Journal of Pharmacovigilance
ISSN: 2329-6887

Amale et al., J Pharmacovigil 2018, 6:2
DOI: 10.4172/2329-6887.1000259

Review Article Open Access

Pharmacovigilance Process in India: An overview

Prashant N Amale*, Deshpande SA, Nakhate YD and Arsod NA

Department of Pharmacology, Priyadarshini JLCollege of Pharmacy, Electronic Zone Building, Hingna Road, Nagpur, India

Abstract

Clinical trial study of drug generally detects common Adverse Drug Reaction (ADR) but, the reaction which occurs after long duration in a specific person or population remains undetected. Pharmacovigilance (PV) is a scientific activity which keeps constant watch on the drug throughout its life cycle. In India, Indian Pharmacopoeia Commission (IPC) and National Coordination Committee (NCC) through the Central Drug Standard Control Organization (CDSCO) cordially regulate the PV activity. To build a potential PV system in India, Pharmacovilance Program of India (PvPI) have been proposed and implemented by the Indian government in 2010. The accurate detection and reporting of ADR is a heart of this system. Hence various regional, zonal and peripheral centres have been proposed for the smooth and effective reporting of ADR. Anyone can report ADR by filling the suspect ADR reporting form available online or offline to the nearest centre in suitable language. Considering Indian geographical distribution, huge population and mobile network connectivity, a toll free number and the mobile app is also provided for timely and effective reporting of ADR. The reported ADRs are collected and processed at the centres in Vigi-flow software. These centres detect signal which are reported to CDSCO and World Health Organisation (WHO) for the further regulatory action. CDSCO-WHO communicates their decision through a suitable media for the betterment of public health.

Keywords: Pharmacovigilance; Adverse drug reaction; Pharmacovigilance program of India; Vigi-flow; Central Drug Standard Control Organisation

Abbreviations: PV: Pharmacovigilance; ADR: Adverse Drug Reactions; AE: Adverse Event

Introduction

Clinical trial data should be able to potentially reflect the safety and effectiveness of a drug for the successful launching of product in the market. Generally the clinical trials are carried in limited number/controlled population and only the common adverse effects can be traced. But, the reaction which develops after long duration and occurs in a specific individual remains undetected. This may be due to the presence of individual genotype and specific physiological conditions. Any medicine is said to be safe only when its benefits are greater than associated risk. So to determine the complete safety profile of medicine/drug; a constant and continuous monitoring in a diverse population is essential which is possible in terms of Pharmacovigilance (PV). PV deals with the complete study of drug related adverse effects and other problems [1]. "Pharmakon" means "Drug" and "Vigilance" means "to keep watch or alert". Broadly speaking, all chemicals other than the food that can alter biological systems are called as drugs. A chemical which shows beneficial therapeutic effect on the body is called as a medicine. However, if it produces harmful or toxic effect then it is regarded as a poison. Thus every drug is poison depending on the dose and use. The noxious and unintended reactions occurring at normal therapeutic dose are named as Adverse Drug Reactions, (ADRs) [1]. While, the untoward events occurred during drug therapy having no relation with its use are called "adverse event" (AE) [2].

Evolution of PV

Before 1960s the health cautiousness and health care regulations were liberal and instead of drug safety, efficacy of drug was the first priority. In 1961, phocomelia due to the thalidomide tragedy forced to establish a system which ensures drug safety [3]. In 1968, World Health Organization (WHO) established the international drug monitoring program because of which the drug safety issues were globalized and systematized. A French group of pharmacologists and toxicologists coined the term PV in mid-70s. Its primary aim was to find out the harms related with drug therapy [4]. Since 19th century few medicines have been developed as safe and effective out of many investigational drugs. It was well known that, almost all drugs possess beneficial and some adverse effects. ADRs are the very widespread problem. Hence, to minimize ADR, PV came in a picture for appropriate and effective monitoring of ADR which can safeguard the public health [5].

Chronological Development of PV

1747: James Ling reported clinical trial showing effectiveness of lemon juice in prevention of scurvy.

1937: Sulphanilamide disaster, where sulphonamide was dissolved in diethyleneglycol leading to death of more than 100 people because of renal failure.

1938: The preclinical toxicity and pre-marketing clinical studies made mandatory by FDA.

1950s: Aplastic anaemia caused due to use of chloramphenicol.

1960: The FDA started hospital based drug monitoring program.

1961: Thalidomide disaster.

1963: 16th world health assembly recognized importance to rapid action on ADR.

1968: Establishment of International Drug Monitoring Program by WHO.

