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Core IV-B, Fourth Floor, India Habitat Centre
Lodhi Road, New Delhi – 110 003 (India)
Tel: +91-11-2468 2177/2180; Fax: +91-11-2468 2173/74
Email: dgoffice@ris.org.in

COVID -19: An Opportunity to Revamp Pharmacovigilance System

Sumya Pathak*, Rajeshwari Singh** and Shubhini A. Saraf***

Abstract: . Traditional medicine (TM) is considered one of the major verticals of the healthcare system across the globe for more comfortable affordability and accessibility than conventional healthcare. There is an unprecedented surge of AYUSH systems during the covid times as preventive and immunity boosters. In the Traditional Indian Medicine (TIM) system, there is a rich history of effectiveness about drug-drug and drug-diet compatibilities by which synergistic ayurvedic medicines are prepared. However, there is a notion that traditional medicines are safe as they have a history of prolonged usage and are devoid of Adverse Drug Reactions (ADRs). There are specific advisories in which ancient literature to avoid the negligence of any possibility of untoward symptoms due to error in diagnosis and planning. The purpose of this review is to explore and recommend specific regulatory interventions for effective PV systems of AYUSH systems in India so that the benefits outweigh the risks associated with the use of TIM. The leads discussed in this review will help to improvise the PV ecosystem. Addressing the challenges for pharmacovigilance (PV) posed by the COVID-19 pandemic as well as in regular times and enabled PV practitioners to strengthen patient safety in terms of traditional medications.

Keywords: Traditional medicine, Ayurveda, Indian System of Medicine, Adverse Drug reactions, Signal systems, Database.

Introduction

Plant-based drugs are often the most widely used components in various systems of traditional medicines (TM) and the key treatment strategy in different TM systems. Various drugs have already entered into the international market through an exploration of

* Post Doc Policy Fellow, Center for Policy Research, BBAU Lucknow, Department of Science & Technolgy. Email: saumyapathak18@gmail.com

** Research Officer (Ayurveda) with NITI Aayog from Ministry of AYUSH. Email: vdrajeshwari.singh@nic.in

*** Prof and Dean Pharmaceutical Sciences, BBAU Lucknow. Email: shubhini.saraf@gmail.com.

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Ethnopharmacology(Patwardhan *et al.* 2005) Comprising almost nearly 75 per cent of drug moieties having their origin in TM, this system of medicine perhaps is the most significant system used globally (Wachtel *et al.* 2011). TM is currently one of the best-preserved and most influential medical systems with the largest number of user's worldwide (Seethapathy *et al.* 2019). Global promotion and propagation of TIM, i.e. Ayurveda has been an important thrust area of WHO (World Health Organization) (WHO-National Health-Care System 2015). Recently, WHO announced plans to set up a global centre of traditional medicine in India. Several steps have been taken by WHO for mainstreaming TM and its amalgamation into the prevalent systems of medicine and health care.

There has been an unprecedented surge in interest in healthcare rooted in AYUSH systems of medicine; more specifically in Ayurveda during this COVID-19 pandemic. The Ministry of AYUSH has also constituted an "Interdisciplinary AYUSH Research and Development Task Force" for initiating, coordinating and monitoring the R&D activities in the AYUSH Sector related to SARS-Cov-2 virus and the COVID-19 disease. This task force is working on various aspects, viz formulating AYUSH advisories for AYUSH practitioners, various models for experimental studies, clinical studies, survey and documentation, preventive and prophylactic AYUSH models, development of any intervention and technology and AYUSH Nutraceuticals.

The Ministry of AYUSH has issued several advisories recommending self-care guidelines, preventive health measures and steps for boosting immunity. Enhancing the body's natural defence system (immunity) is particularly important in the COVID-19 situation. There is a widespread belief regarding the safety of herbal products which are mainly considered as safe. This prompts the irrational use of these herbal medications without seeking any advice from healthcare professionals. Sometimes the weak enforcement of laws demands the strict system of vigilance because the patient's safety is of supreme concern. Currently, COVID-19 patients unknowingly or knowingly are taking various prescriptions for related clinical indications, and there is substantial evidence on such

kinds of practices which may also lead to drug-drug or drug-interaction (Desai MK, 2020). The side effects, adverse drug effects, and misuse of NCIS are also a threat to the wellness quotient of people at large and also a major concern (Chandler, 2020, WHO, 2013).

WHO declared COVID-19 as a Public Health Emergency of International concerns. Various International agencies, i.e. WHO, European Medicines Agency, US Food and Drug Administration (FDA) and the Chinese government are exploring the strategies to deal with the current pandemic. Drug manufacturers globally are coordinating with researchers and industrialists to accelerate the development of new drugs and vaccines. Countries like India and China are also exploring the possibilities of TM and herbal medication to curb the infection regime in COVID-19 scenario (Mirzaie, 2020).

