PHARMACOLOGY

Knowledge of pharmacovigilance among healthcare professionals and the impact of an educational intervention

Ashok K Shenoy[1], Ashwin Kamath[1], Mukta N Chowta[1], Archith Boloor[2], Ajith Aravind[3], Priyamedha Bose Thakur[3], Sachin Kumar[4]

1) Department of Pharmacology, Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Manipal, India

2) Department of General Medicine, Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Manipal, India

3) Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Manipal, India

4) Department of Pharmacology, All India Institute of Medical Sciences, New Delhi, India

Abstract

Aim. To determine the knowledge regarding various aspects of pharmacovigilance among doctors and nurses of a tertiary care teaching hospital and to evaluate the effect of an educational intervention.

Methods. A cross-sectional study was conducted among doctors and nurses of a tertiary care teaching hospital. The participants attended a one-hour educational session during which the concept of pharmacovigilance, the Pharmacovigilance Program of India, the need for reporting ADRs, and the method of reporting were explained by a subject expert. A 20-item questionnaire was used to assess their knowledge regarding pharmacovigilance before and after an educational session. The pre-post comparisons were done using Wilcoxon's signed-rank test. A p-value less than 0.05 was considered statistically significant.

Results. Forty-two doctors and 115 nurses participated in the study. A significant improvement in the participant scores was seen following the educational intervention in both doctors ($Z = -5.344$, $p < 0.001$) and nurses ($Z = -8.808$, $p < 0.001$). Lack of knowledge/awareness was perceived as the major barrier for ADR reporting among nurses as well as doctors.

Conclusion. There is need for education and training among doctors and nurses to enhance their knowledge about drug safety and reporting practices. Educational intervention is likely to improve the knowledge regarding pharmacovigilance, and thereby enhance reporting by healthcare professionals.

Keywords: pharmacovigilance, adverse drug reaction, knowledge, doctors, nurses

Background and aims

Evaluation of drug safety is a continuous process and is an integral part of clinical trials. However, despite the best efforts, it is not possible to capture all the potential adverse effects of a drug during the clinical trial phase and in the immediate post-marketing period due to the limited number of patients who are exposed to the drug [1]. Pharmacovigilance constitutes the detection, assessment, understanding, prevention and control of adverse effects and is important in addressing the knowledge gap regarding safety of a drug [2]. The Pharmacovigilance Programme of India, currently, has provided various platforms for reporting of adverse drug reactions (ADRs) so as to make reporting possible even for non-health professionals and the general public. At the same time, an active effort is made to involve healthcare institutions into the reporting network, particularly the medical colleges [2]. A key factor that is needed to achieve and maintain the usefulness of the program is active reporting by the involved stakeholders, particularly healthcare professionals who are better equipped for the same. This is

DOI: 10.15386/mpr-2076

Manuscript received: 14.02.2021
Received in revised form: 15.03.2022
Accepted: 31.01.2023

Address for correspondence:
Ashwin Kamath
ashwin.kamath@manipal.edu

particularly important in low-income countries where the reporting rates have been observed to be low despite sharing a significant burden of adverse drug effects [3]. There is a need to sensitize the healthcare professionals towards the existence of such a program, its importance, and the need to actively report ADRs [4]. Educational interventions are an important method to achieve this, as evidenced from the findings of a few studies [5,6]. A study conducted at a Portuguese regional pharmacovigilance center showed that educational intervention was the next best approach to developing protocols for increasing ADR reporting [7]. The national pharmacovigilance program has well laid out protocol for ADR reporting and functioning of ADR reporting centers. Hence, our study aimed to determine the knowledge regarding various aspects of pharmacovigilance among doctors and nurses of a tertiary care teaching hospital and to evaluate the effect of an educational intervention. We also determined the perceived barriers to ADR reporting among the doctors and nurses.