***Corresponding author:** Prashant N Amale, Department of Pharmacology, Priyadarshini JLCollege of Pharmacy, Electronic Zone Building, Hingna Road, Nagpur, India, Tel: +91 9730463753; E-mail: prashantamale17@gmail.com

Received: March 25, 2018; **Accepted** April 17, 2018; **Published** April 24, 2018

Citation: Amale PN, Deshpande SA, Nakhate YD, Arsod NA (2018) Pharmacovigilance Process in India: An overview. J Pharmacovigil 6: 259. doi:10.4172/2329-6887.1000259

1970s: Clioquinol was found to be linked with Sub-acute-myelo-optic neuropathy.

1980s and 1990s: Many drugs with serious adverse effects were recorded.

1996: India started global standard clinical trial.

1997: India joined ADR Monitoring Program.

1998: PV activity initiated in India.

2002: 67th National Pharmacovigilance Centre established in India.

2005: India started conducting structured clinical trials.

2009-2010: PV plan of India was initiated and implemented.

Scope of PV

PV is a booming concept which deals with chemical, botanical, and biological medicines including medical devices [6,7]. The information about suspect product is collected from healthcare providers and patients to detect and prevent abnormalities associated with it [8]. Therefore PV deals with adverse effects of drug, poly-pharmacy, paradoxical reactions, and severe adverse events. It also covers vaccination failure, irrational use, and lack of efficacy, drug interactions, poisoning, overdose, abuse, medication errors and misuse of drug.

Importance of PV

A new medicine which is launched without long term safety studies may not claim to be the therapeutically safe and effective and may show harmful or life threatening effect. Few decades ago in India, the safety evaluation of drug was based on the chronic use of that drug. But this practice was inaccurate and failed to claim complete safety [9]. Considering this fact, many Indian organizations or research funding bodies started investing in individual drug research and launching newer product. Once product is developed a new information tends to be generated which may be positive or negative and may impact on risk-benefit profile of that product. Complete study or assessment of newly generated information with the help of PV system is essential to safeguard the public health. The adverse effects of drugs could result in morbidity or mortality and study of which is essential to minimize risks and maximize benefits. Due to recent high-profile drug withdrawal, the pharmaceutical company and regulatory authorities are strictly focussing on safety of drug in market i.e PV [10].

India secured 4th rank in the global pharmaceutical production. Presently greater than 6,000 authorised manufacturers and 60,000 brands of medicine are available in Indian market. Patient consumes more than two different prescription or non-prescription drugs at a time which may interact with each other and produces discomfort. Hence, to avoid this situation and protect the patients from potential harm caused by new or existing drug there is need to improve the PV system [11]. The PV personnel keeps an eye on ADR, analyses them accurately to communicate results with stakeholders to ensure rational use of drug [12]. Till date PV is not established as an academic speciality and present curriculum of clinical biology, pharmacy and pharmacology is unable to cover required PV skill [13]. Considering the scenario many companies in India are investing in research for development of potential molecule. Because of huge population and availability of participants, India is developing as a focal point for clinical research. Previously, new drugs developed in the other countries and took more time to market in India [14]. PV safeguards the population health by recognizing risk factor and seriousness of the ADR along with prevention of further unexpected harms [15].

PV Program of India

In 1986, a formal ADR monitoring system having 12 centres was proposed and there was no development and special attention on the PV activity [16]. In the year 1997, India participated in WHOs ADR Monitoring Program organized at Uppsala-Sweden. This participation was not sufficient to promote PV activity. Hence, on 14th July 2010 the Government of India started the PV Program for India (PvPI). As part of PvPI, All India Institutes of Medical Sciences (AIIMS), New Delhi selected as National Coordinating Centre (NCC) to safe-guard public health by validating the safety of products. About (Figures 1-6) 22 ADR monitoring centres were established in the year 2010. The NCC was transferred from AIIMS, New Delhi to IPC, and Ghaziabad on 15th April 2011 for smooth and efficient functioning of program. Selected eligible medical colleges, hospitals and centres were approved as ADR Monitoring Centres (AMCs). These AMCs collect the Individual Case Safety Reports (ICSRs), analyses and report it to regulatory the authority [17,18]. Till January 2017, 250 AMCs (government and non-government) have been established under PvPI. About 20 Anti-Retroviral Therapy (ART) and 17 Revised National Tuberculosis Program (RNTCP) centres were also established for spontaneous ADR reporting [19-21]. The technical associate from Medical Sciences, Banaras Hindu University is an authorised person for collecting ICSRs along with its follow up and online database entry in Vigi-Flow software. All the primary health care centres (PHCs) and community health centres (CHCs) submit their ADR reports to the regional centre. It was considered that the remedies from natural source are safe and devoid of ADR. But "Charka Samheta", which is the heart of Ayurveda illustrates that ADR can occur with herbal drugs also if they are compounded and dispensed inappropriately [22]. Hence, to put PV for Ayurveda, Siddha, Unani (ASU) was highly essential to provide ADR data of AYUSH drugs as per WHO guidelines [23].

