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PHARMACOVIGILANCE IN AYURVEDA: INTEGRATING CLASSICAL DRUG SAFETY PRINCIPLES WITH CONTEMPORARY PHARMACOVIGILANCE SYSTEMS

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ABSTRACT

Background: Pharmacovigilance (PV) ensures drug safety by monitoring adverse drug reactions and rational drug use. Although systematically developed in modern medicine, its conceptual foundations are deeply embedded in Ayurveda, which emphasizes individualized therapy and prevention of adverse effects. **Objective:** To critically analyze classical Ayurvedic principles of drug safety and evaluate their relevance in contemporary pharmacovigilance, including adverse drug reactions, contraindications, and drug–diet interactions. **Methods:** A narrative review was conducted using classical Ayurvedic texts such as *Charaka Samhita*, *Sushruta Samhita*, and *Rasashastra* literature. Relevant articles were retrieved from PubMed, Scopus, and Google Scholar focusing on pharmacovigilance, herb–drug interactions, and drug safety. **Results:** Ayurvedic concepts such as *Dravya Pareeksha*, *Matra*, *Kala*, *Anupana*, *Shodhana*, and *Viruddha Ahara* provide a comprehensive framework for pharmacovigilance. Classical literature describes contraindications, dose-dependent toxicity, incompatible combinations, and adverse effects of improper drug use. Additionally, herb–drug and diet–drug interactions described in Ayurveda parallel modern pharmacological principles, highlighting the scientific relevance of traditional knowledge. **Conclusion:** Ayurveda inherently incorporates pharmacovigilance principles through a preventive, individualized, and holistic approach. Integrating these concepts with modern pharmacovigilance systems can enhance drug safety, minimize adverse reactions, and promote rational use of herbal medicines.

KEYWORDS: Pharmacovigilance, Ayurveda, Drug Safety, Adverse Drug Reaction, Viruddha Ahara, Herb–Drug Interaction.

INTRODUCTION

Pharmacovigilance has emerged as a crucial discipline in modern healthcare, focusing on the detection, assessment, understanding, and prevention of adverse drug reactions (ADRs) and other drug-related problems.[1,2] However, the conceptual foundation of pharmacovigilance is not entirely novel, as its core principles are deeply embedded in classical Ayurvedic literature.[3–5] Ayurveda emphasizes rational drug use (*Yukti*), individualized therapy, and continuous vigilance during drug administration, thereby inherently incorporating the essence of pharmacovigilance.[3]

Contrary to the widespread misconception that "natural products are inherently safe," both classical Ayurveda and modern pharmacology recognize that any substance possessing pharmacological activity has the potential to produce adverse effects when used inappropriately.[6,7] This concept resonates with the Ayurvedic principle that a substance can act as both *Visha* (poison) and *Amrita* (nectar) depending upon its proper use, dosage, and context.[3] Similarly, the well-known toxicological concept proposed by Paracelsus- "the dose alone makes the poison"—finds a parallel in Ayurvedic doctrines emphasizing *Matra* (dose) and *Yukti* (rational application).[8]

Classical Ayurvedic texts such as the *Charaka Samhita* advocate a systematic and cautious approach toward drug administration. The statement "**परीक्ष्यकारिणो हि कुशलाः भवन्ति**" (Cha. Su. 10/5) highlights that a wise physician proceeds only after thorough examination, reflecting the

need for pre-therapeutic vigilance.[3] Furthermore, improper knowledge or irrational use of drugs is clearly associated with harmful outcomes, as even a potent medicine may act as a toxin if administered without proper understanding.[3,5]

The importance of pharmacovigilance in Ayurveda has increased significantly in the present era due to several factors, including the global expansion of Ayurvedic therapeutics, increased use of complex herbo-mineral formulations, rising trends of self-medication, and concurrent use of Ayurvedic and conventional medicines. These factors have heightened the risk of adverse drug reactions, herb–drug interactions, and drug–diet incompatibilities[7,9,10], thereby necessitating the establishment of a robust pharmacovigilance framework tailored to Ayurvedic practice.

Pharmacovigilance as a scientific discipline evolved during the mid-20th century, with the World Health Organization (WHO) establishing the International Drug Monitoring Programme in 1968.[1,11] India joined this programme in 1998 and subsequently developed its national pharmacovigilance system under the Central Drugs Standard Control Organization (CDSCO) in 2003.[12] Recognizing the importance of traditional medicines, WHO issued guidelines for the safety monitoring of herbal medicines in 2004.[2] The National Pharmacovigilance Programme was launched in India in 2005 and later restructured as the Pharmacovigilance Programme of India (PvPI) in 2010.[12] Parallel initiatives led to the establishment of a dedicated pharmacovigilance programme for ASU drugs under the Department of AYUSH in 2008.[13,14]

Ayurveda inherently addresses multiple dimensions of drug safety through concepts such as *Dravya Pareeksha* (drug evaluation), *Matra* (dose), *Kala* (time), *Anupana* (vehicle), *Shodhana* (purification), and *Viruddha Ahara* (incompatibility).[3,15] In addition, classical texts emphasize contraindications, proper selection of drug sources, avoidance of adulteration and substitution, and the importance of compatible diet and drug combinations. These principles ensure not only therapeutic efficacy but also the prevention of adverse effects, reflecting a comprehensive and proactive pharmacovigilance approach.[3,4,16]

In this context, the present review aims to critically analyze the Ayurvedic perspective of pharmacovigilance by integrating classical principles with contemporary drug safety concepts, including adverse drug reactions, contraindications, and herb–drug and diet–drug interactions, thereby proposing a holistic and scientifically relevant framework for the safe and effective use of Ayurvedic medicines.