This paper reviews the possibilities to strengthen and revamp the current PV system. The major challenge in formulating PV for different medicine systems is the presence of different standards of information and formulation of traditional medicine as compared to modern medicine. This review also suggests the development of an efficient Ethno Pharmacovigilance (EPv) system for Traditional Medicine. The leads discussed in the paper will be helpful in improving the overall regulatory interventions for EPv framework with intentions to foster wider outreach from the regulatory bodies to the beneficiaries.

Adverse event reporting clusters in TIM system

The major goal of globally running Pharmacovigilance (PV) programmes is the prevention of ADR. ADR can be reported by any medical professionals, paramedical professionals as well as patients and their caregivers (ADR reporting form, CDSCO, 2018). Provisions have also been made to record the various cases observed by the research divisions of pharmaceutical concerns, which are specific for their respective products to the national coordination centers (NCC). In order to foster the culture of reporting, PV programme of India (PvPI) has been established to record data of any adverse drug reactions whether small or big or even

idiosyncratic in nature so that the relationship between the cause and the effect can be decoded. (Patwardhan 2005). Vigilance in Pharma drugs is also additionally associated with a wide range of prescribed as well as self-medicated NCEs and other herbal remedies, diagnostic agents and medical devices. The general layman perspective is that the TIM does not harm. Consequently, very often people do not report the traditional medicine that they are taking along with modern medicine. This may lead to a synergistic or an antagonistic effect, both of which need reporting.

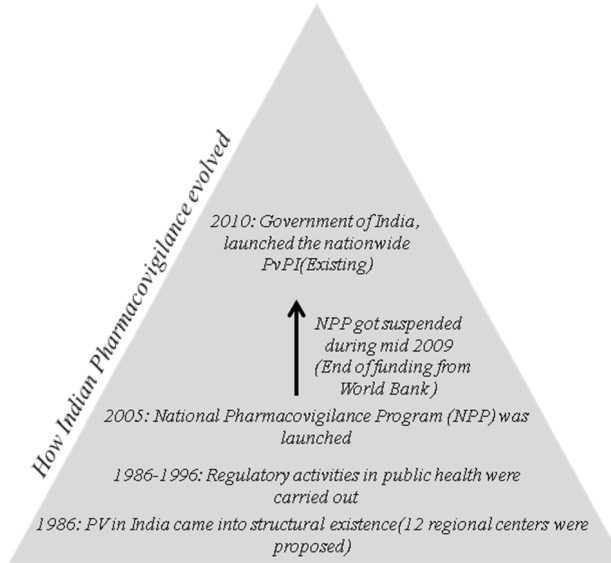
Indian pharmacovigilance structure – is it competing with international benchmarks?

Pharmacovigilance structure in India

PV in India came into existence in 1986, which was coordinated by ICMR (Indian Council of Medical Research) through 12 regional adverse reporting centres across the country. However regulatory activities in public health were carried out for about a decade between 1986- 1996.

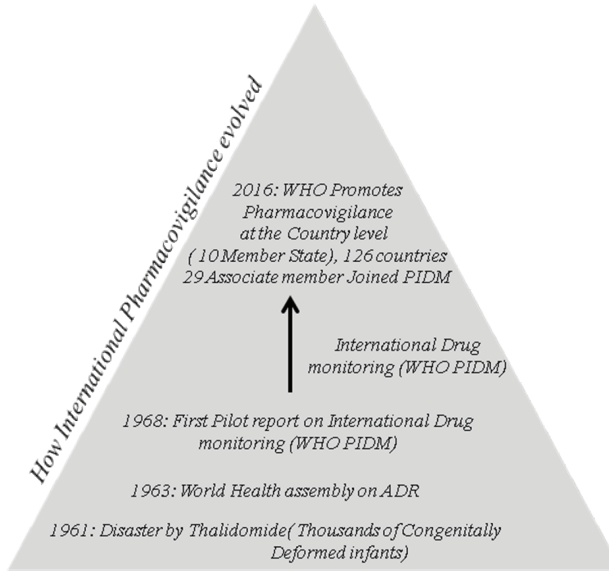
In the year 2005, the National Pharmacovigilance Programme (NPP) was launched supported by the World Bank and supervised by National Pharmacovigilance Advisory Committee (Dutta *et al.* 2018), which was coordinated by the Central Drugs Standard Control Organisation (CDSCO). Unfortunately, the NPP got suspended due to end of funding from World Bank during mid-2009 (Figure 1a). However, the Ministry of Health and Family Welfare (MoHFW), Government of India, recognizing the importance of this project, relaunched the nationwide PvPI in the year 2010 by CDSCO in association with Department of Pharmacology of the All India Institute of Medical Sciences (AIIMS), New Delhi to inspire confidence and trust among patients and healthcare professionals apropos medicines safety (Figure 1 b) (Wal *et al.* 2014). Evolution of the International PV network started from thalidomide disaster in 1961 which led to emergence of ADR reporting system (Figure 1b). Later on WHO promoted PV for current scenario (Figure 1b).

