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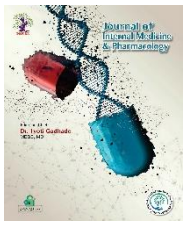

**Mini Review Article**

# Prescription Pattern Monitoring in India: A Thorough Analysis of Current Practices and Implications

**Nagesh Vasmale*, Dr. Prachi Udapurkar**

* Kishori College of Pharmacy, Pimpalner Road, Beed Maharashtra 431 122

ARTICLEINFO

ABSTRACT

Prescription pattern monitoring studies (PPMS) are a tool for assessing the prescribing, dispensing and distribution of medicines. The main aim of PPMS is to facilitate rational use of medicines (RUM). There is paucity of published data analysing the effectiveness of PPMS. The present review has been done to assess the effectiveness of prescription pattern monitoring studies in promoting RUM. Data search was conducted on internet. A multitude of PPMS done on different classes of drugs were collected and analyzed. PPMS using WHO prescribing indicators were also included. The present article reviews various prescription pattern monitoring studies of drugs conducted all over country and abroad. It was observed in most of such studies that physicians do not adhere to the guidelines made by regulatory agencies leading to irrational use of medicines.

**Keywords**: Prescription Pattern: Monitoring System: Healthcare; Pharmaceutical Practice; Prescription Analysis; Drug Utilization

**∗Corresponding author:**

**Nagesh Vasmale***

* Kishori College of Pharmacy, Pimpalner Road, Beed Maharashtra 431 122

E-mail addresses: nageshvasamale2002@gmail.com

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## 1. Introduction

Medicines are an integral part of the health care, and modern health care is impossible without the availability of necessary medicines. They not only save lives and promote health, butprevent epidemics and diseases too. Accessibility to medicines is the fundamental right of every person. However, to bring optimal benefit, they should be safe, efficacious, cost-effective, and rational [1].

Drug utilization research was defined by World Health Organization (WHO) in 1977 as a marketing, distribution, prescription, and use of drugs in society, with special emphasis on the resulting medical, social and economic consequences. Pharmacoepidemiology is the study of the use and effects/side-effects of drugs in large numbers of people with the purpose of supporting the rational and cost-effective use of drugs in the population thereby improving healthoutcomes. Drug utilization research is thus an essential part of pharmacoepidemiology as it describes the extent, nature and determinants of drug exposure. Over time, the distinction between these two terms has become less sharp, and they are sometimes used interchangeably. Together, drug utilization research and pharmacoepidemiology may provide insights into many aspects of drug use and drug-prescribing. They provide much useful information on indirect data on morbidity, treatment cost of illness, therapeutic compliance, incidence of adverse reactions, effectiveness of drug consumption and choice of comparators. Prescription pattern monitoring studies (PPMS) are drug utilization studies with the focus on prescribing, dispensing, and administering of drugs [2].

They promote appropriate use of monitored drugs and reduction of abuse or misuse of monitored drugs. PPMS also guide and support prescribers, dispensers, and the public on appropriate use of drugs, collaborate and develop working relationship with other key organizations to achieve a rational use of drugs. Prescription Patterns explain the extent and profile of drug use, trends, quality of drugs, and compliance with regional, state, or national guidelines like standard treatment guidelines, usage of drugs from essential medicine list and use of generic drugs. There is increasing importance of PPMS because of a boost in marketing of new drugs, variations in pattern of prescribing and consumption of drugs, growing concern about delayed adverse effects, cost of drugs and volume of prescription. The aim of PPMS is to facilitate the rational use of drugs in a population. Irrational use of medicines is a major problem worldwide. WHO estimates that more than half of all medicines are prescribed, dispensed, or soldinappropriately, and that half of all patients fail to take them correctly. The overuse, underuse or misuse of medicines results in wastage of scarce resources and widespread health hazards. The rational use of medicines (RUM) is defined as "Patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period, and at the lowest cost to them and their community. Many studies have been conducted to study the prescribing pattern of physicians across the country [3].