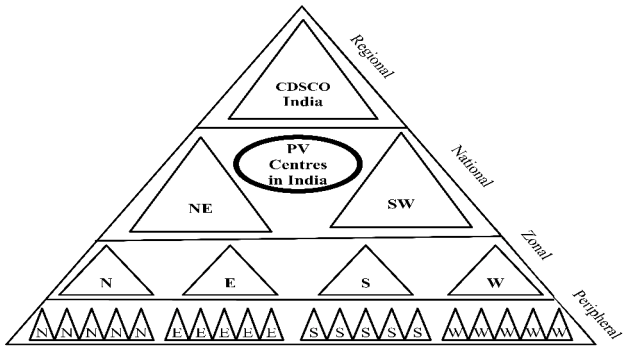

Figure 1: ADR Reporting Centres in India.

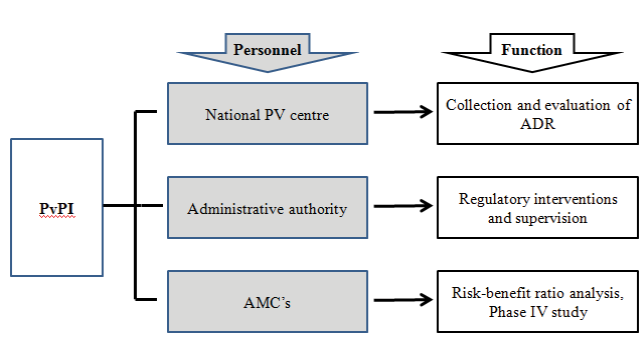

Figure 2: PvPI composition with functions of personnel.

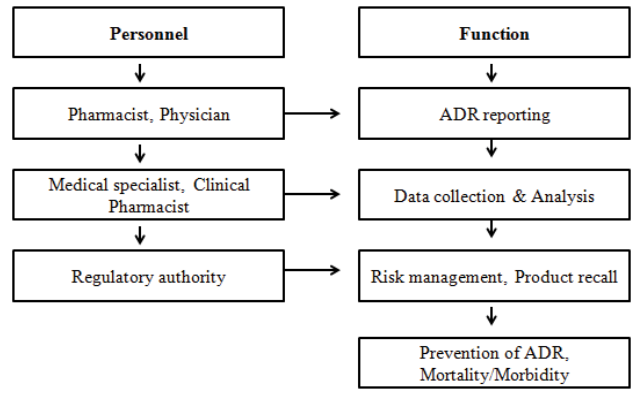

Figure 3: Stakeholders involved and their function in PV activity.

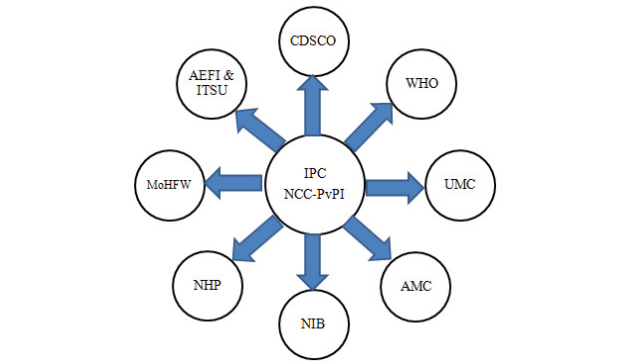

Figure 4: Coordination of various authorities with NCC-PvPI.

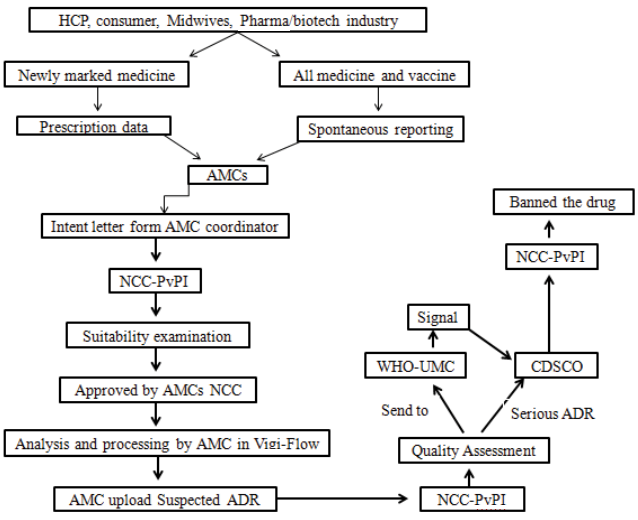

Figure 5: Workflow for PV activity.