METHODOLOGY

A narrative review methodology was adopted to explore the concept of pharmacovigilance from both classical Ayurvedic and contemporary scientific perspectives.[17] Classical Ayurvedic texts, including *Charaka Samhita*, *Sushruta Samhita*, and relevant *Rasashastra* literature, were critically analyzed to identify references related to drug safety, adverse effects, contraindications, incompatibilities, and principles of rational drug administration.

A comprehensive literature search was conducted using electronic databases such as PubMed, Scopus, and Google Scholar.[18] The search strategy included keywords such as “pharmacovigilance,” “Ayurveda,” “adverse drug reaction,” “herbal drug safety,” “drug–diet interaction,” and “herb–drug interaction.” In addition, relevant documents from the World Health Organization (WHO), including guidelines on the safety monitoring of herbal medicines, and reports from the Pharmacovigilance Programme of India (PvPI) were reviewed.[2,12]

Relevant literature focusing on pharmacovigilance in traditional medicine, herb–drug interactions, drug–diet interactions, and safety aspects of Ayurvedic formulations were included. Non-relevant articles, duplicate studies, and sources lacking scientific or classical validation were excluded. The collected data were systematically analyzed and synthesized to establish correlations between classical Ayurvedic principles and modern pharmacovigilance concepts.

RESULTS AND DISCUSSION

1. Concept of Pharmacovigilance in Ayurveda

The conceptual foundation of pharmacovigilance in Ayurveda is deeply rooted in the principles of *Pareeksha* (systematic examination) and *Yukti* (rational application).[19] These principles emphasize that therapeutic decisions should be based on a comprehensive assessment of the drug, the patient, and the disease condition.

Classical Ayurvedic literature strongly advocates a methodical approach to clinical practice. The statement “परीक्ष्यकारिणो हि कुशलाः भवन्ति” (Cha. Su. 10/5) underscores that a competent physician proceeds only after thorough evaluation, reflecting the need for pre-therapeutic vigilance.[3] This highlights the importance of pre-therapeutic assessment, which is analogous to modern pharmacovigilance practices involving risk evaluation prior to drug administration.

Furthermore, *Yukti* represents the rational and judicious use of drugs based on clinical reasoning. It integrates various factors such as *Matra* (dose), *Kala* (time), *Rogi Bala* (patient strength), and *Dravya Guna* (drug properties), ensuring both efficacy and safety.[19,20] Together, *Pareeksha* and *Yukti* form a structured framework for minimizing adverse effects and optimizing therapeutic outcomes.

A fundamental Ayurvedic concept relevant to pharmacovigilance is the dual nature of *Dravya*, wherein a substance can act as both *Visha* (toxic) and *Amrita* (therapeutic) depending on its proper use.[3] Classical texts emphasize that the therapeutic or toxic potential of a drug is determined by factors such as dose, processing, combination, and clinical context. This is reflected in the statement "योगात् विषं भेषजं भवति" (Cha. Su.), which implies that even a toxic substance can become a medicine when used judiciously, whereas improper use may lead to harmful effects.[3,5]

This concept closely parallels modern pharmacological principles, particularly dose-dependent toxicity and the therapeutic index, which define the margin between efficacy and toxicity.[6,16] The Ayurvedic emphasis on rational drug administration (*Yukti*) and appropriate dosing (*Matra*) further reinforces this relationship.

Thus, at a conceptual level, Ayurveda inherently incorporates a systematic and preventive approach to drug safety that closely parallels contemporary pharmacovigilance concepts.[1]

2. Ayurvedic Framework of Pharmacovigilance

Ayurveda provides a comprehensive and systematic framework for pharmacovigilance through principles governing drug evaluation, administration, formulation, and monitoring. These principles ensure rational drug use, enhance therapeutic efficacy, and minimize adverse drug reactions.[3,19] The concept of *Dravya Pareeksha* forms the foundation of this safety-oriented approach as summarized in **Table 1.**

Table 1: Ayurvedic Principles and Their Correlation with Modern Pharmacovigilance.

Ayurvedic Principle	Description	Modern Pharmacovigilance Correlation
Dravya Pareeksha	Evaluation of drug properties, habitat, and processing	Drug standardization and quality control
Matra	Individualized dose based on patient and disease	Dose optimization and toxicity prevention
Kala	Time of drug administration	Pharmacokinetics and chronopharmacology
Shodhana	Purification of toxic substances	Detoxification and safety processing
Kalpana	Formulation and dosage form	Drug delivery and bioavailability
Anupana	Vehicle enhancing drug action	Drug delivery system and absorption enhancement
Viruddha Ahara	Incompatible diet and drug combinations	Drug–food interaction

3. Drug Evaluation and Quality Assurance

3.1 Drug Evaluation (*Dravya Pareeksha)*

Dravya Pareeksha involves a multidimensional assessment of medicinal substances prior to their clinical use. It ensures authenticity, quality, and safety of drugs, closely resembling modern drug standardization and quality control processes.[19,20]

Nature (*Prakriti / Swabhava*)

The inherent nature of a drug determines its primary pharmacological effect and its influence on doshic balance. Understanding whether a drug is *Ushna*, *Sheeta*, or otherwise helps prevent adverse reactions.[3]

Example: *Bhallataka* (Ushna) may cause burning sensations when used in *Pitta*-dominant individuals.

Properties (*Guna*)

Guna refers to qualitative attributes such as *Laghu*, *Guru*, *Tikshna*, and *Ruksha*, which influence drug behavior and pharmacodynamics. These properties must be matched with patient condition to ensure safety.[19]

Example: Excess use of *Trikatu* (Ruksha, Tikshna) may lead to gastric irritation and dryness.