The studies conclude the irrational prescribing practices of prescribers and suggest RUM at all levels of health care delivery system. However, no systematic reviews, meta-analyses, or randomized controlled trials are present about the relevance of PPMS in promoting rational use of drugs. The present review has been done to assess the effectiveness of PPMS in developing RUM. This study was conducted with the aim of analyzing the prescribing practices of physicians and to assess the extent to which the goal of RUM has been achieved. The drugs frequently prescribed by the physicians for disease conditions like diabetes, schizophrenia,



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hypertension, epilepsy, inflammatory conditions such as osteoarthritis have been included in this study. An effort has been made to also include the prescribing trends of antimicrobials due to the growing concern of antimicrobial resistance. Data search pertaining to assessment of PPMS was conducted on the internet. A plethora of information on the prescribing trends of physicians was available which has been summarized in this study [4].

Purpose Of Prescription Pattern Monitoring System

A Prescription Pattern Monitoring System serves several crucial purposes in the healthcare domain. Here are some detailed aspects of its significance [5].

**Drug Utilization Review (DUR):** The system helps in evaluating and analyzing the patterns of drug prescriptions to ensure that medications are used appropriately, avoiding misuse or overuse.

**Quality of Care:** By monitoring prescription patterns, healthcare providers can assess the quality of care delivered to patients. This includes evaluating the effectiveness of prescribed medications and ensuring they align with evidence-based practices.

**Patient Safety:** Identifying and rectifying potential issues such as drug interactions, contraindications, or inappropriate dosage can enhance patient safety. The system helps in flagging instances where prescribed medications may pose risks to patients.

**Cost Containment:** It aids in controlling healthcare costs by identifying opportunities for cost-effective alternatives and minimizing unnecessary or redundant prescriptions, promoting efficient resource utilization.

**Regulatory Compliance:** Ensuring adherence to local and international regulations in prescribing medications is a critical aspect. The system assists in maintaining compliance with guidelines and standards set by regulatory bodies.

**Data-driven Decision Making:** The system facilitates evidence-based decision-making by providing insights into prescription trends, allowing healthcare professionals to make informed choices about treatment plans and medication strategies.

**Continuous Improvement:** Regular monitoring allows for continuous improvement in healthcare practices. Identifying areas where prescriptions can be optimized or modified based on emerging medical evidence contributes to the ongoing enhancement of patient care.

**Preventing Prescription Drug Abuse:** Monitoring prescription patterns helps identify potential cases of prescription drug abuse or diversion, aiding in early intervention and prevention of substance misuse.

**Clinical Research:** prescription patterns can contribute to clinical research and the development of medical knowledge. Researchers can analyze trends efficacy, and outcomes to enhance the understanding of various conditions and their treatments [5].

**2. Prescription Pattern Monitoring Studies in India**

***Prescription Pattern Monitoring of Antidiabetic Drugs***

A prospective, cross-sectional study was carried out in medicine outpatient clinic of tertiary care hospital,Ahmedabad for 8 weeks. Patients with type-2 diabetes and on drug therapy for at least 1-month were included. A similar study was undertaken to identify patterns of antidiabetic drugs prescribing in patients with established type 2 diabetes mellitus (T2DM) who attended the endocrinology Outpatient Clinic in Postgraduate Institute of Medical Education and Research, Chandigarh, India. Aprospective observational study was carried out for a periodof 5 months in diabetic patients who visited the medicine outdoor department of a tertiary care teaching hospital in India to assess prescription pattern, cost of antidiabetic drugs and adherence to treatment



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guidelines.All of these studies demonstrated that prescription pattern of antidiabetic drugs adhereto standard treatment guidelines [7].

***Prescription Pattern Monitoring of Antipsychotic Drugs***

The study was conducted in outpatients of the Department of Psychiatry, Chhatrapati Shahuji Maharaj Medical University Another study was conducted in which an audit of the prescription pattern of antipsychotic drugs in patients with schizophrenia, in a tertiary care center in India was performed. A similar study was done in psychiatry outpatient clinic of a tertiary care hospital in India. These studies concluded that the poly-pharmacy of antipsychotic drugs is common [8].

