (14.6)	0.33
Foot oedema after 4-month amlodipine treatment	Well recognised for a particular drug	19 (23.2)	18 (22)	1
Pain and tingling of tongue after 2 weeks of a new anti-seizure therapy	Reaction not reported before for a particular drug	33 (40.2)	40 (48.8)	0.34
Bronchospasm in an asthmatic patient after the first administration of a β blocker	Serious well recognised for a particular drug	33 (40.2)	29 (35.4)	0.63

Table 6 Healthcare workers' preferred method for reporting of adverse drug reaction

Preferred method	Before intervention	After intervention	p Value
Yellow card	29 (32)	34 (45.1)	0.09
Telephone	18 (24.3)	16 (21.6)	0.21
Fax	1 (1.4)	0	0.33
Online	21 (28.4)	23 (31.1)	0.45
None	5 (6.8)	1 (1.4)	0.02

pharmacist than reporting only serious and unexpected reactions.[23] After the study's interventions, beliefs of reporting of all drug-related reactions have been increased significantly.

Identifying previously unreported ADR was the most important goal for ADR reporting in before and after the interventions of the study. This was also reported by other studies.[14 24] Regarding the influence of the clinical pharmacists' interventions on modifying healthcare workers' perception about ADR, just reporting carbamazepine-induced agranulocytosis showed a significant change, which indicated reporting of a serious reaction.

The preferred method to report an ADR was yellow card followed by online report in both before and after the interventions. In previous study in Iran, phone was the selected method for ADR reporting by pharmacists.[1]

Our study was a single-centre study with small sample size and short duration between pre- and post-clinical pharmacists' interventions participants' evaluation. It seems that the consequence of the interventions will be pale over time. Another limitation of our survey was incompletely filled questionnaires that consequently we could not enrol all 100 questionnaires for the analysis.

Educational programme including workshops, oral presentations, group discussion, designing ADR newsletters in hospitals, providing information about pharmacovigilance for healthcare workers by mail, email, verbal reminders, advertisement and continuous education of nurses, physicians and pharmacists about ADRs, regular attending of pharmacists in the medical wards and involving actively in patient's pharmaceutical care are essential for improving healthcare workers knowledge, attitudes and perceptions about ADRs.[7–10]

In conclusion, clinical pharmacists' interventions can improve knowledge, attitude and perception of healthcare workers about ADR that is a great issue of importance regarding pharmacovigilance and public health.

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Competing interests None.

Contributors HK and SD-K: clinical pharmacists of the hospital and provided educational programmes for the participants of the study and revised the manuscript. NM: data gathering and manuscript preparation. NH: data gathering and provided educational programme for the participants of the study. A-AK: study design and statistical analysis.

Provenance and peer review Not commissioned; externally peer reviewed.

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	3
Methods			
Study design	4	Present key elements of study design early in the paper	3
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3-4
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	3-4
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	4
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	4
Bias	9	Describe any efforts to address potential sources of bias	
Study size	10	Explain how the study size was arrived at	4
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	4
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	4
		(*b*) Describe any methods used to examine subgroups and interactions	4
		(*c*) Explain how missing data were addressed	4
		(*d*) If applicable, explain how loss to follow-up was addressed	4
		(*e*) Describe any sensitivity analyses	4
Results			4

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	5
		(b) Give reasons for non-participation at each stage	5
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	5
		(b) Indicate number of participants with missing data for each variable of interest	5
		(c) Summarise follow-up time (eg, average and total amount)	5
Outcome data	15*	Report numbers of outcome events or summary measures over time	5-6
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	7
Limitations			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	8
Generalisability	21	Discuss the generalisability (external validity) of the study results	8
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	8

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.