Action (*Karma*)

Karma denotes the therapeutic action of a drug, including *Deepana*, *Pachana*, or *Virechana*. Selection of inappropriate action may aggravate disease or cause adverse effects.[19]

Example: Strong *Virechana* therapy in weak patients may lead to dehydration and electrolyte imbalance.

Habitat (*Desha*)

The geographical origin of medicinal plants influences their potency, chemical composition, and safety profile. Environmental factors contribute to variability in pharmacological effects.[19,21]

Example: Drugs from *Jangala Desha* are often more potent and may produce stronger effects than those from *Anupa Desha*.

Authenticity of Drug (Adulteration and Substitution)

Ensuring the authenticity of medicinal substances is a critical aspect of *Dravya Pareeksha*, as the presence of adulterants or the use of inappropriate substitutes may significantly alter pharmacological activity and compromise safety. Variations in plant identity, intentional or unintentional substitution, and contamination can lead to unpredictable therapeutic outcomes and adverse reactions.[22]

Example: Substitution of *Bacopa monnieri* (*Brahmi*) with morphologically similar species may result in reduced cognitive effects or inconsistent therapeutic

responses. Similarly, adulteration of herbal drugs with inferior or contaminated materials may increase the risk of toxicity.

Thus, proper identification, standardization, and quality assurance of raw materials are essential components of Ayurvedic pharmacovigilance.

3.2 Time and Mode of Collection (Good Collection Practices)

The time and mode of collection (Kala and Grahana Vidhi) significantly influence the quality, potency, and safety of medicinal plants in Ayurveda. Classical guidelines emphasize that different plant parts should be collected during specific seasons and physiological stages to ensure maximum concentration of active constituents. Improper collection may lead to reduced efficacy, variability in phytochemical composition, and increased risk of adverse effects. This principle closely aligns with modern pharmacognosy, standardization, and quality control practices as summarized in **Table 2**.

Table 2: Time and Mode of Collection of Medicinal Plants (Ayurvedic Perspective).

Plant Part	Season of Collection (Kala)	Stage/Condition	Rationale (Scientific/Ayurvedic Basis)	Examples
Branches (Shaakha) & Leaves (Patra)	Rainy (Varsha) & Spring (Vasanta)	Before flowering	Maximum concentration of active phytoconstituents during vegetative phase	*Azadirachta indica*, *Pluchea lanceolata*, *Cinnamomum tamala*, *Jasminum* spp.
Roots (Moola)	Summer (Grishma) or Late Winter (Shishira)	When leaves shed or fully matured	Active constituents accumulate in roots during dormancy or maturity	*Withania somnifera*, *Rauwolfia serpentina*, *Picrorhiza kurroa*, *Plumbago zeylanica*
Bark (Twak)	Autumn (Sharad)	When cambium is active	Bark separates easily due to active cambium; better yield and potency	*Bauhinia variegata*, *Crataeva nurvala*, *Terminalia arjuna*, *Albizia lebbeck*
Tubers (Kanda)	Autumn (Sharad)	Dormant phase (vegetative activity reduced)	Maximum storage of active metabolites during inactive phase	*Podophyllum hexandrum*, drugs of Ashtavarga
Latex (Ksheera)	Autumn (Sharad)	Peak secretion phase	Higher latex yield and potency during this season	*Euphorbia neriifolia*
Heartwood (Sara)	Early Winter (Hemanta)	Mature wood stage	Concentration of secondary metabolites increases in heartwood	*Pterocarpus marsupium*, *Acacia catechu*
Flowers (Pushpa)	Flowering season	Fully developed but not senescent	Maximum volatile and active constituents during blooming	*Woodfordia fruticosa*
Fruits (Phala)	According to maturity	Fully matured stage	Optimal phytochemical composition at maturity	*Terminalia chebula*
Whole Plant (Panchanga)	Post-flowering stage	When flowers start drying and falling	Maximum distribution of active constituents throughout plant	*Swertia chirayita*, *Phyllanthus niruri*, *Eclipta alba*, *Mentha piperata*, *Centella asiatica*, *Uraria picta*

3.3 Selection of Plant Part (Anga Vichara)

In Ayurveda, different parts of a medicinal plant possess varying potency and therapeutic properties. Classical texts emphasize that the selection of the appropriate plant part is crucial for achieving the desired therapeutic effect and ensuring drug safety. Charaka clearly describes that specific plant parts such as root, bark, heartwood, leaves, flowers, fruits, latex, and other derivatives should be selected based on their pharmacological action and intended formulation.[23,24]

Various plant parts including root (Moola), bark (Twak), heartwood (Sara), exudates (Ksheera), stem (Kanda), leaves (Patra), flowers (Pushpa), fruits (Phala), latex, alkali (Kshara), oil (Taila), ash (Bhasma), tubers, sprouts, and buds are utilized in Ayurvedic therapeutics. The selection depends on the concentration of active principles and their site-specific pharmacological action.[23]

Improper selection of plant part may lead to reduced therapeutic efficacy or unintended adverse effects, thereby highlighting its significance in pharmacovigilance. This concept reflects an advanced understanding of plant-based drug standardization and is comparable to modern pharmacognostic principles.

3.4 Storage (Good Storage Practices)

Proper storage conditions are essential to preserve drug stability, prevent contamination, and maintain efficacy. Exposure to moisture, light, or heat can degrade active compounds.[25]

Example: Improper storage of herbal powders may lead to fungal contamination and adverse effects.

3.5 Processing (*Shodhana* and Pharmaceutical Techniques)

Processing techniques, particularly *Shodhana*, detoxify drugs and enhance their safety and therapeutic potential. This is especially critical for toxic substances (*Visha*, *Upavisha*).

Example: Unprocessed *Vatsanabha* can cause severe neurotoxicity, whereas proper *Shodhana* renders it safe.

