



ISSN (E): 2277- 7695

ISSN (P): 2349-8242

NAAS Rating: 5.03

TPI 2019; 8(8): 84-92

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www.thepharmajournal.com

Received: 16-06-2019

Accepted: 18-07-2019

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Pharmacovigilance: Present status and future perspectives

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Abstract

Pharmacovigilance is a science which deals with relating to the adverse drug reaction, detection, assessment, understanding and prevention of adverse effects, particularly long-term and short-term adverse effects of medicines. Pharmacovigilance is an important and integral part of clinical research with a number of recent high-profile drug withdrawals, like Cerivastatin. Recently the pharmaceutical industry and regulatory agencies have raised the issue of Pharmacovigilance, because of withdrawal of a number of high profile drugs like Cervistatin (Carvalho, 2016).

Early detection of signals from both clinical trials and post marketing surveillance studies have now been adapted by major pharmaceutical companies in order to identify the risks associated with the medicinal product and effectively manage the risks by applying robust risk management plans throughout the life cycle of the product. Signal detection and risk management have added a new dimension to the field of pharmacovigilance, an evolving discipline; it requires ongoing refinement in order to increase its applicability and value to public health. There is an immense need to understand the importance of pharmacovigilance and how it impacts the life cycle of the product. This will enable integration of good pharmacovigilance practice in the processes and procedures to help ensure regulatory compliance and enhance clinical trial safety and post-marketing surveillance (Gildeeva, 2016).

Surveillance system is to ensure the safety of veterinary medicines once they are authorized and being used in the market place (Saygi, 2016). The rapid identification of any adverse effects to medicines is essential and the data produced from the investigation should be assessed in order to reduce risks in the future use of the product (Das *et al.*, 2014).

Keywords: Pharmacovigilance, adverse drug reaction, post-marketing surveillance, regulatory authorities

Introduction

Adverse drug reaction is an any unexpected or unwanted or dangerous reaction caused by administration of drug. A number of studies conducted throughout the world have demonstrated that adverse drug reaction (ADR) significantly decrease the quality of life, increase hospitalizations, prolong hospital stay and increase mortality. A landmark study by Lazarou in 1998 described adverse drug reaction (ADRs) to be the fourth to sixth largest cause of death in the USA and adverse drug reaction (ADRs) are estimated to cause 3-7% of all hospital admission. More than half of these adverse drug reactions (ADRs) are not recognized by the physicians on admission and adverse drug reaction (ADRs) may be responsible for the death of 15 out of 1000 patients admitted (Vijay, 2013) ^[36]. Furthermore, the financial cost of ADRs to the healthcare system is also huge, with more new medicines being approved for marketing without long-term safety studies by the regulatory authorities and switching of prescription only medicines (POM) to over-the-counter (OTC) to be used more widely by patients for self-medication, the general public is at risk of exposing itself to adverse drug reaction (ADRs) (Kowalski, 2015) ^[20].

Pharmacovigilance is a science which deals with relating to the adverse drug reaction, detection, assessment, understanding and prevention of adverse effects, particularly long-term and short-term adverse effects of medicines. Pharmacovigilance is an important and integral part of clinical research with a number of recent high-profile drug withdrawals, like Cerivastatin. Recently the pharmaceutical industry and regulatory agencies have raised the issue of Pharmacovigilance, because of withdrawal of a number of high profile drugs like Cervistatin (Carvalho, 2016) ^[5]. Early detection of signals from both clinical trials and post marketing surveillance studies have now been adapted by major pharmaceutical companies in

order to identify the risks associated with the medicinal product and effectively manage the risks by applying robust risk management plans throughout the life cycle of the product. Signal detection and risk management has added a new dimension to the field of pharmacovigilance an evolving discipline; it requires ongoing refinement in order to increase its applicability and value to public health. There is an immense need to understand the importance of pharmacovigilance and how it impacts the life cycle of the product. This will enable integration of good pharmacovigilance practice in the processes and procedures to help ensure regulatory compliance and enhance clinical trial safety and post-marketing surveillance (Gildeeva, 2016) ^[15].

Veterinary Pharmacovigilance is the collection and assessment of information, including post marketing surveillance of the adverse effects of veterinary medicines. An adverse effect or reaction to a veterinary product is one that is harmful and unintended and which occurs at doses normally used in animals for the prophylaxis, diagnosis or treatment of disease or the modification of physiological function.

Following the increase in knowledge and growth of technology in the veterinary sector pharmacovigilance is now recognized as a vital component in the safe and efficacious use of veterinary medicines. The purpose of a good pharmacovigilance surveillance system is to ensure the safety of veterinary medicines once they are authorized and being used in the market place (Saygi, 2016) ^[32]. The rapid identification of any adverse effects to medicines is essential and the data produced from the investigation should be assessed in order to reduce risks in the future use of the product. (Das *et al.*, 2014) ^[6].