Criteria for ADR and its Reporting to Regulatory Authority

What to report?

Following events can be reported to the nearest reporting centre or authority [24].

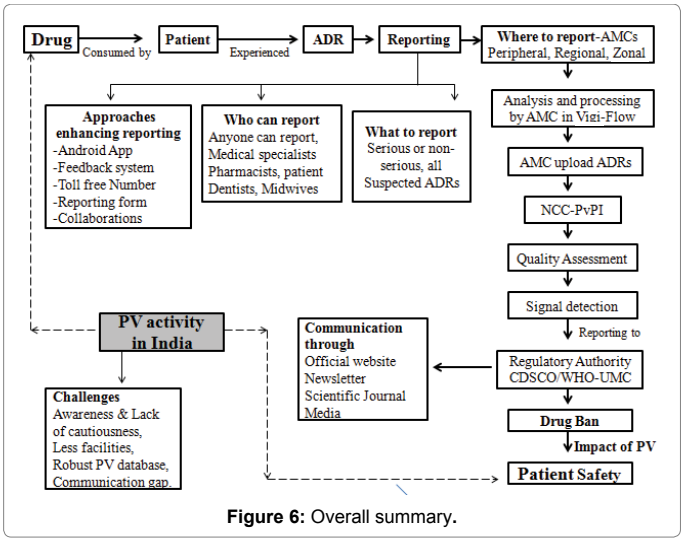

Figure 6: Overall summary.

- Life-threatening event or death
- Hospitalization of the patient
- Congenital anomaly
- Medically significant event (If the event is considered serious by physician)
- Lack of efficacy connected with the use of a medical device or drug product.
- All suspected drug interactions

All known or unknown, serious, non-serious, frequent or rare reaction caused due to use of vaccine or drug must be reported.

When to report?

- All spontaneous case should be reported within 10 days.
- All suspected ADR should be reported as soon as possible because over reporting is always better than under reporting.
- Death event must be reported as soon as possible, while all other serious ADR/event needs to report within 7 days only.
- All non-serious cases must be reported within (Tables 1-2) 30 days.
- Reporting delay may create serious problem.

Who can report?

Professionals working in healthcare team are the preferred source of information in PV, for example

- Medical specialists
- Pharmacists
- Dentists
- Midwives

Along with HCPs patient, patient's relatives, witness or any common person after medical confirmation can report [25-28].

Stakeholder at	Functions
AMC's	ADR collection and reporting to PvPI-NCC
	Follow up check and query resolution
	ADR data feeding into Vigi-flow database
	Training and circulation of feedback to physician
PvPI-NCC	Development of SOPs, guidance document and training manuals
	Causality assessment
	CDSCO reporting
	Analysis of cases
Zonal or Sub-zonal CDSCO Offices	Financial and managerial help to AMC
CDSCO, New Delhi	Make decision and action on recommendation of PvPI NCC along with stakeholder awareness about decision.
	Teamwork along with WHO-UMC

Table 1: Stakeholders and their functional responsibility.

Marketing surveillance year	Drug	ADR/AE	Remark
1950	Chroramphenicol	Aplastic anemia	Still continued
1961	Thalidomide	Phocomelia	National disaster
1970	Clioquinol	Sub-acute myelo-optic neuropathy	Detected after 30 years of use
1970	Diethylstilbestrol	Cervix Adenocarcinoma	In utero exposure
1975	Practolol	Oculo-mucocutaneous syndrome	5 years of marketing
1976	Zomepirac	Anaphylaxis	Withdrawn
1978	Phenformin	Lactic acidosis	Withdrawn
1980	Ticrynafen	Deaths from liver	After 5 years
		Disease	
1982	Ticrynafen	Hepatitis	Withdrawn
1990	Etretinate	Birth defect	High risk of birth-defect, narrow safety margin
1999	Astimizole	Arrhythmias	Other drugs interaction
2004	Rofecoxib	Myocardial infarction	Withdrawn
2010	Rosiglitazone	Heart attacks	Withdrawn in Europe
2011	Drotrcoginalfa	Prowess-shock study	Withdrawn by Lily
2012	Rimonabant	Depress mood, suicidal tendencies and convulsions	Withdrawn
2012	Sibutramine	Cardiac side effects	Banned

Table 2: Example of major induced toxicities, reporting in post marketing surveillance.

How to report?

- Duly filled [21] ADR reporting form needs to send to the nearest AMC or directly to the NCC.
- Dial toll free helpline number-1800 180 3024 to report ADRs.