Methods

A cross-sectional study was conducted among doctors and nurses of a tertiary care teaching hospital in South India. A 20-item questionnaire was used to assess their knowledge regarding pharmacovigilance before and after an educational session (Supplementary File 1). The questionnaire includes items assessing the knowledge regarding pharmacovigilance and its importance, the reporting framework, assessment of causality, detection of ADRs during phase 4 of clinical trials, etc. Regarding identifying rare adverse reactions through phase 4 studies, the basis was to ensure that the reporters understand the importance of ADR reporting in the general clinical setting, which provides valuable information in a real-world situation, in contrast to the safety data obtained in the controlled settings of a clinical trial. Each item was given a score of 0 or 1 depending on whether the answer was incorrect or correct, respectively. Hence, the minimum and maximum possible scores were 0 and 20, respectively. In addition, an open-ended question was included to elicit the factor(s) which the participants considered as a barrier for ADR reporting.

The study was initiated following approval from the Institutional Ethics Committee (IEC 10-17/188), and written informed consent was obtained from the participants. The study was conducted in accordance with the Declaration of Helsinki and the Indian Council of Medical Research National Ethical Guidelines for Biomedical and Health Research Involving Human Participants. All consenting doctors and nurses answered a pre-validated 20-item questionnaire. The validation procedure involved responses from 15 nurses; the resultant Cronbach's alpha was 0.755, which indicates acceptable level of reliability of the questionnaire. Following the pre-intervention assessment, the participants attended a one-hour educational session during which the concept of pharmacovigilance, the Pharmacovigilance Program of India, the need for reporting ADRs, and the method of reporting were explained by a subject expert. This was followed by a post-intervention assessment using the same questionnaire to determine the effectiveness of the educational intervention. In order to avoid any concern among the participants with regard to anonymity of the response, no demographic information was collected, except to know whether the participant was a doctor or a nurse.

Statistical analysis

The data were entered in a Microsoft Excel file, and later analyzed using Statistical Package for Social Sciences, version 11.5 (SPSS Inc., Chicago, USA). The normality of data distribution was assessed using Shapiro-Wilk test. Since the data were not normally distributed ($p < 0.05$), the pre-post comparisons were done using Wilcoxon's signed-rank test. A p-value less than 0.05 was considered statistically significant.

Results

Forty-two doctors and 115 nurses participated in the study. All the participants completed the questionnaire pre- and post-intervention, with all the questions attempted. Table I shows comparison of the test scores, before and after the educational intervention. A significant improvement in the participant scores was seen following the educational intervention in both doctors ($Z = -5.344$, $p < 0.001$) as well as nurses ($Z = -8.808$, $p < 0.001$). Also, the range of scores obtained was narrower following the intervention, as indicated by the interquartile range.

Table II shows the correctness of responses to each question among doctors and nurses. On comparison of the pre- and post-intervention scores in nurses, 102 out of 115 participants (88%) showed an improvement in scores, and 2 participants (1.7%) showed a negative change; 11 participants (9.5%) showed no change in scores before and after intervention. Regarding doctors, thirty-nine out of 42 participants (92.86%) showed an improvement in scores, and 3 participants (7.14%) showed a negative change.

Table I. Comparison of knowledge regarding pharmacovigilance among doctors and nurses before and after an educational intervention.

	Nurses (N = 115)			Doctors (N = 42)		
	Pre-intervention	Post-intervention	p-value	Pre-intervention	Post-intervention	p-value
Median score	12	17	<0.001	25	29	<0.001
Interquartile range	8-15	16-18		21-28	28 - 31	

Table II. Percentage of correct responses by doctors and nurses regarding pharmacovigilance before and after an educational intervention.