***Prescription Pattern Monitoring of Antiasthmatic Drugs***

A prescription-monitoring study was conducted to evaluate the drug-prescribing trend of Antiasthmatic drugs in urban and rural areas of Saurashtra region, Gujarat.[10] Another drug utilization or prescription-monitoring study was conducted in various hospitals of Shamli, Prabuddha Nagar, Uttar Pradesh, India. The study was conducted in three famous hospitals of Shamli on 330 patients.[11] A similar prescription-monitoring study was conducted to establish

the drug-prescribing trend of Antiasthmatic drugs in various hospitals of Gorakhpur [12]. It is concluded that the prescribing pattern of Antiasthamatics does not completely meet standardtreatment guidelines [9].

***Prescription Pattern Monitoring of Antihypertensive Drugs***

A prescription-based survey among patients with established hypertension was conducted at the Medicine Outpatient Department (OPD) of University Teaching Hospital in South Delhi, India. It was a prospective study aimed to investigate the use of antihypertensive drugs and to identify whether such pattern of prescription is appropriate in accordance with international guidelines for the management of hypertension.[13] A similar prospective observational study was carried out for a period of 6 months (January 2011–June 2011) in an OPD of Rohini Super specialty Hospital, Warangal, Andhra Pradesh to assess the prescribing pattern for antihypertensive in geriatric patients [14]. Another cross-sectional study was carried out to evaluate the prescribing pattern of antihypertensive in T2DM patients and compare with existing recent guidelines in North India [15]. The above-mentioned studies revealed that the antihypertensive utilizationpattern is in accordance with the international guidelines for treatment of hypertension. There is considerable use of different antihypertensive drug combinations for the treatment ofhypertension and such practice has a positive impact on the overall blood pressure control [10].

***Prescription Pattern Monitoring Of Antiepileptic Drugs***

A prospective study was carried out between January and April 2011 in the Neurosciences Centre OPD at All India Institute of Medical Sciences, New Delhi to analyze prescription pattern and utilization behavior of antiepileptic drugs as well as analysis of quality of life data.[16] Another study was carried out in Cuttack to get an insight into the type of epileptic seizures and to assess the drug utilization pattern of antiepileptic drugs.[17] Another study conducted in India evaluated the utilization pattern of antiepileptic drugs in different hospitals.[18] All these studies concluded that the poly-pharmacy is commonly observed in prescribing antiepileptic drugs and isthe cause of concern [11].

***Prescription Pattern Monitoring of Non-Steroidal Anti-Inflammatory Drugs***

Non-steroidal anti-inflammatory drugs (NSAIDs) constitute one of the largest groups of



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pharmaceutical agents used all over the world. They are also the most common drugs reported causing adverse drug reactions by drug regulatory agencies. Several studies have been conducted to study the prescription pattern of NSAIDS. A drug utilization study was conducted in theout-patient clinic of the orthopedics department from December 2002 to June 2003 in a tertiary care hospital in India to determine the quality of prescribing.[19] Another prospective study was conducted in Orthopedics OPD of a tertiary care teaching hospital in Dehradun to analyze the prescribing pattern of NSAIDS.[20] These studies suggest that the prescribing pattern of NSAIDs was not in accordance with current guidelines mentioned by regulatory agencies. Moreover, the adverse effect profile should be considered while prescribing these drugs [12].

***Prescription Pattern Monitoring of Antibiotics***

Monitoring the antibiotic utilization pattern is of growing concern due to increase in antibiotic resistance, lack of adherence to standard treatment guidelines and rise in health care expenditure. Various studies have been conducted to assess the prescribing practices of medical practitionersin this context. A cross-sectional prospective study was carried out in six inpatient department (Surgery, Orthopedics, ENT, Ophthalmology, Medicine, and Pediatrics) of a 550-bedded tertiary care hospital in Trivandrum to evaluate the prescribing pattern of antibiotics. A similar study wasconducted to analyze the current usage of antimicrobial agents in the Medical Intensive Care Unitof a teaching hospital in Central India. Another study was done to assess the antibiotics usage in the pediatric population. The survey was conducted at the outpatient facilities `in the South Parganas district of West Bengal. Data were collected prospectively by interviewing patients immediately after patient-physician and patient-dispenser encounters. A total of 312 prescriptions were analyzed. A cross-sectional study was carried out to analyze and compare antibiotic prescribing for inpatients, in two private sector tertiary care hospitals; one teaching and one nonteaching in Ujjain [13].