4. Drug Administration and Clinical Considerations[26]

This phase focuses on individualized drug administration based on patient and disease factors. It ensures optimal therapeutic outcomes while minimizing the risk of toxicity and adverse effects.

4.1 Dosage (*Matra*)

Matra refers to individualized dose selection based on Rogi Bala (patient strength) and Vyadhi Bala (disease severity). Both overdose and underdose can lead to adverse outcomes or therapeutic failure.

Classical texts emphasize that even potent or toxic substances can act as therapeutic agents when administered in appropriate doses, while improper dosing may lead to severe adverse effects. Charaka highlights that dosage should be individualized considering factors such as patient strength (Rogi Bala), disease severity (Vyadhi Bala), and doshic status. Furthermore, dose modification through Yukti (rational combination), Samskara (processing), and method of administration is essential to optimize therapeutic efficacy and minimize toxicity.

Excessive dosing leads to harmful effects, whereas insufficient dosing results in therapeutic failure, reflecting a clear understanding of dose-dependent toxicity comparable to modern pharmacological principles.

Example: Excessive use of Trikatu may cause gastric irritation, whereas insufficient dosage may result in inadequate therapeutic response.

Classical Ayurvedic literature also specifies precise dosage ranges for toxic drugs, emphasizing their safe therapeutic window, as summarized in **Table 3.**

Table 3: Prescribed Dosage of Selected Toxic Ayurvedic Drugs.

Drug (Ayurvedic Name)	Minimum Dose	Maximum Dose
Vatsanabha	1/8 Ratti	1/6 Ratti
Kupilu	1/4 Ratti	1 Ratti
Ahifena	1/4 Ratti	1 Ratti
Dhatura Beeja	1/4 Ratti	1/2 Ratti
Jayapala Beeja Churna	1/2 Ratti	1½ Ratti
Bhallataka	1 Ratti	3 Ratti
Langali Rasayan	250 mg	500 mg
Bhanga	125 mg	250 mg
Ganja	60 mg	125 mg
Snuhi Kanda Swarasa	5 ml	10 ml
Snuhi Ksheera	125 mg	250 mg
Snuhi Moola Churna	1 g	2 g
Karvira Moola Churna	1 g	2 g

4.2 Time of Administration (*Kala*)

The timing of drug administration significantly influences its absorption, action, and safety. Incorrect timing may result in adverse reactions or reduced efficacy.

Example: *Bhallataka* during summer may aggravate *Pitta*, and *Trikatu* after meals may cause gastric irritation. In disorders of Apanavayu, the ideal time of administration is *Pragbhakta.*

4.3 Indications for Use (*Vyadhi Visheshata*)

Drugs should be administered strictly according to their therapeutic indications. Misuse outside indicated conditions may lead to adverse outcomes.

Example: Use of heating drugs in inflammatory disorders may worsen symptoms.

4.4 Patient Constitution (*Prakriti*)

Individualized therapy based on *Prakriti*, *Agni*, age, and comorbidities is essential for safe drug administration. This reflects the Ayurvedic principle of personalized medicine.

Example: *Ushna* drugs in *Pitta Prakriti* individuals may lead to acidity and burning sensation.

4.5 Anupana (Drug Delivery Modulator)
Anupana modifies drug absorption, distribution, and therapeutic action, acting as a natural drug delivery system. It enhances efficacy while reducing adverse effects.

Example: *Yashtimadhu* with milk improves bioavailability and enhances central nervous system effects.

4.6 Contraindications (Nishedha / Apatya)
Classical Ayurvedic texts also describe specific contraindications for various drugs, emphasizing the importance of patient selection in preventing adverse drug reactions.

Contraindications (Apathyas and Nishedha) represent an essential component of pharmacovigilance in Ayurveda. Classical texts clearly emphasize that certain drugs should be avoided in specific patient populations or disease conditions to prevent adverse outcomes. Factors such as age, strength of the patient, physiological status (e.g., pregnancy), and disease condition play a crucial role in determining drug suitability. Even widely used drugs like Haritaki and Ghrita may produce harmful effects if administered in inappropriate conditions as summarized in **Table 4.**

Table 4: Contraindications of Selected Ayurvedic Drugs and Substances.

Drug/Substance	Contraindicated Conditions / Patients	Remarks (Classical Insight)
Croton tiglium L. (Danti / Jayapala)	Children, elderly, pregnant women, debilitated patients, rectal disorders, chronic diarrhoea	Strong purgative; may cause severe complications in weak individuals
Terminalia chebula Retz. (Haritaki)	Pregnancy, severe debility, dehydration, Pitta predominance, immediately after bloodletting or exhaustion	Though Rasayana, may aggravate conditions if used in contraindicated states
Commiphora mukul (Hook. ex Stocks) Engl. (Guggulu)	Pregnancy, excessive debility, acute inflammatory conditions	Heating and scraping property may aggravate certain conditions
Aconitum ferox Wall. ex Ser. (Vatsanabha)	Pregnancy, children, elderly, cardiac disorders, Pitta conditions, without proper purification (Shodhana)	Highly toxic; requires strict dose and purification control
Papaver somniferum L. (Ahifena)	Children, elderly, respiratory disorders, excessive Kapha conditions	CNS depressant; may cause respiratory suppression
Ghrita (in excess or improper use)	Kapha disorders, indigestion, improper season or excessive intake	Excess leads to metabolic disturbances and Kapha aggravation
Jala (Water – improper intake)	Immediately after meals in excess	May impair digestion (Agni)

This highlights the Ayurvedic principle of individualized therapy and risk assessment, which closely parallels modern concepts of contraindications and patient-specific drug safety.