Pharmacovigilance (PV) was officially introduced in December 1961 in the Lancet by W. McBride, the Australian doctor who first suspected a causal link between serious fetal deformities (phocomelia) and thalidomide; a drug used during pregnancy, thalidomide was used as an antiemetic and sedative agent in pregnant women. In 1968, the World Health Organization (WHO) promoted the "Programme for International Drug Monitoring", a pilot project aimed to centralize world data on adverse drug reactions (ADRs).

In particular, the main aim of the "World health organization (WHO) Programme" was to identify the earliest possible Pharmacovigilance (PV) signals (Flower, 2013) ^[10]. The term Pharmacovigilance (PV) was proposed in the mid-70s by a French group of pharmacologists and toxicologists to define the activities promoting the assessment of the risks of side effects potentially associated with drug treatment PV is the science of collecting, monitoring, researching, assessing and evaluating information from healthcare providers and patients on the adverse effects of medications, biological products, blood products, herbals, vaccines, medical device, traditional and complementary medicines with a view to identifying new information about hazards associated with products and preventing harm to patients. The challenge of maximizing drug safety and maintaining public confidence has become increasingly complex, Pharmaceutical and biotechnology companies must not only monitor, but also proactively estimate and manage drug risk throughout a product's lifecycle, from development to post-market (Kaur, 2015) ^[19].

Pharmacovigilance (PV) is particularly concerned with ADRs, which are drug responses that are noxious and unintended, and which occur at doses normally used for the prophylaxis, diagnosis or therapy of disease, or for the modification of physiological function. Continuous monitoring of drug effects, side effects, contraindications and outright harmful effects which could result in a high degree of morbidity, and in some cases, even mortality, are essential to maximize benefits and minimize risks. Care and caution at the pre-clinical and clinical testing stages can guarantee absolute safety, when a drug is marketed and prescribed to large populations across the country and outside.

Clinical trials involve several thousands of patients at most, less common side effects and adverse drug reaction (ADRs) are often unknown at the time a drug enters the market (Raza, 2015) ^[29]. Post marketing Pharmacovigilance (PV) uses tools such as data mining and investigation of case reports to identify the relationships between drugs and adverse drug reaction (ADRs). The drug regulatory agencies have the responsibility of having a well-established pharmacovigilance (PV) system to monitor adverse drug reactions (ADRs) during the drug development phase and later during the life time of a marketed drug A complex and vital relationship exists between wide ranges of partners in the practice of drug safety monitoring such as government, industry, health care centers, hospitals, academia, medical and pharmaceutical associations, poisons information centers, health professionals, patients, consumers and media. Sustained collaboration and commitment are vital if future challenges in PV are to be met in order to develop and flourish (Reis, 2015) ^[30].

Since very few new drugs were discovered in India and hardly any new drug was launched for the first time in India in the past, there was no major compulsion to have a strong PV system to detect adverse drug reaction ADRs of marketed products. The experience from the markets where the drug was in use for several years before its introduction in India, was used by the companies and the regulatory agencies to assess the safety parameters and take corrective actions, such as the withdrawal or banning of the drug in question.

The evolution of a new patent regime in the Indian pharmaceutical and biotechnology industries as a Trade Related Intellectual Property Rights and Services (TRIPS) makes it incumbent upon India to no longer copy patented products and market them without license from the innovator company. The leading Indian companies, realizing the compulsions of the new regime, have already initiated investments of substantial resources for the discovery and development of new drugs needed for both Indian and International markets. Research and development by the Indian pharmaceutical and biotech companies will hopefully lead to new drugs based on pre-clinical and clinical data generated mostly in India (Shinde, 2015).

In such cases, the Indian regulatory agencies cannot count on the experience of other markets to assess the incidence and prevalence of importance of a properly designed Pharmacovigilance (PV) system in India. With the Indian companies' capacity to develop and market new drugs out of their own research efforts, it is important that adequate Pharmacovigilance (PV) standards are introduced to monitor ADRs of products first launched in India (Fujimoto, 2014) ^[11].

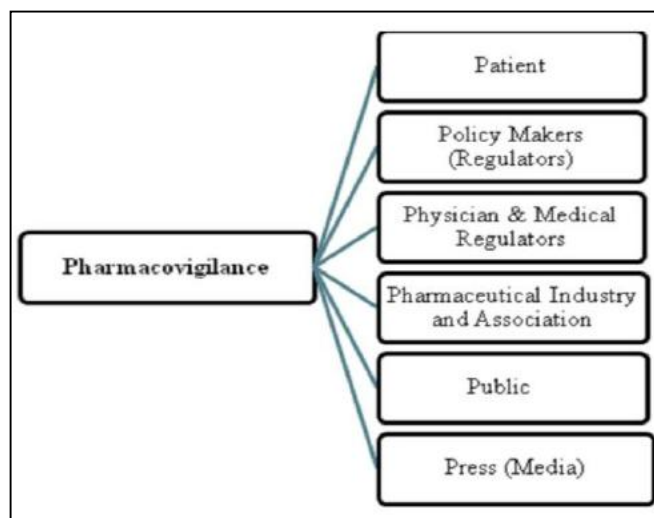


Fig 1: Structure of Pharmacovigilance

This seminar summarizes objectives and methodologies used in Pharmacovigilance with critical overview of existing Pharmacovigilance in India, challenges to overcome and future prospects with respect to Indian context (Dinesh, 2015) [8].