Mailing the filled ADR reporting form directly to pvpi@ipcindia.net or pvpi.ipcindia@gmail.com.

Logging on to the http://www.ipc.gov.in, http://www.ipc.gov.in/PvPI/pv_home.html for list of authorised AMCs of India.

Where to report

Various Peripheral, Regional and Zonal centres have been proposed and established in India [24].

Peripheral PV centre: It is a primary ADR information gathering centre. It includes small medical centres, private hospitals, dispensaries, nursing home and pharmacies. ADRs are recognized and synchronized by RPCs or ZPCs. Every state, Union territory and few leading medical colleges in India have this peripheral centre.

Regional PV centre: It's regarded as secondary PV Centre. It is located in medical college having relatively larger facilities. They are identified and coordinated by zonal centres. There are five such regional centres in India.

Zonal PV centres: It's regarded as Tertiary PV Centre. Generally located in metro city's medical college having attachment of sufficient facility. It is identified by CDSCO and act as first ADR data collection centre. Zonal centre for North and East zone is AIIMS.

List of Central Drug Standard Control Organisation (CDSCO) Zonal and Sub-Zonal Offices

- Zonal Centre-Ahmadabad [24]
- Zonal Centre-Hyderabad
- North Zonal centre-Ghaziabad a) Sub-Zone Office-Ghaziabad b) Chandigarh, c) Sub-Zonal Office, Jammu
- East Zonal Centre-Kolkata-Air Port and Sea Office, Kolkata
- West Zonal Centre-Mumbai-Air Port and Sea Office, Mumbai, Jawaharlal Nehru Port Office, Navi Mumbai
- South Zonal Centre-Chennai a) Air Port and Sea Office, b) Sub-Zonal and Port Office, Chennai c) Port Office, Kochi-Bangalore.

Roles and Responsibilities of In-Charge Personnel at PVPI

- The Co-ordinator at PVPI-AMC is [24] responsible for the

smooth and effective functioning of AMC, the charge for the same is given to sub-coordinator in absence of coordinator.

- AMC appoints a technical associate who is responsible for collection, follow up, reporting, scrutiny, assessment and entry of ADR in to Vigi-Flow database. All the procedure followed as per SOP and final assessment is performed by NCC.
- AMC controller/in-charge is accountable to send monthly ADR status reports to NCC.
- Making awareness and guiding the HCPs, students, patients about ADR reporting by taking lectures, advertisement though email, telephone, pamphlet and newsletter are the responsibilities of centre coordinator at PvPI.
- Feedback collection and communication to the HCPs is an additional duty of AMC coordinator.

Services Enhancing PV Activity in India

Helpline facility for the assistance of ADR reporting

Considering the use of telecommunication and phone connectivity in India, PvPI-NCC launched a toll free helpline number (1800 180 3024) on 11 October, 2013 which helps to increase the involvement of the patients, stakeholders and public in ADR reporting. This attempt created awareness and improved data collection from all parts of the country, which was very difficult previously. After receiving the ADR data an acknowledgement message used to drop to the sender. This message facility creates positive impact and builds confidence in public which ensures honest and timely reporting of ADR for enhancing drug safety [29].

Android mobile application for ADR reporting

In developing countries due to lack of basic facilities and easy going procedures results in under-reporting of ADR which is a serious concern. India is growing at faster rate in IT (Information Technology) sector which is a great opportunity to utilize for public health. India has 1.27 billion populations out of which approximately 77.58% of people are using mobile phones and getting information on single click. Considering the huge internet connectivity it was more appropriate to introduce the concept of reporting and communication of ADR with PvPI, stakeholders and population through smart phones. For easy and faster reporting of ADR, NCC-PvPI had developed a mobile app in association with NSCBMC (Netaji Subhash Chandra Bose Medical College), Jabalpur, on 22 May 2015. This approach was much inspiring to several Clinical Research Organisations (CRO's) or companies to create and own user friendly ADR reporting app and websites [30].

Feedback form for HCPs

A feedback form from the HCPs is collected at the PvPI to ensure smooth running of PV activity. HCPs can write their views, problems and suggestions to the PV authority by filling a prescribed form available on the official website. Taking feedback from HCP creates good impact amongst them and boost ups the PV process [21].

Feedback form for consumer

Some private organisations have the feedback form on their official sites for consumer. Consumer can directly report ADR, suggestions and any other problems related to the product by filling a respective feedback form, via email or post.