**3. How Effective Prescription Pattern Monitoring Studies Are in India?**

Many PPMS have been done all over the world to determine the quality of prescribing practices of physicians and promote RUM. However, it has been observed in most of such studies that physicians' agencies leading to irrational use of medicines. This in turn leads to increase the incidence of treatment failure, antimicrobial resistance and economic burden on the patient and the community. The treatment of diseases using essential drugs, prescribed by their generic names, has been emphasized by the WHO and the National Health Policy of India. Essential medicines are those that satisfy the priority health care needs of the population.

They are selected with due regard to public health relevance, evidence on efficacy and safety, and comparative cost-effectiveness. Essential medicines are intended to be always available within the context of functioning health systems in adequate amounts, in the appropriate dosage forms, with assured quality and adequate information, and at a price the individual and the community can afford.

The National List of Essential Medicines of India (NLEMI 2011) was revised recently bythe Ministry of Health and Family Welfare, Government of India, in June 2011, nearly 8 years after the previous list, on the directions of the Supreme Court of India. The list was accessed from the official website of the drug regulatory authority of India, the Central Drugs Standard Control Organization, downloaded and reviewed by comparing it with the 17th Model WHO EML, March 2011, the 3rd WHO Model EML for children, March 2011 and the National



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EML 2003.

In United States, drug utilization studies are primarily developed in the form of prescription drug monitoring program (PDMP) at institutional, state, and national level. A PDMP is a tool that can be used to address prescription drug diversion and abuse. PDMPs serve multiplefunctions, including: Patient care tool; drug epidemic early warning system; and drug diversion and insurance fraud investigative tool. They help prescribers avoid drug interactions and identify drug-seeking behaviors or "doctor shopping. In European countries, drug utilization research also describes and compare the patterns of specific groups of drugs. In developing the country such as India, PPMS are done at individual level and not as a national program in contrast to developed countries. Hence, the data generated is not analyzed and used in promoting RUM.

Many socioeconomic factors affect drug utilization in India. Like; illiteracy, poverty, multiple health care systems, drug advertisement and promotions, sales without prescription, over the counter drugs etc. Cost factors like prices of drug, entry of new drug in market, volume of drug use; Population factors like changes in total population, demographics, change in health status of a population system factors like changes in health program and health system reforms and restructuring, shift of drug provision from hospital to community, changes in policies and program; research and technology related factors include new treatment approaches, drugs replacing surgery,

Availability of more diagnostic technologies, evidence-based curative approaches, use of newer pharmaceutical technology practice and people related factors like changes in prescribing and dispensing, number and mix of prescribers, multiple doctoring, consumer expectations and behavior and wastage; pharmaceutical industry related factors like new drug products, promotion of drugs to physicians, drug sampling and consumer advertising. These factors present important challenges in developing the country such as India for development of indicators to monitor trends and results that affect the performance of health care system and health of the population.

It is very important that the PPMS should be consultative and transparent, selection criteria be explicit, selection of the medicines be linked to evidence-based standard clinical guidelines, clinical guidelines and the list be divided into levels of care, and are regularly reviewed and updated. The effectiveness of PPMSs can be conceptualized in terms of their impact in ensuring the appropriate use of prescription-controlled substances, reducing their diversion and abuse, and improving health outcomes, both at the patient and community levels. This impact is maximized when prescription history data are, to the extent technologically feasible, complete, and accurate; analyzed appropriately and expeditiously; made available in a proactive and time manner; disseminated in ways and formats that best serve the purposes of end users; and applied in all relevant domains by all appropriate users. This suggests that PPMSs can be thought of as information systems with inputs, internal operations, outputs, and customerswho make use of their products [14].