Questions	Nurses (N = 115)			Doctors (N = 42)		
	Pre-intervention - % of correct answer	Post-intervention - % of correct answer	Difference in % of correct pre- and post-intervention scores	Pre-intervention - % of correct answer	Post-intervention - % of correct answer	Difference in % of correct pre- and post-intervention scores
1. What is pharmacovigilance?	91.30	98.26	6.96	76.2	97.6	24.4
2. Objectives of spontaneous reporting	38.26	38.26	0.00	38.1	59.5	21.4
3. Who can report ADRs?	93.04	93.91	0.87	95.2	100	4.8
4. Regulatory body for ADR monitoring	73.91	94.78	20.79	97.6	100	2.4
5. What is materiovigilance?	61.74	78.26	16.52	90.5	100	9.5
6. Tool for online reporting - Vigiflow	64.35	97.39	33.04	71.4	92.9	21.5
7. Common adverse effect of drugs	65.22	84.35	19.13	69	88.1	19.1
8. Forms for reporting ADRs	44.35	80.87	36.52	47.6	95.2	47.6
9. Causality assessment scales	42.61	92.17	49.56	33.3	54.8	21.5
10. Number of reports required to generate signal	33.91	82.61	48.70	23.8	50	26.2
11. Number of medical device monitoring centres in India	55.65	96.52	40.87	31	57.1	26.1
12. Languages in which consumer ADR reporting is available	62.61	97.39	34.78	40.5	50	9.5
13. ICH guideline regarding ICSR reporting	63.48	97.39	33.91	28.6	54.8	26.2
14. Naranjo scale - score for “definite” ADR	53.04	89.57	36.53	26.2	54.8	28.2
15. PvPI - year of inauguration	66.09	96.52	30.43	19	42.9	23.9
16. What is included under pharmacovigilance?	53.91	84.35	30.44	73.8	83.3	9.5
17. WHO-UMC causality assessment scale - number of categories	58.26	93.91	35.65	35.7	69	33.3
18. Centres for reporting of adverse event due to medical devices	34.78	78.26	43.48	35.7	78.6	42.9
19. Number of ADR monitoring centres in India	67.83	95.65	27.82	42.9	90.5	47.6
20. Phases of clinical trial	1.74	0.00	-1.74	78.6	90.5	11.9

With regard to nurses, the intervention had a positive effect on the responses to all questions, except question 20. In the pre-test, most nurses responded correctly to question regarding who should report an ADR (93%) and what is pharmacovigilance (98.26%) in the post-test. In addition, there was a 33% increase of correct responses to the question related to Vigiflow post-intervention. The maximum improvement was observed in understanding of causality assessment scales, in which an increase of 49.56% correct responses was observed. There was no improvement associated with understanding the significance of spontaneous ADR reporting, in which 38.26% of the nurses responded correctly. In question 20, a negative change was observed; the pre-test showed only 1.74% of correct responses, and the post-test, with 0.00% of correct responses.

The percentage of physicians who responded correctly to each question was compared for both pre- and post-intervention. The intervention had a positive effect on the responses to all questions. Most physicians (>90%) responded correctly to questions 3, 4 and 5 in the pre-test. Most physicians responded correctly to most of the questions in the post-test. In addition, there was a 47.6% increase of correct responses to the question related to forms for reporting the adverse drug reactions post-intervention. The maximum improvement was observed in questions 3, 4 and 5 where the 100% of the responses were correct post-intervention. There was good improvement in the number

of correct responses to questions 17, 18 and 19. There was no significant improvement in the response to the question on the year of inauguration of PvPI after the intervention.

Out of the 21 nurses who had given their opinion regarding barriers to ADR reporting, 17 of them (90%) suggested that lack of knowledge was the major factor. Of the 25 doctors who provided their suggestions, lack of awareness / knowledge was the major factor followed by the non-availability of the ADR monitoring forms, busy schedule, and lack of follow-up. The various reasons mentioned for under-reporting of ADRs are listed in table III.

Table III. Opinions of nurses and doctors regarding reasons for under reporting of adverse drug reactions.

Reasons for not reporting ADR	Percentage
Nurses, N = 21	
Lack of knowledge	90%
Busy schedule	23%
Lack of cooperation from physicians	9%
Inconvenient	4%
Doctors, N = 25	
Lack of knowledge	20%
Lack of awareness	28%
Busy schedule	12%
Lack of follow up	8%
Lack of system in place / action plan	16%

Discussion

India is in need of a well-placed and functional pharmacovigilance system, especially taking into consideration the large patient population and the consequent increased disease burden, as well as drug intake. Currently, under-reporting is common among both health professionals and the general public due to lack of adequate knowledge regarding the importance of reporting ADRs and how to report ADRs; in addition, the time and effort required to fill ADR forms is a hindrance for reporting by healthcare professionals [8,9].