Safety data reporting of ongoing marketed product

PSUR (Periodic safety update reports) is provision to check the safety of marketed product. In India, it is mandatory for Marketing Authorization Holders (MAHs) to submit PSUR to CDSCO twice a year for 2 consecutive years. For the first time in December, 2013 the representatives from MAHs, CDSCO, and NCC-PvPI were participated in an interactive session on "Review of PSURs/Post Marketing Surveillance data and PV Planning of Marketed Products" held at New Delhi. Aim of this meeting was to enhance the participation of MAHs in PvPI [31].

Availability of ADR reporting form in vernacular languages

India is a multi-linguistic nation hundreds of languages spoken in India. Due to this reason flexibility in language is required to ease the process of ADRs reporting. The final goal of PV system is to ensure the safety of medicine among the population. By considering population growth and number, patients or general public can submit ADRs spontaneously by filling suitable form available in their convenient language. This vernacular languages facility was started on 1 Aug. 2014, at NCC-PvPI. Patient or his/her representative/relatives are promoted to fill the form (Medicines Side Effect Reporting form for Consumers" i.e blue form) or E-mail at pvpi.compat@gmail.com. This form is available in Hindi, Marathi, Bengali, Kannada, Assamese, Odiya, Telugu, Tamil, Malayalam and Gujarati languages and can be downloaded from official website of IPC www.ipc.gov.in [30].

Educational courses and training program on PV

For the enhancement of the PV activity, proper education and training related to PV activity throughout the country is essential. To fulfill this criteria the NCC has recognized nine medical institutes that can provide PV training which are situated at regional level particularly in major cities like Mumbai, Mysore, Chandigarh, Kolkata, Bhopal, Ahmedabad, Rishikesh, Hyderabad. In addition some Indian universities have adopted PV as B. Pharmacy subject which will boost the PV knowledge, create awareness and build new personnel to enhance the drug safety. Several private institutions are also providing certificate course of PV. Separate PV journals are available which continuously highlight the current trend in PV.

Collaborations with various government and private hospitals

Every year PvPI signs MoU with various eligible hospitals and health care institution to enhance reporting and the PV activity. 250 authorised reporting centres approved in India till Jan 2017 from various states. A special notification on PvPI website is available viz. "The interested government and private medical colleges and corporate hospitals to become a ADR monitoring centres, please furnish the 'Letter of Intent' and submit us round the year [24].

Collaborations with CDSCO

PvPI is working closely with CDSCO zonal offices and other health authority of India. CDSCO knows that PV activity assure safety of medicine in India. It takes opinion of NCC before making regulatory decisions. The NCC in collaboration with other national and international organizations promotes safety of medicines [31].

Collaboration with WHO-Uppsala Monitoring Centre (UMC) and other health authorities

WHO is the topmost health [24] regulatory authority in the world? This authority frames guideline and provides technical support to greater than 130 countries in the world. Final goal of PvPI is to develop

excellent PV centre in India. To know the global scenario and building of strong PV system in India, PvPI-NCC works in association with the WHO-UMC based in Sweden.

WHO-UMC regulates following activity: Training of the HCPs and related staff at the PvPI-NCC and AMC throughout the country. Ensures use of Vigi-flow software at PvPI. Access to Vigi-flow, which contains worldwide medicines safety data and early information about potential safety hazards of medicines (worldwide data). Technical support to stakeholders in matters published and distributed by PvPI–NCC regularly.

PvPI-NCC work in association with following authorities: Drug Controller General of India (DCGI), CDSCO, Department of Biotechnology (DBT), Ministry of Environment and Forests (MOEF), Indian Council of Medical Research (ICMR), Central Bureau of Narcotics (CBN), Ministry of Health and Family Welfare (MHoFW), National Pharmacovigilance Advisory Committee (NPAC), AEFI (An Adverse Event Following Immunization), Immunization Technical Support Unit (ITSU).

Processing of ADR

All the ADR reports from various sources are collected at the AMC's. PV staff at AMC study, validate and prioritise the report and perform provisional causality assessment. The assessed ADR forms are then directed towards authorised coordinating centre for further proceedings. The AMC's staff maintains a record of all the activities of the centres and carries out ADR monitoring of drugs as per the standard watch list. The coordinating centres then conduct final causality evaluation and feed the reports into the PV database. These centres also prepare an aggregate report of ADRs collected at said time interval and send it to WHO-UMC. The finding of PV analysis is then implemented and integrated into general population health program. Finally, the integrated ADR data is transferred through Vigi-Flow database to the UMC database. UMC team analyses the submitted data and detects drug-ADR relationship called as a signal, is very important aspect and communicate with NCC-PvPI via CDSCO to stop the marketing or use of drug in India. A separate quality review panel exists for the maintenance of quality of ADR processing which inspects or analyses all the centres based on their quality and timely completion of work records, and regularity of training provided [32-34].