5. Kalpana (Formulation Science)[26]
Ayurveda emphasizes that the therapeutic efficacy and safety of a drug are significantly influenced by its formulation (Kalpana) and mode of administration. Classical texts describe that the same drug may produce different effects depending on its preparation, vehicle (Anupana), and dosage form as summarized in **Table 5.**

Table 5: Different Formulations and their Pharmacovigilance Relevance.

Aspect	Description	Examples (Classical Reference)	Pharmacovigilance Relevance
Formulation (Kalpana)	Different dosage forms alter drug action, absorption, and efficacy	Swarasa (juice), Churna (powder), Kalka (paste)	Incorrect formulation may reduce efficacy or increase adverse effects
Medhya Rasayana Kalpana	Specific formulations mentioned for cognitive enhancement in classical texts	Mandukaparni Swarasa, Yashtimadhu Churna with milk, Guduchi Swarasa, Shankhapushpi Kalka	Demonstrates importance of selecting proper dosage form for targeted action
Vehicle (Anupana)	Substance administered along with drug modifies its action and bioavailability	Yashtimadhu with milk enhances CNS effects	Improper Anupana may lead to reduced effect or adverse reactions
Fresh vs Dry Drug (Ardra vs Shushka)	Dose varies depending on whether drug is fresh or dried	Fresh drug generally used in double quantity compared to dry form	Incorrect dose conversion may lead to toxicity or therapeutic failure
Dose Adjustment	Dosage depends on preparation	Swarasa requires higher dose than	Ensures safe therapeutic

Based on Form	method and potency of formulation	Churna due to potency differences	window and prevents overdose
Processing (Samskara)	Pharmaceutical processing modifies drug potency and safety	Classical preparation methods in Rasayana formulations	Improper processing may lead to toxicity or reduced efficacy

Kalpana plays a crucial role in determining drug efficacy, bioavailability, and safety in Ayurveda. Proper selection of formulation, vehicle, and dosage based on the state of the drug ensures optimal therapeutic outcomes and minimizes adverse effects, reflecting principles comparable to modern pharmaceutics and pharmacokinetics.

6. Adverse Drug Reactions in Ayurveda

Ayurveda provides a clear conceptual framework for adverse drug reactions through the principles of *Atiyoga* (overuse), *Ayoga* (underdose), and *Mithyayoga* (improper use). These classifications reflect dose-dependent toxicity, therapeutic failure, and irrational drug use, respectively, as summarized in **Table 6.**

Table 6: Factors Responsible for Adverse Drug Reactions in Ayurveda.

Factor	Ayurvedic Term	Explanation
Overdose	Atiyoga	Excess drug leading to toxicity
Underdose	Ayoga	Inadequate therapeutic effect
Improper use	Mithyayoga	Wrong indication or administration
Lack of purification	Ashodhit Dravya	Toxic effects due to improper processing
Incompatibility	Viruddha	Adverse reactions due to wrong combinations

6.1 Classification of Adverse Drug Reactions in Ayurveda

Ayurveda classifies adverse drug reactions (ADRs) into drug-related and procedure-related events, reflecting a comprehensive understanding of therapy-associated risks. Drug-related ADRs are further categorized into *Badhana* and *Sanubadhana*. *Badhana* refers to acute reactions arising from improper use, overdose, or incorrect administration of drugs, whereas *Sanubadhana* denotes delayed or cumulative effects resulting from prolonged exposure. Classical commentaries interpret *Badhana* as immediate toxicity and *Sanubadhana* as chronic pathological alterations.[27,28] For instance, acute complications following improperly administered Panchakarma procedures can be considered *Badhana*, while long-term metabolic disturbances due to excessive intake of *Madhura Rasa* represent *Sanubadhana*. This classification closely parallels modern concepts of acute and chronic toxicity, highlighting the advanced pharmacovigilance perspective inherent in Ayurveda.

In addition, classical Ayurvedic texts emphasize that inappropriate drug selection or administration in unsuitable patient conditions can also lead to adverse outcomes. Specific drugs are known to produce characteristic toxic manifestations when misused or improperly processed. For example, *Vatsanabha* may induce neurotoxic symptoms such as tingling and numbness, *Dhatura* can cause hallucinations and delirium, and *Bhallataka* may result in severe irritation and systemic toxicity. These observations underscore the importance of rational drug selection, appropriate patient assessment, and adherence to classical guidelines in preventing adverse drug reactions as summarized in **Table 7.**

Table 7: Classical Ayurvedic Drugs and Documented Adverse Effects.

Drug	Botanical Name	Adverse Effects (Classical Description)
Vatsanabha	*Aconitum ferox* Wall. ex Ser.	Tingling, numbness, dysphagia
Dhatura	*Datura metel* L.	Delirium, hallucination, mydriasis
Bhallataka	*Semecarpus anacardium* L.f.	Burning sensation, irritation, hypotension
Jayapala	*Croton tiglium* L.	Severe purgation, vomiting, collapse
Ahiphena	*Papaver somniferum* L.	Respiratory depression, sedation
Langali	*Gloriosa superba* L.	Diarrhea, confusion

6.2 Adverse Effects of Toxic Drugs

Classical Ayurvedic texts also describe adverse effects of specific toxic drugs when used improperly, as summarized in **Table 8.**

Table 8: Adverse Effects of Selected Toxic Ayurvedic Drugs (Improper Use / Shodhana Failure).