Figure 1a: Evolution of PV System in India



Source: Own synthesis.

Figure 1b: Evolution of PV in the World



Source: Own synthesis.

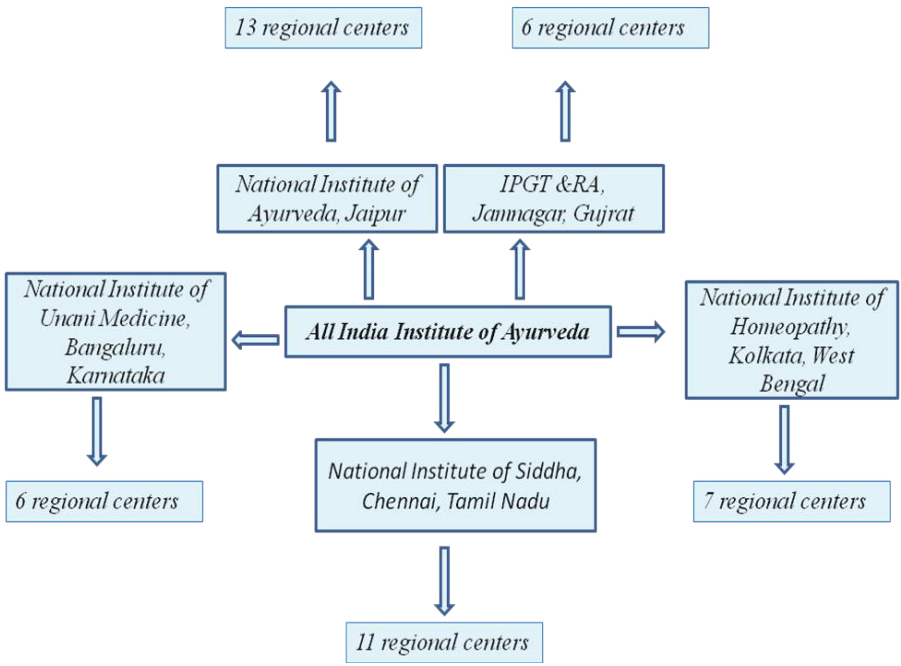
Similarly, the Government of India introduced NPP for Ayurveda, Siddha and Unani (ASU) drugs in the year 2008. It was a well-structured organised component functioning through eight regional centres, 30 peripheral centres and 55 Ayurveda colleges as centres, which was established during 2008-2011 and Institute of Post Graduate Teaching and Research in Ayurveda (IPGTRA), Gujarat Ayurveda University, and Jamnagar as National Pharmacovigilance Resource Centre. Under this NPP-ASU drugs, many orientation and training programmes were conducted by the centre and in collaboration with WHO country office, New Delhi too and few adverse cases were also reported. However, this NPP for ASU drugs got suspended owing to lack of continued support. Further, Ministry of AYUSH later introduced new Central Sector Scheme of Pharmacovigilance of Ayurveda, Siddha, Unani and Homoeopathy Drugs envisaged in 2017 with main objective of documentation of adverse drug reactions along with bringing the misleading advertisements flourishing in print and electronic media under this Pharmacovigilance programme. Presently, PvPI for ASU drugs runs through a National Center of Pharmacovigilance (NpvCC) which is operational at All India Institute of Ayurveda, New Delhi, India. This establishment is the governing body of five intermediate Pharmacovigilance centres of India (Figure 2). The five intermediate pharmacovigilance centres in turn govern the 42 peripheral pharmacovigilance centers (PPvCCs) (Figure 2). NPvCCs plans to select more peripheral centers, to strengthen the pharmacovigilance networks in India (AIIA, 2018).

Apart from these centers, PvPI consists of two decision making bodies, i.e. Indian Pharmacopoeia Commission (IPC) and NCC (Thota *et al.* 2018). The NCC in India is a WHO-approved pharmacovigilance (PV) entity participating in WHO Programmes for International Drug Monitoring (PIDM) (Thota *et al.* 2018)

Efforts are being made to sensitise healthcare professionals as well as paramedics to report any ADRs and educate the various stakeholders to enforce the concept of PV across the country. Inputs for vigilance come from healthcare professionals as well as patients. They send Individual