Prior to the intervention, 93% of the nurses had an understanding as to who could report the ADR. In addition to this, the study showed that 90% of the nurses who had given their opinion suggested that lack of knowledge was a major factor which caused the under reporting of ADRs. These results are similar to the study by Bhagavathula et al [4]. Also, a study among Polish nurses from urban tertiary care teaching hospitals showed that a majority of them felt inadequately prepared to independently report ADRs and did not report ADRs when the patients complained of possible adverse reactions [10]. Hence, there is a requirement to sensitize the nurses towards the existence of such a program, its importance, and the need to actively report ADRs.

The present study showed that nurses were already aware of what pharmacovigilance was, and what components it entailed, including ADR monitoring, as more than 90% of the doctors and nurses were able to give correct responses to those questions. This is in contrast to a study done by Sanghavi et al. in which only 7.5% of the participants knew about the ADR system in India [11].

The study highlighted the importance of education among doctors and nurses, as is evident from the significant increase in the post test scores; 88% of nurses and 92.86% of doctors showed an improvement in knowledge regarding pharmacovigilance after the educational intervention. This is in agreement with a study done by Ganesan et al. in a tertiary care centre in South India, in which the knowledge, attitude and practice of both doctors and nurses improved following an educational intervention [5]. A study on pharmacovigilance knowledge, attitude, and practice among doctors, nurses, and pharmacists in an Egyptian hospital showed low baseline scores which improved significantly following an educational intervention by clinical pharmacists from the pharmacovigilance centre [12]. In an interventional study of healthcare professionals from six teaching hospitals in Nigeria, the intervention group attended a seminar followed by monthly reinforcements via text messages for one year. A significant improvement in the knowledge of the participants in the intervention group was seen compared with the test group [13].

In the current study, the participants were able to submit correct answers in response to questions regarding the regulatory body of ADR reporting, materiovigilance, online reporting in Vigiflow, forms used for reporting, causality assessment scales like Naranjo and WHO-UMC, PvPI and ADR monitoring centers in India, following the intervention. Similar results were shown in a study done by Goel et al. among interns [14], in which the intervention consisted of hands-on training, and a theoretical presentation on objectives of ADR reporting, incidence, role of healthcare professionals, epidemiological importance of reporting, Vigiflow database, patient safety and causality assessment of ADRs [5,11]. Studies conducted in foreign countries have also showed a beneficial effect of educational intervention over short and long term [15-17].

Besides focusing on interventions to improve the knowledge and enhance reporting among doctors and nurses, there is a need to increase the knowledge and awareness among future healthcare professionals regarding pharmacovigilance [18]. The success of education intervention seen in this study as well as from other geographies with different health care environment suggest that such measures are effective in overcoming the malaise and unwillingness in ADR reporting [10,19]. Setting such interventions right from the early clinical years of students is likely to promote the ADR reporting culture, although the long-term effects of the various educational interventions are yet to be studied [20]. In this regard, a core curriculum has been proposed

by a World Health Organization expert committee for pharmacovigilance preparedness among medical, dental, nursing and pharmacy students [18].

Conclusions

Our study showed that there was a significant lack of knowledge among the health professionals regarding pharmacovigilance and ADR monitoring, which improved significantly following an educational intervention. Also, lack of knowledge was reported as a major hurdle in proper reporting of ADRs by the doctors and nurses who participated in the study; this further highlights the importance of educational intervention in strengthening the pharmacovigilance activities. To conclude, the study shows that there is need for education and training among doctors and nurses in order to improve their knowledge regarding drug safety and reporting practices.