Origin of Pharmacovigilance

A new breakthrough in this field only happened after an episode occurring in 1937. In that year about 105 children and 71 adults were found dead after the consumption of syrup containing Sulphonamide and diethyl glycerol, where diethyl glycerol was incriminated. Sulphonamide was used since 1932 for treatment of streptococcal infection and was lowered as syrup and diethyl glycerol was added as solvent. Sulfanilamide (Prontosil), used since 1932 for treatment of Streptococcal infections, was launched as a syrup, containing diethyleneglycol as solvent. Although tested regarding taste and odor, its safety was not evaluated before launching. This tragedy caused the American Congress to approve Food Drug and Cosmetic Act, in 1938 under which pharmaceutical product manufacturers would have to show scientific evidences of the safety of the drugs before releasing them for sale (Kulkarni, 2000) [21].

The thalidomide tragedy is a milestone in the origin and development of pharmacovigilance. Thalidomide was introduced in 1957 and widely prescribed as an allegedly harmless treatment for morning sickness and nausea. It was tested in approximately 300 patients without toxicity. It was soon linked to a congenital abnormality phocomelia, which caused severe birth defects in children of women who had been prescribed this medicine during pregnancy. In 1962, after reports of numerous cases of phocomelia, it was discontinued (Hama, 2015) [16]. In the same year, the Kefauver-Harris amendment was approved, requiring scientific evidences of efficacy and safety before drug tests in humans. As a means of pooling existing data on adverse drug reaction (ADRs), WHO's Programmed for International Drug Monitoring was started in 1968. Initially a pilot project in 10 countries with established national reporting systems for ADRs, the network has since expanded significantly as more countries worldwide developed, following are chronological sequences as follows (Allabi and Nwokirke, 2014) [2].

- 1937: Sulphanilamide disaster, where sulphonamide was dissolve 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.
- 1950: Aplastic anemia 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 (Muhammad, 2016) [23].

Need of Pharmacovigilance

1. There may be a need to monitor the effects of drugs during the clinical trials and after it in market.
2. Adverse events can even happen during the clinical trials and after its launch in the market
3. Monitor the quality of drugs.
4. Identify the health risks involved in the administration of certain drugs.
5. Prevent harm to people.
6. Research the efficacy of drugs.

Aim of Pharmacovigilance

The major aims of pharmacovigilance have been identified for human medicines (Stephens, 2000) [35], and these can be readily adapted for veterinary medicines:

1. Identification and quantification of previously unrecognized adverse drug reactions.
2. Identification of subgroups of patients at particular risk of adverse drug reactions, e.g. relating to species, breed, age, gender, physiological status and underlying disease.
3. Continued monitoring of the safety of a product in each species for which it is authorized, to ensure that the risks and benefits remain acceptable. This should include extension of monitoring to new indications and new species.
4. Comparing the adverse reaction profile with those of products in the same therapeutic class, both within and across species.
5. Detection of inappropriate prescription and administration, with respect to the latter, administration by specific groups, e.g. farmers or the public, may need to be monitored.
6. Further investigation of a drug or product's toxicological, pharmacological or microbiological properties in order to understand, where possible, the mechanisms underlying adverse drug reactions.
7. Detection of drug-drug interactions. This is particularly important for new drugs that are then co-administered with established products or even other new drugs.
8. Provision of appropriate information on adverse drug reaction data and drug-drug interaction information to veterinarians and others involved in the treatment of animals, e.g. veterinarians, farmers and other animal owners.
9. Adverse effects of veterinary medicinal products on the environment and on organisms in the environment.
10. The violation of permitted residue limits of veterinary medicines in food of animal origin such as meat, milk and honey.
11. Legislation and guidelines governing the requirements of pharmacovigilance (Elhassan, 2015) [9].

Importance of Veterinary Pharmacovigilance

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. Considering this fact, many Indian organizations or research funding bodies started investing in individual drug research and launching newer product (Huerta-Sanchez, 2015) ^[17].

Once product is developed a new information tends to be generated which may be positive or negative on risk-benefit profile of that product. Complete study or assessment of newly generated information with the help of Pharmacovigilance 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 strict (Priyanka, 2014) ^[28].

Focusing on safety of drug in market i.e. Pharmacovigilance India secured 4th rank in the global pharmaceutical production. 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 Pharmacovigilance system. The Pharmacovigilance personnel keeps an eye on adverse drug reaction (ADRs), analyses them accurately to communicate results with stakeholders to ensure rational use of drug (Gaies, 2012). It has been essential to meet the challenges of the increasing range and potency of pharmaceutical and biological medicines including vaccines, which carry with them an inevitable and sometimes unpredictable potential for harm.