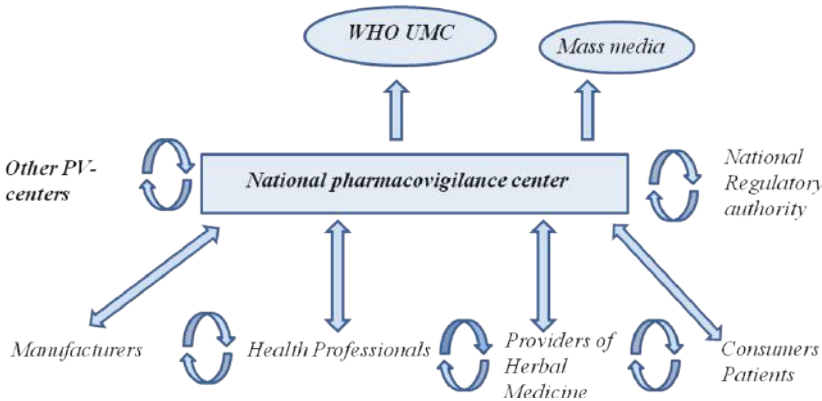
Case Safety Reports (ICSRs) to an Adverse drug Monitoring Centre (AMC) (regional PV centre/NCC). These AMC collect and collate adverse event data through VIGIFLOW tool (internet based software used in ADR reporting). Every year representatives from the NCCs meet and exchange reports on ADR in pursuit to find solutions for promoting medicines safety. These case safety reports are then recommended to the causality assessment of ADR performed using the WHO-UMC (Uppsala Monitoring Centre [UMC]) causality assessment system (WHO-UMC 2016) (Figure 2a).

Figure 2: Structure of Three-Tier Pharmacovigilance System in India for AYUSH drugs (AIIA, 2018)



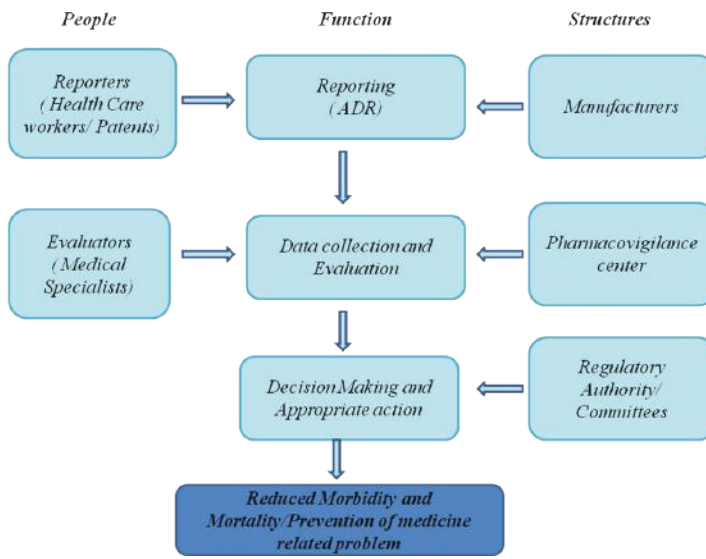
Source: https://aiia.gov.in/pharmacovigilance/.

Figure 2a. Communication Network of PV System by WHO



Source: Own synthesis.

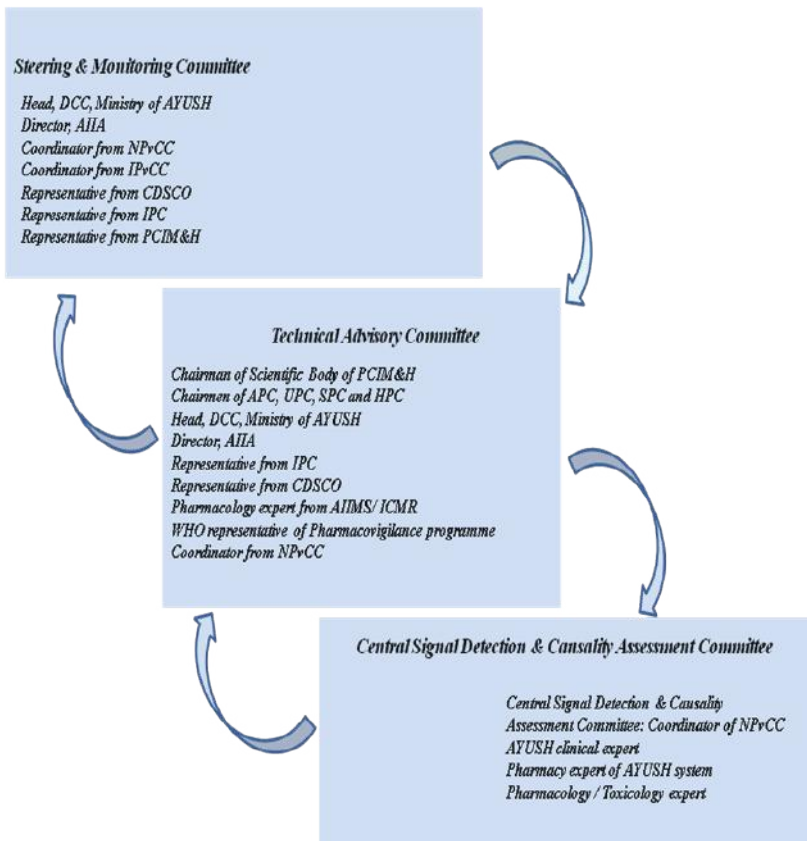
Figure 2b. Framework for Information Flow between People and PV Networks for Functions



Source: NPC, 2018.