References

1. McNeil JJ, Piccenna L, Ronaldson K, Ioannides-Demos LL. The Value of Patient-Centred Registries in Phase IV Drug Surveillance. Pharma Med. 2010;24:281-288.
2. Guidance document for spontaneous adverse drug reaction reporting. Indian Pharmacopoeia Commission. Ministry of Health and Family Welfare, Government of India. 2014. Available from: http://www.ipc.gov.in/PvPI/pub/Guidance%20Document%20for%20spontaneous%20Adverse%20Drug%20Reaction%20Reporting.pdf.
3. Aagaard L, Strandell J, Melskens L, Petersen PS, Holme Hansen E. Global patterns of adverse drug reactions over a decade: analyses of spontaneous reports to VigiBase™. Drug Saf. 2012;35:1171-1182.
4. Bhagavathula AS, Elnour AA, Jamshed SQ, Shehab A. Health Professionals' Knowledge, Attitudes and Practices about Pharmacovigilance in India: A Systematic Review and Meta-Analysis. PLoS One. 2016;11:e0152221.
5. Ganesan S, Sandhiya S, Reddy KC, Subrahmanyam DK, Adithan C. The Impact of the Educational Intervention on Knowledge, Attitude, and Practice of Pharmacovigilance toward Adverse Drug Reactions Reporting among Health-care Professionals in a Tertiary Care Hospital in South India. J Nat Sci Biol Med. 2017;8:203-209.
6. Shrestha S, Sharma S, Bhasima R, Kunwor P, Adhikari B, Sapkota B. Impact of an educational intervention on pharmacovigilance knowledge and attitudes among health professionals in a Nepal cancer hospital. BMC Med Educ. 2020;20:179.
7. Ribeiro-Vaz I, Santos CC, Cruz-Correia R. Promoting adverse drug reaction reporting: comparison of different approaches. Rev Saude Publica. 2016;50:14.
8. Gupta SK, Nayak RP, Shivaranjani R, Vidyarthi SK. A questionnaire study on the knowledge, attitude, and the practice of pharmacovigilance among the healthcare professionals in a teaching hospital in South India. Perspect Clin Res. 2015;6:45-52.
9. Haines HM, Meyer JC, Summers RS, Godman BB. Knowledge, attitudes and practices of health care professionals towards adverse drug reaction reporting in public sector primary health care facilities in a South African district. Eur J Clin Pharmacol. 2020;76:991-1001.
10. Zimmermann A, Flis A, Gaworska-Krzemińska A, Cohen MN. Drug-safety reporting in Polish nursing practice-Cross sectional surveys. PLoS One. 2020;15:e0241377.
11. Sanghavi DR, Dhande PP, Pandit VA. Perception of pharmacovigilance among doctors in a tertiary care hospital: influence of an interventional lecture. Int J Risk Saf Med. 2013;25:197-204.
12. Ibrahim DM, Shawki MA, Solayman MH, Sabri NA. Pharmacovigilance education to healthcare professionals: Will it affect their performance in reporting adverse drug reactions? Int J Clin Pract. 2021;75:e14731.
13. Opadeyi AO, Fourrier-Réglat A, Isah AO. Educational intervention to improve the knowledge, attitude and practice of healthcare professionals regarding pharmacovigilance in South-South Nigeria. Ther Adv Drug Saf. 2019;10:2042098618816279.
14. Goel D, Farooq M. Impact of educational intervention on knowledge, attitude and practice of pharmacovigilance among interns. Adv Hum Biol. 2017;7:75-79.
15. Jha N, Rathore DS, Shankar PR, Bhandary S, Pandit RB, Gyawali S, et al. Effect of an educational intervention on knowledge and attitude regarding pharmacovigilance and consumer pharmacovigilance among community pharmacists in Lalitpur district, Nepal. BMC Res Notes. 2017;10:4.
16. Varallo FR, Planeta CS, Mastroianni PC. Effectiveness of pharmacovigilance: multifaceted educational intervention related to the knowledge, skills and attitudes of multidisciplinary hospital staff. Clinics (Sao Paulo). 2017;72:51-57.
17. Khalili H, Mohebbi N, Hendoiee N, Keshtkar AA, Dashti-Khavidaki S. Improvement of knowledge, attitude and perception of healthcare workers about ADR, a pre- and post-clinical pharmacists' interventional study. BMJ Open. 2012;2:e000367.
18. van Eekeren R, Rolfes L, Koster AS, Magro L, Parthasarathi G, Al Ramimmy H, et al. What Future Healthcare Professionals Need to Know About Pharmacovigilance: Introduction of the WHO PV Core Curriculum for University Teaching with Focus on Clinical Aspects. Drug Saf. 2018;41:1003-1011.
19. Potlog Shchory M, Goldstein LH, Arcavi L, Shihmanter R, Berkovitch M, Levy A. Increasing adverse drug reaction reporting-How can we do better? PLoS One. 2020;15:e0235591.
20. Reumerman M, Tichelaar J, Piersma B, Richir MC, van Agtmael MA. Urgent need to modernize pharmacovigilance education in healthcare curricula: review of the literature. Eur J Clin Pharmacol. 2018;74:1235-1248.