Communication of Decision by Regulatory Authorities

Communication of important finding is the best practice to upgrade the knowledge of stakeholders. NCC shares important findings and knowledge related to reporting of ADR, proper use of medicines and risk-benefit with HCPs and common public also. For the communication NCC uses following methods:

Official website

The official websites www.cdsco.nic.in (CDSCO) and www.ipc.gov.in (NCC) are best medium for the communication of ADR. The uploaded documents on this site like list of AMCs, information related to the reporting of ADR i.e how, what, and where to report ADRs, can be searched any time anywhere. In addition to the above documents newsletters, training module, etc. are also available on website.

Communication though media

Awareness/communication of medicines safety with HCPs, patients, and the general public is essential for safe and rational drug therapy. PvPI communicates the findings related to medicine in national newspapers and electronic media on regular basis. This approach increases the safe and rational use along with removal of possible harms.

Newsletter

PvPI publishes newsletter in secured PDF format i.e 3 issues every year to guide HCP's; how to monitor, report, and prevent ADRs. The printed format is supplied to the authorized stakeholder [21].

Scientific journals

NCC publishes original research and review articles on PvPI in national and international journals.

The challenges of PV in India

Underreporting of ADR's is the basic lacuna in Indian PV system. There is inadequate nationwide awareness and illiteracy about PV in HCPs and common populations. People are less cautious about the adverse effect of drug and they try to neglect minor reactions which may be harmful in future. HCPs are less enthusiastic towards PV, unavailability of sophisticated instruments, basic facilities, gap between guideline and laws, are some other difficulties. Regulatory inspections in PV sectors are less regulatory to achieve the desired goal. India has the expertise brain in IT and hence the PV system required to furnish with the help of PV experts in alliance with IT. This teamwork may develop a robust database or software which collect, analyses and process number of ICSRs and ADR reporting form at high speed and accurately. DCGI and other health authority needs to investing and taking regulatory decision to build a comprehensive PV database and setup. This database must be cost effective and user friendly as like Argus and Arisg database used by IT company, so as to process PV cases rapidly. Currently India is trying to grow in this sector for which industrial and regulatory involvement is required [35]. Every time patient is unable to go to the physician hence pharmacist and other HCPs should be competent to identify and communicate the ADR [36]. Sometimes ADRs are unable to identify by the physicians during hospital admission. Such hidden ADRs may be responsible for the death of many patients [37].

Impact of PV

In last 5 years, the NCC worked hard in the enhancement of knowledge of HCPs about reporting of ADRs. As result of this more than 149000 ADRs reported to CDSCO till Dec. 2015 [31]. Currently, India contributes 3% of the WHO global ICSR's database. In the month of Jan 2017 about 5523 ICSRs have been reported to PvPI from different centres. The primary SUASAR analysis from the PvPI database in 2017 showed that Cefepime, Losartan, Amisulpride, are associated with the risks [21]. Previous post marketing data reveals that toxicities or adverse effect of drug leads to the enhancement of patient safety and prevention of harms followed by suspect drug withdrawal from the market.

Conclusion

In India PV system has increased awareness in people regarding ADR reporting. The issues of underreporting are resolving due to available reporting facilities like toll free dial number, message, mail and ADR form in vernacular languages. Various multinational companies have started the outsourcing of PV activity in India which is creating the good PV culture. Various universities have incorporated PV courses in their curriculum as compulsory or elective subject. Still government needs to focus on the awareness and enhancement

of pharmacists' knowledge and providing them facilities and power to conduct PV activity. Every hospital should have the special PV cell to monitor and report the ADR. Considering the Indian population, talent and interest of HCPs and current development in PV sector, India will be the hub and outsourcing centre for global PV activity in near future.