Scope of Pharmacovigilance

The discipline of Pharmacovigilance (PV) has developed considerably since the 1972 WHO technical report, and it remains a dynamic clinical and scientific discipline. It has been essential to meet the challenges of the increasing range and potency of pharmaceutical and biological medicines including vaccines, which carry with them an inevitable and sometimes unpredictable potential for harm. The risk of harm, however, is less when medicines are used by an informed health profession and by patients who themselves understand and share responsibility for their drugs. When adverse effects and toxicity appear, particularly when previously unknown in association with the medicine, it is essential that they are analyzed and communicated effectively to an audience that has the knowledge to interpret the information (Allabi and Nwokirke, 2014) ^[2].

This is the role of Pharmacovigilance (PV), has already been achieved, but more is required for the integration of the discipline into clinical practice and public policy. To fulfill the PV obligations for its marketed products as per regulations, a pharmaceutical company in India has to essentially carry out activities such as collection, and expedited reporting of serious unexpected adverse drug effect (ADRs). A typical setup for PV studies, including people involved on various levels, organizational setup (Naik, 2015) ^[24]. This is the role of Pharmacovigilance, of which much has already been achieved. But more is required for the integration of the discipline into clinical practice and public policy. To fulfill the Pharmacovigilance obligations for its marketed products as per regulations, a pharmaceutical company in India has to essentially carry out activities such as collection, and expedited reporting of serious unexpected ADRs. A typical setup for Pharmacovigilance studies, including people involved on various levels (Dave, 2013) ^[7].

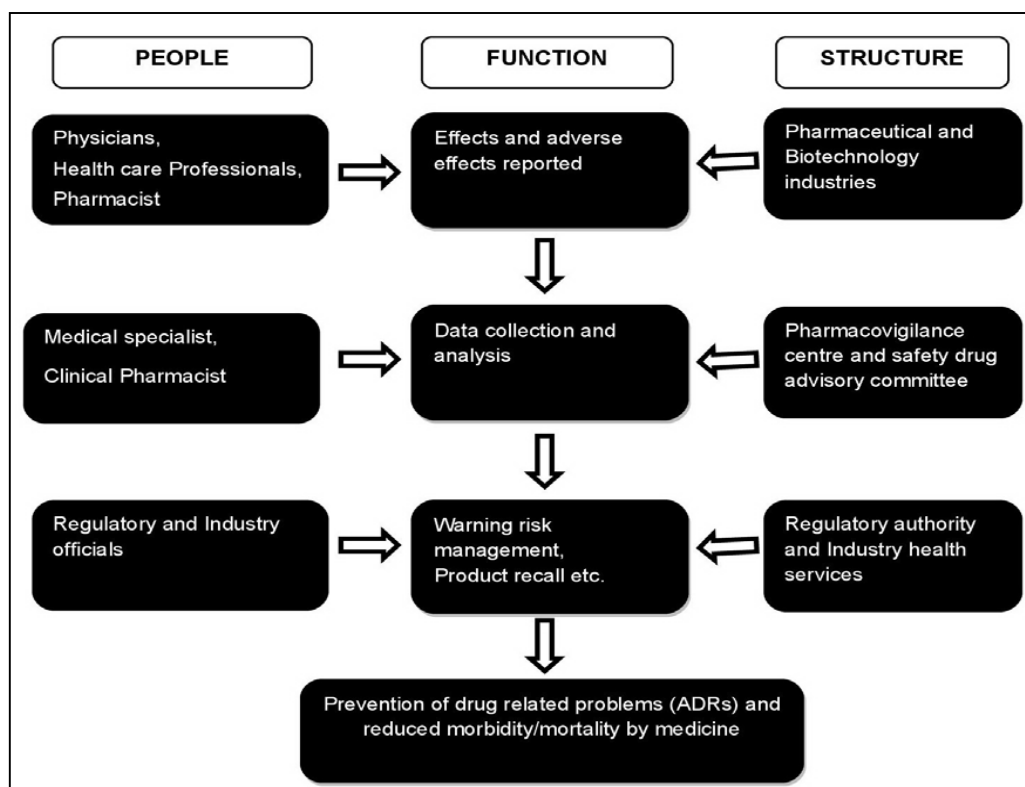


Fig 2: Function of Pharmacovigilance

History of Pharmacovigilance in India

The origin of pharmacovigilance in India goes back to 1986 formal adverse drug reaction (ADR) monitoring system consisting of 12 regional centers, each covering a population of 50 million, was proposed for India. However, nothing much happened until a decade later when in 1997, India joined the world health organization (WHO) adverse drug reaction Monitoring Programme based in Uppsala, Sweden. This attempt was unsuccessful and hence, from 1 January 2005, the WHO sponsored and World Bank-funded National Pharmacovigilance Program for India was made operational (Garlapati and Nagandla 2015) [13]