Reporting of ADR, data collection and evaluation with decision making network. PV ecosystem is a bidirectional network, in which information flows between people and PV systems which functions for reporting of ADR, data collection and evaluation with decision making network (Figure 2b). This framework leads to reduced morbidity and prevention of medicine related problems (NPC, 2018). Several professionals have been trained and oriented for vigilance networks in India. The operational frameworks have been discussed in Figure 3.

Figure: 3. Operational Framework of PV Programme in India

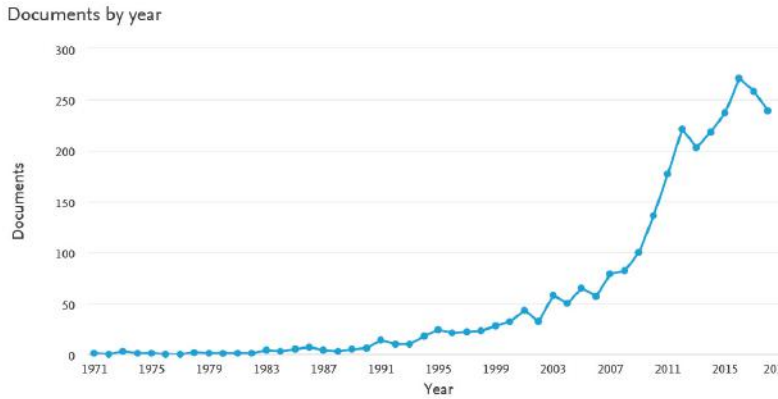


Source: Indian Pharmacopeia commission with detailed List of administrative bodies involved in PV programme.

Adopted from website of Indian Pharmacopeia commission with detailed List of administrative bodies involved in PV programme. In the past few years, PV ecosystem of India has invested in making three tier PV network system to channelize ADR reporting system but less emphasis has been given to enforce AI(Artificial Intelligence) and ML(Machine Learning) based tools, extensive databases for disease registry and ADRs which is actually the need of the hour. AI and ML may enhance signal detection and may significantly reduce ADRs in establishing drug and disease databases, structuring raw data and improving the quality of case reports in order to attain computer-aided warnings and signal detection. Real time reporting of drugs and vaccines undergoing trials are being recorded in Vigibase. (Chandler, 2020). This experience from WHO-UMC should be taken in consideration for techniques regarding signal detection and data mining. The PV network of India should take up the task of setting up such a system and enabling the population to pick up signals pertaining to possible ADRs.

Inculcating the concepts and compliance of PV at grassroots level can be achieved through capacity-building programmes and a more structured training support can be provided at graduate and postgraduate levels. PV needs to be an integral part of every curriculum related to healthcare, be it the modern system of medicine or a traditional one, being utilised as a standalone system or integrated system by the stakeholders. Incorporation of PV in an educational network system leads to efficient channelling of ADR. In this context, according to WHO traditional medicine strategy 2014- 2023, only 30 per cent in total of 129 member states have traditional and complementary medicine at university level whereas 70 per cent member states have no education at university level. Apart from regulation, scientometric analysis has been done in the publications regarding the ADR system, and the studies indicate that India is leading in publications dealing with toxicity in TM (Figure 4) (Scopus, 2019). These results show that the accessibility and awareness of patients and medical personnel for PV has increased in the present century owing to the awareness programme of WHO.

Figure 4: Growth of articles published on ADR in Traditional Medicine



(search algorithm "Toxicity" AND "Traditional Medicine" AND (LIMIT-TO (DOCTYPE , "ar").

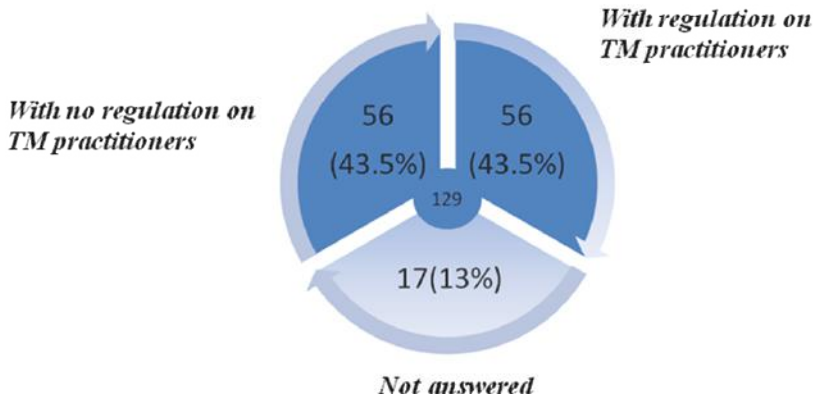
Source: Scientometric analysis done by Scopus, 2019 ; https://www.scopus.com

India and the International Drug monitoring program

WHO promotes PV network with 10 member states, 29 associate members and 126 countries through a joint programme, termed International Drug Monitoring (PIDM), WHO-PIDM pertains to reporting of individual case safety reports by all the stakeholders of the PV network, WHO global database and Vigibase.