Drug (Botanical Name)	Common Formulations	Adverse Effects (Improper Use / Overdose)
Aconitum ferox Wall. ex Ser. (Vatsanabha)	Anandbhairav Ras, Mritsanjeevan Ras, Saubhagya Vati	Severe burning sensation, tingling of tongue, numbness, nausea, salivation, dysphagia, dilated pupils
Papaver somniferum L.	Nidrodya Vati, Karpur Ras,	Dizziness, dyspnoea, CNS depression, excessive sleep,

(Ahifena)	Mahavataaraj Ras, Dugdha Vati, Aakarkarabhadi Vati	respiratory failure, constricted pupils, death
Gloriosa superba L. (Langli)	Kasisadi Tail, Langli Rasayan	Burning sensation, confusion, diarrhoea, prostration
Croton tiglium L. (Dravanti / Jaypal)	Icchabhedi Ras, Jalodarari Ras, Jwaramurari Ras	Burning in throat, abdominal pain, vomiting, purging, vertigo, circulatory collapse; Croton oil: erythema, blisters
Abrus precatorius L. (Gunja)	Gunja Bhadra Ras	Severe gastrointestinal irritation, nausea, vomiting, diarrhoea, flushing, hypotension, tremors, tetanic spasms, circulatory failure leading to death
Ricinus communis L. (Erand)	Erand Paak, Erandmooladi Kwath	Abdominal pain, vomiting, diarrhoea, dizziness, cold extremities, muscle cramps
Datura metel L. (Dhatura)	Unmad Gajankush Ras, Sootshekhar Ras, Kanakasava	Dry hot skin, flushing, dilated pupils, blurred vision, delirium, hallucinations
Calotropis procera (Aiton) Dryand. (Arka)	Arkeshwar Ras, Arka Taila, Arka Lavana	Skin irritation, blister formation
Semecarpus anacardium L.f. (Bhallataka)	Amrit Bhallatak, Tirarushkar Yog, Bhallatak Tail	Burning in throat, abdominal pain, hypotension, delirium, coma

7. Viruddha Ahara and Aushadha (Incompatibility)[29]

Viruddha Ahara (incompatible diet) and Viruddha Aushadha (incompatible drugs) are important causative factors for adverse effects in Ayurveda. Any substance that aggravates Doshas without facilitating their elimination from the body is termed Viruddha. Charaka has described multiple types of incompatibilities, including Desha (habitat), Kala (time), Agni (digestive power), Matra (dose), Satmya (adaptation), Dosha, Samskara (processing), Virya (potency), Avastha (condition), Krama (sequence), and Samyoga (combination).

Improper combinations of food or drugs may lead to various pathological conditions such as skin disorders, gastrointestinal disturbances, neurological manifestations, metabolic disorders, and even severe complications like toxicity or death. This concept reflects an early understanding of drug–drug and drug–food interactions, which are well recognized in modern pharmacovigilance as summarized in **Table 9.**

Table 9: Types of Viruddha and Their Clinical Relevance.

Type of Viruddha	Description	Example	Clinical Significance
Desha Viruddha	Incompatibility due to habitat	Use of dry drugs in arid regions	Aggravation of Vata
Kala Viruddha	Seasonal incompatibility	Hot potency drugs in summer	Pitta aggravation
Agni Viruddha	Digestive incompatibility	Heavy food in low Agni	Indigestion, Ama
Matra Viruddha	Improper dose	Excess intake of ghee or honey	Toxic effects
Samyoga Viruddha	Wrong combination	Milk + fish	Skin disorders
Samskara Viruddha	Improper processing	Heated honey	Toxicity
Virya Viruddha	Opposite potency drugs	Hot + cold potency drugs together	Metabolic disturbance

8. Drug–Diet and Herb–Drug Interactions

In addition to incompatibility (Viruddha), interactions between drugs and diet or concurrent medications further contribute to adverse drug reactions.

8.1 Drug–Diet Interactions

Drug–diet and herb–drug interactions are important contributors to adverse drug reactions. Ayurveda emphasizes dietary restrictions (Pathya–Apathya) during drug administration, while modern pharmacology recognizes interactions affecting drug absorption, metabolism, and efficacy. Both perspectives highlight the importance of avoiding incompatible combinations to ensure safety and therapeutic effectiveness. Drug–diet interactions are summarized in **Table 10.**

Table 10: Drug–Diet Interactions along with Ayurvedic Dietary Considerations.[30,31]

Substance/Food/Drug	Interacting Drug/Agent	Effect	Clinical Outcome/Significance
Milk	Antibiotics (Doxycycline, Ciprofloxacin)[32,33]	Decreased absorption	Reduced efficacy
Milk + Antacids	–	Milk-alkali syndrome[34]	Metabolic disturbance
Tea[35]	Iron	Formation of tannates	Decreased iron absorption
Fatty diet[36]]	Calcium	Decreased absorption	Impaired bone metabolism
Fibre diet[36]	Minerals	Decreased bioavailability	Nutritional deficiency

Allium sativum L. (Garlic)[9]	Warfarin, Aspirin	Increased bleeding risk	Hemorrhage
Spinach[37]	Anticoagulants	Decreased drug effect	Reduced anticoagulation
Piper longum L.[38]	Rifampicin, Sulfadiazine	Increased bioavailability	Enhanced effect/toxicity
Citrus juices[39]	Felodipine, Nifedipine	Increased bioavailability	Risk of overdose
Gandhak[40]	Incompatible diet (Kshara, Amla, Lavana)	Interaction risk	Prevents adverse reactions
Parad[40]	Heavy/incompatible foods	Reduced efficacy	Prevents toxicity
Loha[40]	Incompatible diet	Interaction risk	Prevents adverse effects

8.2 Herb- Drug Interactions

Certain herbal drugs such as Ephedra (Ephedra vulgaris) and Hypericum perforatum (St. John's Wort) have been associated with significant adverse effects and interactions. Ephedra may cause hypertension, arrhythmias, and central nervous system stimulation, whereas St. John's Wort is known to reduce plasma levels of several drugs by enzyme induction, leading to therapeutic failure.