The National Pharmacovigilance Program established in January 2005, was to be overseen by the National Pharmacovigilance. Advisory Committee based in the Central Drugs Standard Control Organization (CDSCO), New Delhi. Two zonal centers-the South-West zonal centre (located in the

Department of Clinical Pharmacology, Seth GS Medical College and KEM Hospital, Mumbai) and the North-East zonal centre (located in the Department of Pharmacology, AIIMS, New Delhi), were to collate information from all over the country and send it to the Committee as well as to the Uppsala monitoring centre in Sweden. Three regional centers would report to the Mumbai center and two to the New Delhi one. Each regional center in turn would have several peripheral centers reporting to it. Presently there are 26 peripheral centers. The program has three broad objectives (Preda, 2013) [27].

- The short-term objective is to foster a reporting culture.
- The intermediate objective is to involve a large number of healthcare professionals in the system in information dissemination.
- Long-term objective is for the program to be a benchmark for global drug monitoring.

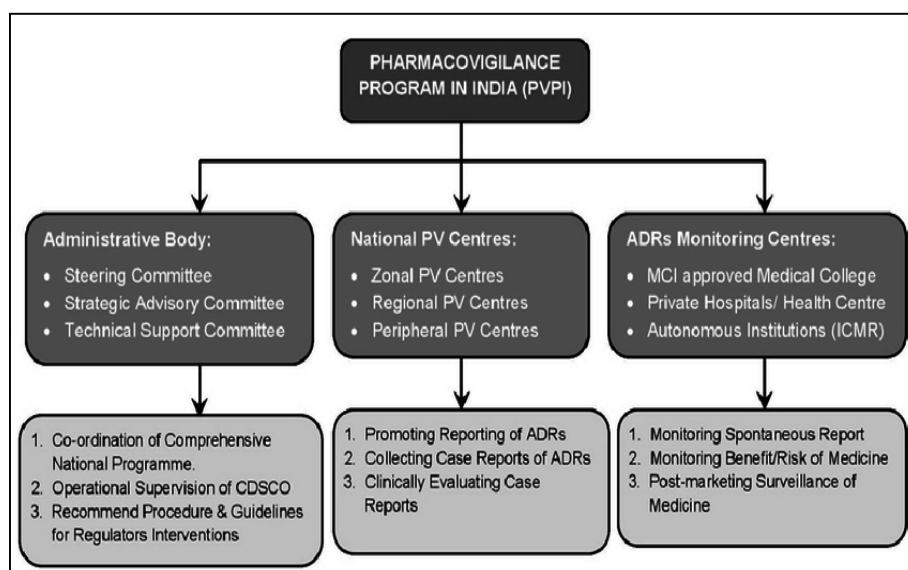


Fig 3: Various committee structure of Pharmacovigilance

Current Scenario of Pharmacovigilance

India is a vast country and there is a drug brand more than 6,000 licensed drug manufacturers and over 60,000 branded formulations. India is the fourth largest producer of pharmaceuticals in the world and is also emerging as a hub for clinical trials. Many new drugs are being introduced in the country, so there is an immense need to improve the pharmacovigilance system to protect the Indian population from potential harm that may be caused by some of the new drugs (Yerramili, 2014) [37]. In the past, India's regulatory agencies and drug companies based their safety assessments on experiences derived from long-term drug use in the Western markets and there was no real urgency for the government to establish a strong pharmacovigilance system of its own. In recent years, however, the lag between when a drug is placed in the market and its subsequent availability in India has decreased considerably so that the much needed longer-term safety data is no longer available. In addition, India-based drug companies have increased their capacity to develop and launch new drugs through their own research efforts and this has heightened the importance of developing adequate internal pharmacovigilance standards to detect adverse drug events (Mishra *et al.*, 2013) [22].

Inspections in all pharmaceutical companies operating in India all pharmaceutical companies should be instructed to

maintain and submit to the DCGI the Summary of Pharmacovigilance System document operating within the company, which would serve as the base for future pharmacovigilance inspections. A high-level discussion with various stakeholders, i.e., Ministry of Health and Family Welfare (MHW), Indian Council of Medical Research (ICMR), Medical Council of India (MCI), Pharmacy Council, Nursing Council, Dental Council, Pharmaceutical Companies, Consumer Associations, Nongovernmental Organizations (NGOs) and Patient Groups should be initiated in order to make them aware of how the drug control general of India (DCGI) is planning to improve and develop a robust system in pharmacovigilance Strengthen the DCGI office with trained scientific and medical assessors for pharmacovigilance Intensive training should be given in all aspects of pharmacovigilance to officials working within the pharmacovigilance department of the DCGI and in the peripheral, regional and zonal centers. This should be an ongoing activity with training scheduled twice a year. Creating a single countrywide specific adverse event reporting form to be used by all (Salim. 2015) [31].