The development of PIDM has been done keeping in mind the necessity of encouraging PV reporting of various drugs and well as fostering regulatory innovations. Strategy for traditional medicine (WHO in 2013-2023) has also provided significant data for traditional and complementary medicine practitioners of 129 member countries. Traditional medicine is practiced in various different ways throughout the world and there is no common base for these systems. This leads to huge variations in knowledge base as well as skills amongst various practitioners (Figure 5).

Figure 5: Regulatory analysis of drug practitioners in WHO members/ non-member countries



Source: WHO Strategy for traditional medicine 2013-2023.

Figure 5: WHO report for Drug practitioners for the member countries with regulation and without any regulation (WHO, 2013). In Strategy for traditional medicine (WHO in 2013-2023), examples have been given to rationalise the traditional system of medicine in China. For this purpose, there is a Chinese Medicine Ordinance (CMO) and a well-defined system of regulation for Chinese medicine practitioners. In this regard, there is a need to upgrade our policies with respect to the registration of healthcare professionals who wish to practice traditional systems of medicine.

There are some reports available in terms of regulation in eastern and western countries. The comparative studies in the United States of America, UK, Germany, Australia, China and India clearly signify the need for policy interventions to revitalizing the PV network system of India for reforming government executive, educational regulations and selling of TM (Table 1). India has the maximum number of regional AMCs (ADRs Monitoring Centres) in the world and also one of the largest contributors of ADRs among the top ten countries under WHO PIDM (Kalaiselvan *et al.* 2014). Hence, there is a huge scope

for practicing physicians, clinical pharmacists, nurses, and marketing authorisation holders, with WHO-UMC professionals for promoting patient safety, towards their prescriptions/products. For the sake of establishing a framework according to the international standard of pharmacovigilance, training programmes from WHO personnel will be needed. In this regard, to put a proper PV training programme in place in India we need to upgrade the existing framework.

International leads to revamp the traditional medicine system

The World health Assembly, 1963 (WHA, 1963) reiterate the necessity of information on ADRs (Figure 1). These resolution invites "Member States to arrange for a systematic collection of information on serious adverse drug reactions (WHO). Eventually, *Erice Declaration*, an international agreement was signed by all member states to follow uniform standards for reporting ADRs in 1997 which states "Monitoring, evaluating and communicating drug safety is a public-health activity with profound implications that depend on the integrity and collective responsibility of all parties - consumers, health professionals, researchers, academia, media, pharmaceutical industry, drug regulators, governments and international organisations - working together.

Apart from *Erice declaration* the various other statements also emphasised on the safe and standard use of the drugs, i.e. Article 2 of WHO's constitution states "to develop, establish, and promote International standards with respect to food, biological, pharmaceutical and similar products." and Article 21 states "standards with respect to the Safety, purity and potency of biological, pharmaceutical and similar products moving in international commerce."

The Uppsala Monitoring Centre (UMC) is an independent centre created by WHO for drug safety and scientific research working for a world where the safe and effective use of medicines is commonplace. There are more than 100 countries which are following the obligations of UMC. These countries have formulated their own specific PV guidelines

Table 1: Comparison of regulations in Traditional Medicine System of Selected Countries

	USA	UK	Germany	Australia	China	India
Governmental Executive	Federal Food and Drug Administration as well as each states regulate the licensure of TM practitioner	Medicine Control Agency, National Department of Health	Federal Agency for Drugs and Medicinal products (BfArM)	Therapeutic Goods Administration, Commonwealth Department of Health and Ageing	National Department of Health	Steering & Monitoring Committee governed by Ministry of AYUSH (Figure 4)
Educational Regulations	Educational regulations varies depends on professional licensure and scope of practice	No standardized educational system	No standardized educational system	No standardized educational system.*	4 years of university study system for pharmacist And 5 to 7 years of formal educational system for TM physicians	Five and a half years duration, including 1-year internship in Formal education system
Selling of TM	Strictly after licensing and approval	Strictly after licensing and approval	Strictly after licensing and approval	Strictly after licensing and approval	Strictly after licensing and approval	Presently, the State licensing authority is for approval. Central government regulated structure is missing as practised for modern medicine. A formal structure needs to be developed and strictly followed to sell TM.

Note: *State of Victoria is an exception. Few educational policies are available in compliance with the requirements of the national association.