Herb–drug interactions are clinically significant, as herbal medicines can influence drug metabolism, absorption, and pharmacological effects. Induction or inhibition of metabolic enzymes and additive pharmacodynamic effects may lead to reduced efficacy or increased toxicity, emphasizing the importance of cautious co-administration.[9,41] Herb–drug interactions are presented in **Table 11.**

Table 11: Herb–Drug Interactions.

Herb (Botanical Name)	Interacting Drug/Agent	Effect	Clinical Outcome/Significance
Hypericum perforatum L.(St. John's Wort)[42]	Warfarin, Digoxin, Theophylline	Decreased drug levels	Therapeutic failure
Allium sativum L. (Garlic)[43]	Aspirin, Warfarin	Increased bleeding risk	Hemorrhage
Ginkgo biloba L.[46]	Aspirin	Increased bleeding risk	Bleeding complications
Plantago ovata Forssk. (Isabgol)[45]	Lithium	Decreased absorption	Reduced efficacy
Piper methysticum G.Forst. (Kava-kava)[46]	Alprazolam	Increased adverse effects	CNS depression
Commiphora mukul (Hook. ex Stocks) Engl. (Guggulu)[47,48]	Hypolipidemic drugs	Potentiation	Dose reduction required
Commiphora mukul (Hook. ex Stocks) Engl. (Guggulu)[47,48]	Anticoagulants (Warfarin, Aspirin)	Increased effect	Risk of bleeding
Commiphora mukul (Hook. ex Stocks) Engl. (Guggulu)[47,48]	Thyroid drugs	Thyroid stimulation	Dose adjustment required

9. Safety Monitoring

Adulteration and substitution

Adulteration and substitution of drugs is a major concern in Ayurveda, as therapeutic efficacy and safety depend largely on the genuineness of raw materials. Due to factors such as overexploitation, geographical limitations, and lack of proper identification, substitutes or adulterants are often used. Improper substitution may alter pharmacological activity and may lead to reduced efficacy or adverse drug reactions, making it an important aspect of Ayurvedic pharmacovigilance. Some of the common drugs and their substitutes /adultrants are represented in **Table 12.**

Table 12: Common Ayurvedic Drugs and Their Substitutes/Adulterants.[49,50]

Ayurvedic Drug	Botanical Name	Common Substitute / Adulterant	Pharmacovigilance Concern
Rasna	*Pluchea lanceolata* (DC.) C.B.Clarke	*Alpinia galanga*, *Vanda roxburghii*	May alter anti-inflammatory action
Daruharidra	*Berberis aristata* DC.	*Coscinium fenestratum*	Variation in alkaloid content
Sthonayaka	*Taxus baccata* L.	*Abies webbiana*	Reduced potency, different phytochemistry
Yashtimadhu	*Glycyrrhiza glabra* L.	*Glycyrrhiza uralensis*, *Abrus precatorius* (root)	Risk of toxicity (Abrus)
Priyangu	*Callicarpa macrophylla* Vahl	*Aglaia roxburghiana*	Reduced therapeutic efficacy
Amalvetas	*Hippophae salicifolia* D.Don	*Rheum emodi*	Different pharmacological action
Sarpagandha	*Rauwolfia serpentina* (L.)	*Rauwolfia canescens*	Variation in reserpine content

	Benth. ex Kurz		
Akarkara	*Anacyclus pyrethrum* (L.) Lag.	*Achillea millefolium*, *Spilanthes acmella*	Reduced nervine stimulant effect
Vidanga	*Embelia ribes* Burm.f.	*Embelia robusta*, *Myrsine africana*	Altered anthelmintic activity
Chirayata	*Swertia chirayita* (Roxb. ex Fleming) H. Karst.	*Andrographis paniculata*	Bitter principles differ
Shweta Musali	*Chlorophytum arundinaceum* Baker	*Asparagus adscendens*	Different aphrodisiac potency
Langali	*Gloriosa superba* L.	*Costus speciosus*	Risk of toxicity misinterpretation
Pashanbheda	*Bergenia ligulata* (Wall.) Engl.	*Aerva lanata*	Reduced lithotriptic activity
Swarnakshiri	*Euphorbia thomsoniana* Boiss.	*Argemone mexicana*	Potential toxicity (Argemone)

DISCUSSION AND CRITICAL ANALYSIS

The present review demonstrates that Ayurveda inherently encompasses a comprehensive framework for pharmacovigilance, grounded in principles of rational drug use, individualized therapy, and preventive healthcare. Recent studies have further emphasized the growing importance of pharmacovigilance in herbal medicine systems, particularly in the context of their increasing global use and associated safety concerns. In this regard, classical concepts such as *Dravya Pareeksha*, *Matra*, *Kala*, *Anupana*, *Shodhana* and *Viruddha Ahara* collectively provide a multidimensional approach to drug safety that closely aligns with contemporary pharmacovigilance principles.

One of the key strengths of Ayurvedic pharmacovigilance lies in its personalized approach to therapeutics. Unlike modern pharmacovigilance systems, which largely rely on post-marketing surveillance and population-based data, Ayurveda emphasizes pre-therapeutic assessment through *Pareeksha* and *Yukti*. This proactive approach reduces the likelihood of adverse drug reactions by tailoring treatment to individual patient characteristics, thereby aligning with emerging concepts of personalized and precision medicine.

The concept of *Dravya* as both *Visha* (toxic) and *Amrita* (therapeutic) reflects an advanced understanding of the risk–benefit balance associated with pharmacological substances. This parallels the modern concept of the therapeutic index and dose-dependent toxicity. Similarly, the principles of *Matra* and *Kala* demonstrate an awareness of dosage and timing as critical determinants of drug safety, comparable to pharmacokinetic and pharmacodynamic considerations.