A single countrywide specific adverse event reporting form needs to be designed should not only be used by the National Pharmacovigilance Centers, but also by all registered hospitals (both private and government), teaching hospitals,

Drug Information Centers and pharmacies throughout the country. It should also be made available to all primary healthcare centers (PHCs) in rural areas and all practicing general practitioners and physicians. Creating a clinical trial and post-marketing database. ADRs for signal detection and access to all relevant data from various stakeholders' full complete data should be made available to the DCGI and to the various stakeholders from the date of first registration of the clinical trial in the India.

This data should comply with consolidated standards of reporting trials guidelines including overall benefit-risk profile of the product. Current standards of safety reporting as outlined in Schedule and information about all adverse events (AEs) and adverse drug effects (ADRs) per study arm should be systematically included as well as detailed description of cases with previously unknown adverse events (AEs) adverse drug effects (ADRs) and the reasons for study withdrawals, for drugs already in the market, type and frequency of all adverse events (serious and non-serious) should be submitted in periodic safety update reports (PSURs) and also added to the summary of product characteristics (SPCs).

List all new drug indications by maintaining a standard database for every pharmaceutical company a list should be maintained by the regulatory authorities and pharmaceutical companies for all new drugs indications in the database. All new issues need to be put under heightened surveillance. Pharmaceutical companies in these circumstances should have meetings set up with the DCGI to outline their risk management plan (RMP) for the safety issues in question and describe how they would put effective strategies in place to mitigate the Education and training of medical students, pharmacists and nurses in the area of pharmacovigilance (Elhassan, 2015) [9].

There are several courses conducted by various organizations focusing in clinical research, but to date there is no course relevant to pharmacovigilance in the country. The various stakeholders including the MCI should incorporate a pharmacovigilance syllabus within the pharmacology and medicine curricula so that proper theoretical and practical training can be imparted to physicians. Similarly, nurses and

pharmacists should also be trained in pharmacovigilance so that they are able to recognize adverse drug reaction (ADRs) and develop a culture of reporting ADRs in the future. An awareness program and a training schedule (both by distance education and face-to-face learning) covering all aspects of pharmacovigilance.

These are meant for the research and development (R and D)-based pharmaceutical companies, particularly those involved in new drug research, the medical profession, the pharmacists and chemist-druggist trades and the patients, to be alert in detecting ADRs and reporting them to the Indian regulatory agencies, who in turn will investigate and take timely corrective action. Collaborating with pharmacovigilance organizations in enhancing drug safety with advancements in information technology (IT), there has been the emergence of new opportunities for national and international collaborations that can enhance post-marketing surveillance programs and increase drug safety. The Uppsala Monitoring Center (UMC) is an example of an international collaboration to establish a harmonized post-marketing surveillance database. The system is based on the exchange of adverse reaction information among national drug monitoring centers in 80 countries. The information is transferred, stored and retrieved in a timely and secure way through the internet (Allabi and Nwokirke, 2014) [2].

The UMC database collectively contains over four million records with a large number of data fields. A similar database can be built for the DCGI with the help of experienced private firms from the safety data received from clinical trials and post-marketing surveillance. Building a network of pharmacovigilance and pharmacopeidemiologists in India core group of experts will need to be formed which will have representatives from multinational corporations (MNCs), Indian pharmaceutical companies and personnel from the regulatory authority (DCGI). Interaction with the IT sector in building a robust pharmacovigilance system for India Software programs developed can be used for collection and analyses of data sets, determining trends of drug usage in various disease areas, compliance, medication errors and drug interactions leading to ADRs (Patil, 2014) [26].