Source: WHO Strategy for traditional medicine 2013-2023 & https://main.ayush.gov.in)

though the basic idea is the same and aligned with UMC mandate. For example, ICH guidelines for PV give recommendations on the numbers of patients and duration of exposure for the safety evaluation of drugs intended for the long-term treatment of non-life threatening conditions which includes six specific guidelines pertaining to drug safety. Similarly, the US FDA has title 21 Code of Federal Regulations. (Khattri et al. 2012)

Moving towards pharmacovigilance to ethno pharmacovigilance: a practical lesson from China

TIM and TCM are two living old TM systems globally from India and China respectively, but both have different regulatory systems for PV. China has already incorporated it successfully in its healthcare system. In comparison with India, there is a four-tier PV system in China which comprises a national level and further goes to the provisional level and down to the to the municipal and county levels. ADR appraisal is done at all these levels and is integrated at the national level. The Department of Drug and Cosmetics Surveillance (DDCS) of the CFDA (China Food and Drug Administration) are concerned with production, supply, circulation, and consumption of medicines and cosmetic products. In China, the DDCS oversee the execution of Good Manufacturing Practices (GMP) in various interrelated sectors of food and drug as well as agriculture so that the safety of the patient is paramount. The National Centre for ADR Monitoring (NCADRM) of China is the technical supporting institution for the DDCS, which examines ADRs and re-assesses the drugs available and acts as a body for post-market surveillance, assisting the CFDA (Zang *et al.* 2014). In comparison to India, as stated above, China has one tier-I center, 34 tier-II centers, and more than 400 tier-III centers for ADR monitoring which are assisted by numerous other organizations that function as watchdogs and assist the PV policy of -China on this issue (Zhang *et al.* 2014)

China's medical systems have incorporated the TCM and Western medicine simultaneously in the PV sytems of country. Chinese systems shared unique characteristics in their healthcare with modifying their post-marketing research methods with the use of active and well equipped

surveillance centers. Chinease Drugs administrations stringently study all Chinese patented medicines by pharmaceutical Research and Development (R&D), clinical and nonclinical studies before going for approval of market authority. Western medications as well as TCM share a reporting system, to determine the factors which directly or indirectly hinder TCM safety, multicomponent, origin from different plant sources and non-uniformity in drug names which challenges the globalization of TCM and its vigilance systems. (Zhang *et al.* 2014).

Critical issues for scalable and sustainable PV system

Establishment of a scalable and sustainable PV system in a country which has practiced traditional medicine for ages is an arduous endeavour. Innovative efforts along with a strong regulatory framework are needed to make this system work at the national level along with its compliance with global standards. Although, at this stage, there are countless aspects which need to be taken care of, some of the issues require immediate attention. These include the following:

Guidelines for the global market – There is a need to set up general regulations for sale of individual drugs, which should be complied globally. In case of a drug being withdrawn from a region or country, there should be immediate recommendation on its global distribution on the basis of updated safety information.

Independent studies for PV activities - 'A study executed should be free from biases, commercial, financial, and personal influences' by independent centers and independent groups of investigators (WHO, 2013). Such studies should not be conducted by the industry/organisation itself. Representatives of WHO will collaborate with government organisations to study PV related activities. Proper training from related centers of WHO shall be conducted to train personnel for vigilance.

Availability of risk evaluation, management and its denigration plans -These plans should be more focused on preventing medications in the form of quality improvement of medications which leads to better patient cure (Sophia and Promila, 2004).

Prevention as part of structural improvement in PV- As the treatment increases, it is obvious that ADR occurrence increases. Structural improvement of PV is obtained by generating new ADR signals from passive collection of ADRs (Sophia and Promila, 2004).

According to WHO TM strategies, *PV* can only prevail if it moves out from its current "headquarters to the street and from the regulators to the patients" (WHO, 2013). PV needs to be structured on the mandate of "for the people. "The above said proposals are given to improve the present structure of PV.

Incorporation of data sciences in PV system and role of artificial intelligence

Active PV is greatly enhanced if existing databases can be integrated with presently working PV centres, In this regard, AI–based intervention for ADR reporting can improve ADR data collection which leads to improvise the data collection in global databases of PV.

Incorportaion of these Big data sciences will help in transforming healthcare into a sustainable, scalable operating model. This will further advance the knowledge base associated with newer drugs and the efficacy of the healthcare system. This way, an efficient model of PV can be utilised to improve healthcare with propagating traditional as well as ethical values. The recent outbreak of COVID-19 epidemic in China, despite their efficient healthcare system, can be a lesson for developing a global system which is capable of handling any such health catastrophe in a global scenario.

Discussion

In India, there are two health ministries, viz Ministry of Health and Family Welfare and Ministry of AYUSH, looking at the conventional modern system of medicine and traditional healthcare systems in the country, respectively. There is separate legislation for medical education and clinical practice. However, the drugs regulatory system is dealt with by the Drug and Cosmetics Act, 1940 (D&C) and rules thereunder. Following observations are there to strengthen regulation of drugs:

- Chapter IV of D&C Act, 1940 deals with the manufacture, sale and distribution of drugs & cosmetics under which Section 33A mentions that Chapter-IV shall not, except as provided in the Act, apply to ASU drugs.
- There are different regulations for new drug discovery in both conventional and AYUSH systems of healthcare. There is a need to strengthen programme level regulations to bridge the gap between both healthcare systems.
- The import, manufacture, distribution, sale of Ayurveda, Siddha, Unani and Sowa Rigpa drugs are covered under the D&C Act, 1940. The new formulation has been explained under 3(h) of D&C Act, 1940, i.e. patent or proprietary medicine which gives the scope for various formulations and combinations for ASU ingredients. The enabling provisions have been explained under Rule 158 (B) of the D&C Rules, 1945, which requires safety and evidence of effectiveness for ASU drugs.
- As per Rule, 157 of D&C Rules, 1945, which explains the provision of Good Manufacturing Practices (GMP) for ASU drugs (Schedule T). Compliance to GMP is mandatory for all the manufacturers of ASU drugs. These GMP are elaborated as Part I and Part II of the schedule T. Part I describes the essentials for factory premises and the requirements for sterile products. At the same time, Part II consists of the list of recommended machinery, equipment and minimum manufacturing premises required for the manufacture of various categories of Ayurvedic, Siddha system of medicines and inspection.
- Vaidyas, Siddhas and Hakeem came under IMCC, Act 1970 registered who prepare medication on their own to dispense to their patients and not sell such drugs in the market are exempted from the purview of Good Manufacturing Practices (GMP).
- Schedule Y of D&C Act,1940 deals with the requirements and guidelines for permission to import and/or manufacture of new drugs for sale or to undertake clinical trials of conventional medicines along with all the details of application required for conducting

clinical trials, responsibilities of the sponsors, investigators and the ethics committee. Post-marketing trails of new drugs of conventional medicines are closely monitored for their clinical safety once they are marketed. It is mandatory for submission of Periodic Safety Update Reports (PSURs), its cycle, template specific timelines Adverse reactions, must be reported to licencing agencies within 15 days of knowledge of the applicant.

In China, a single regulatory framework is available for both systems of medicine instead of different ideologies of knowledge. This type of regulatory system will be helpful in the implementation part. However; self-medication is also a major concern for ADRs. There is an urgent need for specific regulatory provisions for clinical trials for AYUSH systems. In this regard, the major concern is the D&C Act, 1940, which is silent on the definition of OTC (Over The Counter) products for AYUSH systems self-medication of these natural products.

In this COVID-19 pandemic, when there have been many clinical trials underway in both conventional and AYUSH systems, the overarching need is to improve their efficiencies using limited resources to provide comprehensive care to patients by interdisciplinary hand-holding. There must be harmonisation on regulatory aspects and implementation of schemes about PV. The pandemic inculcated new knowledge and reporting system to strengthen regulatory issues.

The health system emerged with new directions for managing clinical trials from initial recruitment to support patient care and lifestyle modification. Additionaly, the pandemic given us an opportunity to recreate the whole health observatory with a system for data mining tools for adverse and safety reporting. COVID-19 has opened the windows for the use of a multi-system of healthcare. For this, bringing in a system which is safe and transparent is an important goal for all kinds of medicinal practices. Global as well as local acceptance of traditional medicines can become a leading way forward for inclusive growth. This acceptance can be made possible by correlating traditional medicinal

systems with modern sciences. Therefore, there is a pressing need for integrating many scientific advances and generating robust PV systems in two ways.

First, Global regulation for a global market is required. The effective operational framework is the second improvisation which is needed to amalgamate medicine safety with true independence,

Second, Active anticipation of ADRs in the coming years, although the area of pharmaceutical research has seen tremendous advancement and is capable of tackling many diseases efficiently for the sake of humanity.

The ADR reporting system still needs to be strengthened in India by taking examples of EU, USA and China. Integration of these examples can be a remedy for the ailments from which the present PV system in India suffers. Technology and cooperation together shall make a better and sustainable framework in India. PV has been developed and is continuously strengthened with a wide range of technical measures and risk control methods; these altogether pushed forward for better development of drug surveillance for better and sustainable PV framework in India. The above study recommends the following suggestions which in long run would be required to uplift the PV ecosystem of India.

- Up-scaling of pharmacovigilance as a mandatory component of each stratum of medicine.
- Need of specific regulatory provisions for clinical trials as well as OTC products for AYUSH system.
- Programme level harmonisation on regulatory aspects. Guidelines for the export of TIM in the global market and recording of ADRs in respective countries.
- Artificial Intelligence and data management sciences for PV system.

Revamping PV system needs improvement in regulatory capacities, public-health-driven use of relevant evidence-based and user-friendly technologies, including digital technologies, and innovation to increase

access to quality health and relevant information. These suggestions may foster the health care, placing PV at the centre of efforts to achieve sustainable health vigilance system which leverage universal health coverage and the health-related Sustainable Development Goals.

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Core IV-B, Fourth Floor, India Habitat Centre
Lodhi Road, New Delhi-110 003 India., Tel. 91-11-24682177-80
Fax: 91-11-24682173-74, Email: dgoffice@ris.org.in
Website: http://www.ris.org.in

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