**4. Prescription Pattern Monitoring System in Other Country**

***United States:***

In the United States, Prescription Drug Monitoring Programs (PDMPs) stand as a pivotal component of the healthcare landscape, meticulously established at the state level. PDMPs constitute electronic databases meticulously designed to track prescriptions for controlled substances. This proactive approach not only assists healthcare providers in averting misuse but also significantly



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elevates patient safety standards. An exceptional feature of the U.S. system lies in the interoperability of PDMPs, fostering seamless communication and collaboration at a national level. This interconnectedness ensures a unified and cohesive strategy in the management and monitoring of prescription patterns.

***United Kingdom:***

Within the United Kingdom, the Electronic Prescription Service (EPS) emerges as a cornerstone for revolutionizing prescription processing. This innovative electronic system serves as a conduit for the secure and efficient transmission of prescriptions between healthcare professionals and pharmacies. Aiming to reduce the burden of paperwork and minimize errors, EPS streamlines the prescription workflow, fostering a more streamlined and error-resistant prescription processing system. The system's emphasis on efficiency contributes to an elevated standard of patient care and reinforces the integrity of prescription practices.

***Australia:***

Australia's approach to monitoring and regulating prescription patterns revolves around the Pharmaceutical Benefits Scheme (PBS), a governmental initiative with far-reaching impacts. Administered by the government, the PBS plays a pivotal role in subsidizing prescription medications, ensuring accessibility for the population. Beyond its financial implications, the PBS provides valuable insights into drug utilization patterns, serving as a cornerstone for evidence-based decision-making in healthcare policy. The scheme's comprehensive nature addresses both the economic and clinical dimensions of prescription practices.

***Canada:***

Canada adopts a decentralized strategy with provincial Prescription Monitoring Programs, strategically honed to focus on controlled substances. These programs play a crucial role in preventing the misuse of prescription drugs, offering healthcare professionals indispensable tools for informed decision-making. The decentralized nature of these programs allows for adaptability, tailoring strategies based on the unique needs and regional nuances of each province. This flexibility ensures that the prescription monitoring system aligns seamlessly with local healthcare contexts.

***Germany:***

Germany's prescription monitoring system epitomizes sophistication, incorporating electronic prescription transmission to elevate accuracy and efficiency within the healthcare realm. This cutting-edge system represents a paradigm shift in ensuring the precision of prescription-related data and processes. By leveraging electronic means for prescription transmission, Germany's monitoring system not only contributes to enhanced patient care but also streamlines medication management, showcasing a commitment to leveraging technology for the betterment of healthcare practices.

**5. Conclusion**

In conclusion, the study of the Prescription Pattern Monitoring System in India has provided valuable insights into the current landscape of prescription practices and monitoring strategies. The multifaceted analysis encompassing morphological features, phytochemical composition, and pharmacological attributes of Lantana camara serves as a foundation for understanding its potential applications in traditional and modern medicine. The intricate details of its botanical characteristics, coupled with the comprehensive exploration of phytochemical constituents, offer a holistic perspective on the plant's therapeutic potential.

Furthermore, the comparative analysis of Prescription Pattern Monitoring Systems across different countries offers a global understanding of diverse approaches, strategies, and best practices. Insights from countries such as the United States, the



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United Kingdom, Australia, Canada, and Germany contribute to a broader perspective on optimizing prescription practices. Learning from these international experiences opens avenues for collaborative efforts to refine and enhance prescription monitoring systems globally.

As we navigate the evolving landscape of healthcare, the synthesis of knowledge from the study of Lantana camara and the global analysis of prescription monitoring systems underscores the importance of adaptability and innovation in addressing healthcare challenges. The intersection of traditional herbal medicine, represented by Lantana camara, and modern prescription monitoring systems signifies the dynamic nature of healthcare practices. By leveraging these insights, we can continue to advance towards a more informed, efficient, and patient-centric approach to prescription and healthcare management.

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**Conflict of Interest Statement**

The authors declare no conflicts of interest related to the research, writing, or publication of this study on the Prescription Pattern Monitoring System in India. This work has been conducted with transparency, integrity, and in adherence to ethical standards. There are no financial, personal, or professional relationships that could potentially influence or bias the content presented in this research. The primary focus is on providing objective and unbiased information for the advancement of knowledge in the field of pharmacy and healthcare.

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