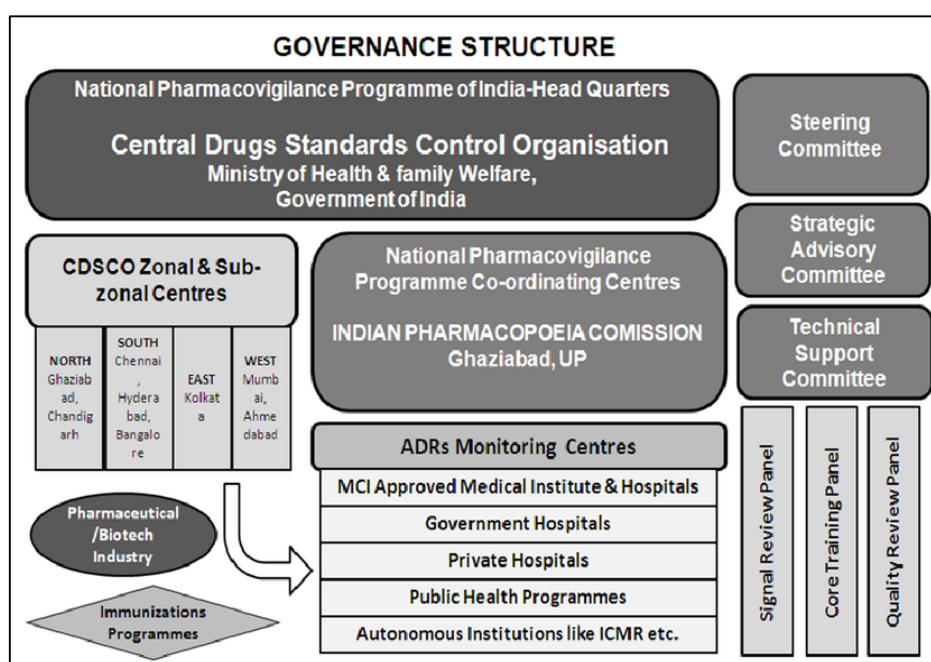


Fig 4: Governance structure

Pharmacovigilance Programme in India

In 1986, a formal adverse drug reaction monitoring system having 12 centres was proposed and there was no development and special attention on the Pharmacovigilance activity. (Camacho, 2016) [4] In the year 1997, India Participated in WHO's adverse drug reaction Monitoring Program organized at Uppsala-Sweden. This participation was not sufficient to promote Pharmacovigilance activity. Hence, on 14th July 2010 the Government of India started the Pharmacovigilance 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 adverse drug reaction monitoring centres were established in the year 2010 (Fujimoto, 2014) [11].

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 adverse drug reaction Monitoring Centres (AMCs). These AMCs collect the

Individual Case Safety Reports (ICSRs), analyses and report it to regulatory authority. 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 adverse drug reaction reporting. The technical associate from Medical Sciences, Banaras Hindu University is an authorized 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 adverse drug reaction reports to the regional centre. It was considered that the remedies from natural source are safe and devoid of adverse drug reaction. 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. Hence, to put PV for Ayurveda, Siddha, Unani (ASU) was highly essential to provide ADR data of AYUSH drugs as per WHO guidelines (Srivastava, 2011) [34].