References

1. World Health Organization (1984) World Health Organization Collaborating Centre for International Drug Monitoring, Geneva.
2. World Health Organization (2002) World Health Organization Collaborating Centre for International Drug Monitoring. The Importance of Pharmacovigilance Safety Monitoring of Medicinal Products, Geneva.
3. Kim JH, Scialli AR (2011) Thalidomide: The tragedy of birth defects and the effective treatment of disease. Toxicol Sci 122: 1-6.
4. Begaud B, Chaslerie A, Haramburu F (1994) Organization and results of drug vigilance in France. Rev Epidemiol Sante Publique 42: 416-423.
5. Routledge (1998) 150 years of Pharmacovigilance. Lancet 351: 1200-1201.
6. Kumar S, Baldi A (2013) Pharmacovigilance in India: Perspectives and Prospects. J Drug Deliv Sci Technol 3: 237-246.
7. Ghewari P, Salunke S, Bhatiya N, Killedar S (2014) Strategies and current scenario of pharmacovigilance in India. JADD 1: 122-134.
8. Ruhoy IS, Daughton CG (2008). Beyond the medicine cabinet: An analysis of where and why medications accumulate. Environ Int 34: 1157-1169.
9. Report E, Effective Communications in PV (1997) International Conference on Developing Effective Communications in Pharmacovigilance, Erice, Sicily, pp: 24-27.
10. Grady C (2005) Payment of clinical research subjects. J Clin Invest 115: 1681.
11. Kumar A (2011) Past, present and future of pharmacovigilance in India. Syst Rev Pharm 2:55-58.
12. Dave VS (2013) Current trends in pharmacovigilance. J Pharmacovigilance 1: 2.
13. Olsson S (2008) Pharmacovigilance training with focus on India. Indian J Pharmacol 40: SS28-SS30.
14. Kshirsagar N (2005) The pharmacovigilance system in India. Drug Safety 28: 647-650.
15. World Health Organization (2002) Safety of Medicines: A Guide to Detecting and Reporting Adverse Drug Reactions, Geneva.
16. Kulkarni RD (1986) Reporting system for rare side effects of non-narcotic analgesics in India: Problems and opportunities. Med Toxicol 1: 110-113.
17. Protocol for National Pharmacovigilance Program (2004) CDSCO, Ministry of Health and Family Welfare, Government of India.
18. Pharmacovigilance Program of India (2013) Guidance Document for Spontaneous Adverse Drug Reaction Reporting 1:1-69.
19. ADR Reporting Status: August 2015
20. Kalaiselvan V, Prasad T, Singh A (2014). Current status of adverse drug reactions monitoring centres under pharmacovigilance program of India. Indian J Pharm Pract 7: 19-22.
21. http://www.ipc.gov.in/PvPI/adr.html
22. Rajamma AJ, Dubey S, Sateesha SB, Tiwari SN, Ghosh SK (2014) Comparative larvicidal activity of different species of *Ocimum* against *Culex quinquefasciatus*. Int J for Pharm Res Sch 3: 1916-1922.
23. Protocol National Pharmacovigilance Program for Ayurveda, Siddha and Unani (ASU) Drugs. Sponsored by Department of AYUSH, Ministry of Health & Family Welfare, Government of India, New Delhi.
24. Indian Pharmacopoeia Commission Pharmacovigilance Program of India.
25. Mann RD, Andrews EB (2002) Spontaneous reports are very useful. Pharmacovigilance. John Wiley & Sons Ltd, Chichester.
26. Srivastava P, Kumar P, Sharma A, Upadhyay Y (2011) A review Pharmacovigilance importance and current regulations. Pharmacol Online 2: 1417-1426.
27. Kalaiselvan V, Prasad T, Bisht A, Singh S, Singh GN (2014) Adverse drug reactions reporting culture in pharmacovigilance programme of India. Indian J Med Res 140:563-564.
28. Van K, De Graaf L, de Jong, Van den Berg LT (2003) Consumer adverse drug reaction reporting: A new step in pharmacovigilance? Drug Saf 26: 211-217.
29. Kalaiselvan V, Mishra P, Singh GN (2014) Helpline facility to assist reporting of adverse drug reactions in India. WHO South East Asia J Public Health 3: 194.
30. Kuchya S, Kalaiselvan V, Kaur I, Singh GN (2016) Mobile application an approach to enhance easy adverse drug reactions reporting in India. Health and Technology 6: 157-158.
31. Kalaiselvan V, Thota V, Singh GN (2016) Pharmacovigilance Programme of India: Recent developments and future perspectives. Indian J Pharmacol 48: 24-28.
32. Safety of Medicines (2002) A guide to detecting and reporting adverse drug reactions. Why health professionals need to take action. Geneva, World Health Organization.
33. Palanisamy S, Kottur SG, Kumaran A, Rajasekaran A (2013) A study on assessment of knowledge about adverse drug reactions. Der Pharmacia Lettre 5: 41-52
34. Kalaiselvan V, Sharma S, Singh GN (2014) Adverse reactions to contrast media: An analysis of spontaneous reports in the database of the pharmacovigilance program of India. Drug Saf 37: 703-710.
35. Khattri S, Balamuralidhara V, Pramod Kumar T, Valluru R, Venkatesh M (2012) Pharmacovigilance regulations in India: A Step forward. Clin Res Regul Aff 29: 41-45.
36. Hugman B (2006) The Erice declaration: The critical role of communication in drug safety. Drug Saf 29: 91-93.
37. Kalantri SP (2003) Ethics in clinical research. Indian J Anaesth 47: 30-32.