Questionnaire

Please encircle the answer of your choice. For questions 7 and 8, please indicate your answers by using arrows.

1. Pharmacovigilance is:
(a) The science of detecting the type and incidence of ADR after drug is marketed
(b) The science of monitoring ADRs occurring in a hospital
(c) The process of improving the safety of the drug
(d) The detection, assessment, understanding and prevention of adverse effects

2. Spontaneous reporting can help with all the following except:
(a) Assessing safety of a drug
(b) Calculating incidence of ADRs
(c) Identifying predisposing factors to ADRs
(d) Identifying previously unrecognized ADRs

3. The healthcare professionals responsible for reporting ADRs in a hospital is/are:
(a) Doctor
(b) Nurses
(c) Pharmacist
(d) All of the above

4. In India, which regulatory body is responsible for monitoring ADRs?
(a) Central Drugs Standard Control Organization (CDSCO)
(b) Indian Council of Medical Research (ICMR)
(c) Indian Clinical Research Institute (ICRI)
(d) Medical Council of India (MCI)

5. In materiovigilance, we can report:
(a) Event due to machine
(b) Event due to implant
(c) Event due to reagents (in-vitro)
(d) All of the above

6. Which online tool is used for reporting ICSRs in PvPI?
(a) Argus
(b) ARISg
(c) Vigiflow
(d) Vigibase

7. Match the following:
(a) Pioglitazone (i) Heart attack and stroke
(b) Deanxit (ii) Bone marrow depression
(c) Analgin (iii) Suicidal tendency
(d) Sibutramine (iv) Bladder cancer

8. Match the following:
(a) Yellow card (i) Health care professional
(b) Blue card (ii) Consumer reporting
(c) Red form (iii) United Kingdom
(d) Blue form (iv) Australia

9. All are causality assessment scales except:
(a) Naranjo
(b) WHO-UMC
(c) Kramer scale
(d) Hartwig scale

10. Minimum how many reports are required to generate a signal?
(a) 1
(b) 2
(c) 3
(d) >3

11. Currently how many medical device monitoring centers are there in India?
(a) 8
(b) 10
(c) 12
(d) 14

12. Consumer ADR reporting is currently available in how many vernacular languages:
(a) 9
(b) 10
(c) 11
(d) 12

13. Which ICH guideline discusses ICSR reporting?
(a) E2A
(b) E2B
(c) E2C
(d) E2D

14. “Definite” causality assessment based on Naranjo scale means a score of:
(a) More than 7
(b) More than 8
(c) More than 9
(d) More than 10

15. Pharmacovigilance programme of India was officially inaugurated in the year:
(a) 2008
(b) 2009
(c) 2010
(d) 2011

16. Pharmacovigilance includes:
(a) Drug related problem
(b) Herbal drugs
(c) Medical devices
(d) All

17. How many categories are there in WHO-UMC causality assessment scale?
(a) 5
(b) 6
(c) 8
(d) 9

18. Adverse event due to medical devices can be reported to 1. SCTIMST; 2. AIIMS; 3. PGIMER; 4. NHSRC:
(a) 1 & 4
(b) 2 & 4
(c) 2 & 3
(d) All the above

19. Total number of ADR monitoring centers across India till date are:
(a) 200
(b) 225
(c) 250
(d) 275

20. Rare ADRs are most likely to be identified in which phase of a clinical trial?
(a) Phase 1
(b) Phase 2
(c) Phase 3
(d) Phase 4

21. What factors do you think makes adverse drug reaction reporting inconvenient/difficult/not possible? (You may list as many factors as you like).