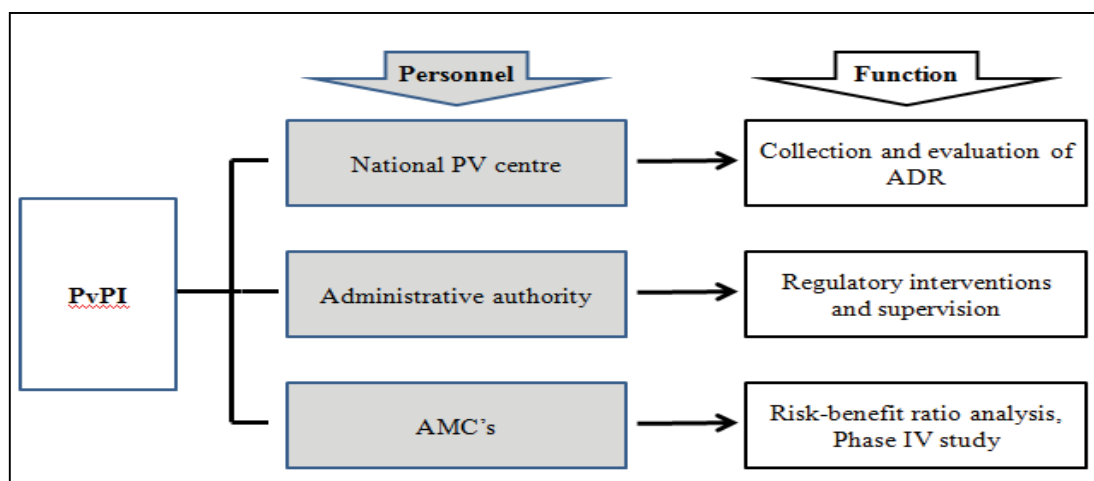


Fig 5: Pharmacovigilance programme in India

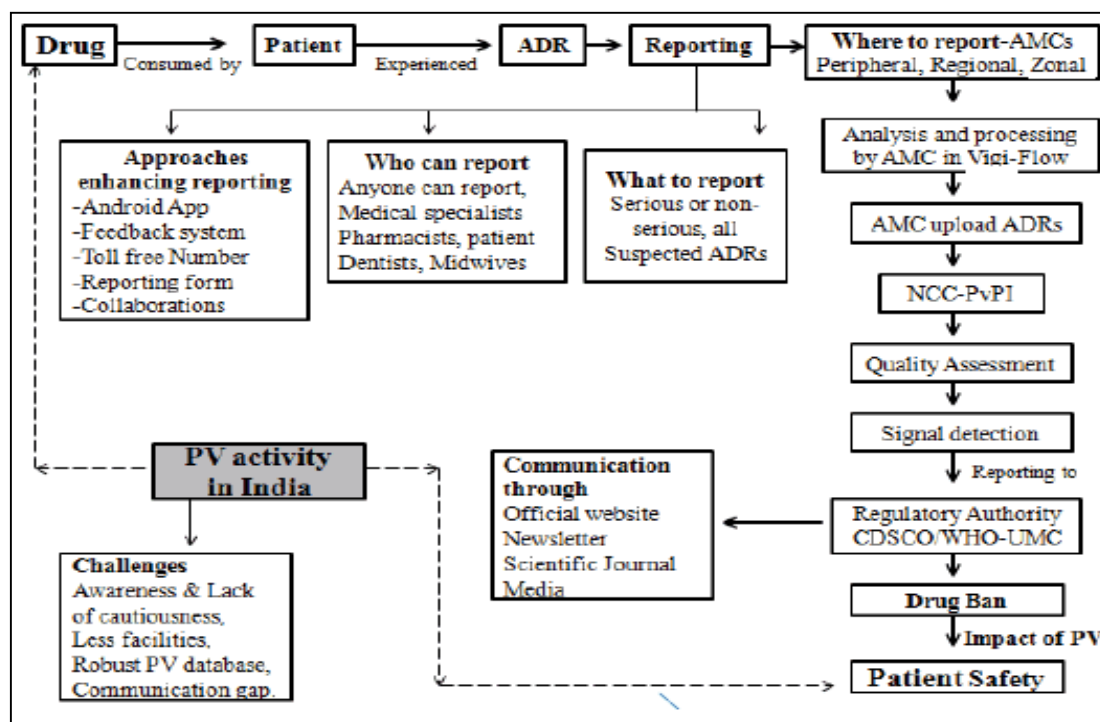


Fig 6: Pharmacovigilance activity

Future Prospects

As future prospects increase, PV systems capable to detect new ADRs and taking regulatory actions are needed to protect public health. Little emphasis has been put into generating information that can assist a healthcare professional or a patient in the decision-making process. The gathering and communication of this information is an important goal of PV. Information about the safety of drug active surveillance is necessary. When develop new methods for active post-marketing surveillance, one has to keep in mind that the important to collect complete and accurate data on every Serious reported event. Spontaneous reporting is a useful tool in generating signals, but the relatively low number of reports received for a specific association makes it less useful in identifying patient characteristics and risk factors. PV methods must also be able to describe which patients are at risk of developing an adverse drug reaction (ADRs). As a source of information, the PV approach would be consistent with the growing patient involvement in drug safety (Flower, 2013) ^[10].

The PV could play a role in identifying individual risk factors for the occurrence of certain ADRs. In the future, PV has to concentrate on the patients as a source of information in addition to the more traditional groups, such as the health professionals. At present, the DCGI should act quickly to improve PV so as to integrate Good Pharmacovigilance Practice (GPP) into the processes and procedures to help ensure regulatory compliance and enhance clinical trial safety and post marketing surveillance. An appropriately working PV system is essential if medicines are to be used carefully. It will benefit healthcare professionals, regulatory authorities, pharmaceutical companies and the consumers. It helps pharmaceutical companies to monitor their medicines for risk. Post-marketing PV is currently a challenging and laborious process, not only industry-wide, but also for regulatory agencies (Ghewari, 2014) ^[14].

The aim of the PV is to receive the information, documentation of the work and knowledge online while giving priority to the new and important safety issues. Non-serious events have less priority than serious events but important in comparing the changes in health, although they are also screened routinely in present time, GlaxoSmithKline has created a powerful new approach to Pharmacovigilance (PV), integrating traditional, case-based PV methods with disproportionality and data visualization tools. (Borja-Oliveira, 2015) ^[3]. These tools exist within a system framework that facilitates in-stream review, tracking of safety issues and knowledge management. This very innovative tool and the processes will help to advance PV by improving efficiency and providing new analytical capabilities. Similar approach may be adopted by pharmaceutical companies for prompt detection and analysis of ADRs. Transparency and communication would strengthen consumer reporting, which are positive steps towards involving consumers more in PV (Kalaiselvan, 2014) ^[18].

Conclusion

In India Pharmacovigilance (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 Pharmacovigilance (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. Pharmacovigilance is comes under drug safety reporting and post marketing surveillance.

In this pharmacovigilance we can report the adverse drug events for efficacy of the drug product. Drug safety associate can investigate the case and reported to the drug regulatory affairs. Many pharmaceutical companies across the globe will maintain this pharmacovigilance reports. Pharmacovigilance is key for maintaining the drug safety.

India is now considered to be a hub for clinical research. The drug control general of India (DCGI) has shown its commitment to ensure safe use of drugs by establishing the National Pharmacovigilance Program. More and more clinical trials are now being conducted in India and business process outsourcing (BPOs) based in India are now also undertaking pharmacovigilance projects from multinational corporations (MNCs). Healthcare professionals, consumer groups, nongovernment organization (NGOs) and hospitals should appreciate that there is now a system in place to collect and analyze adverse event data. They should start reporting adverse events actively and participate in the National Pharmacovigilance Program to help ensure that people in India receive safe drugs. With the help and proper coordination of all stakeholders, we can definitely build a world class pharmacovigilance system in India.

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