The role of *Anupana* as a modulator of drug action represents a unique and underexplored dimension of Ayurvedic pharmacology. Its ability to influence drug absorption, distribution, and therapeutic outcomes closely resembles modern drug delivery systems and bioavailability enhancement strategies. This highlights the potential of Ayurvedic principles to contribute to contemporary pharmaceutical research.

Despite these strengths, several challenges limit the effective implementation of pharmacovigilance in Ayurveda. The absence of a robust and standardized adverse drug reaction reporting system remains a major concern. Additionally, variability in drug quality due to issues such as adulteration, substitution, and lack of standardization further complicates safety assessment. Limited clinical documentation and inadequate integration with national pharmacovigilance programs also hinder systematic data generation.

Furthermore, the increasing global use of Ayurvedic medicines, often in conjunction with conventional drugs, raises concerns regarding herb–drug interactions. Although classical texts describe incompatibility (*Viruddha Ahara*), there is a need for systematic scientific validation and documentation of such interactions in contemporary settings.

To address these challenges, there is a pressing need to integrate Ayurvedic pharmacovigilance principles with modern pharmacovigilance frameworks such as the Pharmacovigilance Programme of India (PvPI). Establishing dedicated reporting systems for Ayurvedic drugs, promoting awareness among practitioners, and encouraging evidence-based research are essential steps toward strengthening drug safety monitoring.

Future research should focus on developing standardized protocols for adverse drug reaction reporting in Ayurveda, conducting pharmaco-epidemiological studies, and exploring the scientific basis of classical concepts such as *Anupana* and *Viruddha Ahara*. Such efforts will not only enhance the safety profile of Ayurvedic medicines but also facilitate their global acceptance.

CONCLUSION

Pharmacovigilance, although formally recognized as a modern scientific discipline, is inherently embedded within the fundamental principles of Ayurveda. Classical concepts such as *Dravya Pareeksha*, *Matra*, *Kala*, *Anupana*, *Shodhana*, and *Viruddha Ahara* collectively establish a comprehensive framework for ensuring drug safety, rational use, and prevention of adverse effects.

These principles demonstrate a sophisticated understanding of dose–response relationships, individualized therapy, and risk–benefit assessment, closely paralleling contemporary pharmacovigilance paradigms.

The present review highlights that Ayurveda adopts a proactive and preventive approach to pharmacovigilance, emphasizing pre-therapeutic evaluation and personalized treatment strategies. However, challenges such as the lack of structured adverse drug reaction reporting systems, limited clinical documentation, and inadequate integration with modern pharmacovigilance programs remain significant.

Integrating classical Ayurvedic principles with contemporary pharmacovigilance frameworks can strengthen drug safety monitoring, enhance therapeutic outcomes, and improve the scientific credibility of Ayurvedic medicine. In conclusion, Ayurveda offers a robust and holistic model of pharmacovigilance that, when appropriately integrated with modern systems, has the potential to significantly improve patient safety and support the global acceptance of Ayurvedic therapeutics.

FUTURE DIRECTIONS

Future research should focus on strengthening pharmacovigilance in Ayurveda through systematic integration with the Pharmacovigilance Programme of India (PvPI) and global drug safety frameworks. The development of dedicated adverse drug reaction (ADR) reporting systems for Ayurvedic medicines, along with large-scale pharmaco-epidemiological studies, is essential. Further efforts are required for the standardization and quality control of herbal and herbo-mineral formulations. In addition, scientific validation of classical concepts such as *Anupana*, *Viruddha Ahara*, and *Kala* using modern pharmacological approaches may provide deeper insights into drug safety and efficacy. Such integrative research will enhance the credibility, safety, and global acceptance of Ayurvedic therapeutics.

REFERENCES

1. World Health Organization. *The importance of pharmacovigilance: safety monitoring of medicinal products*. Geneva: WHO, 2002.
2. World Health Organization. *Safety monitoring of herbal medicines in pharmacovigilance systems*. Geneva: WHO, 2004.
3. Agnivesha. *Charaka Samhita*, Sutra Sthana 1/124 Varanasi: Chaukhambha Orientalia, 2014.
4. Sushruta. *Sushruta Samhita*. Varanasi: Chaukhambha Sanskrit Series, 2012.
5. Vagbhata. *Ashtanga Hridaya*. Varanasi: Chaukhambha Orientalia, 2010.
6. Brunton LL, Hilal-Dandan R, Knollmann BC. *Goodman & Gilman's The Pharmacological Basis of Therapeutics*. 13th ed. New York: McGraw-Hill, 2018.
7. Ekor M. The growing use of herbal medicines: safety and regulatory challenges. *Front Pharmacol*. 2014; 4: 177.
8. Paracelsus. *On the miners' sickness and other diseases of miners*. Basel; 1567.
9. Izzo AA, Ernst E. Interactions between herbal medicines and prescribed drugs. *Drugs*. 2009; 69(13): 1777–1798.
10. Posadzki P, Watson LK, Ernst E. Adverse effects of herbal medicines. *Clin Med*. 2013; 13(1): 7–12.
11. World Health Organization. WHO Programme for International Drug Monitoring; 1968.
12. Pharmacovigilance Programme of India (PvPI). Indian Pharmacopoeia Commission, 2010.
13. Ministry of AYUSH. National Pharmacovigilance Programme for ASU drugs. New Delhi, 2008.
14. Thatte U, Bhalerao S. Pharmacovigilance of Ayurvedic medicines in India. *Indian J Pharmacol*. 2008; 40(Suppl 1): S10–S12.
15. Sharma PV. *Dravyaguna Vijnana*. Varanasi: Chaukhambha Bharati Academy, 2011.
16. Rang HP, Ritter JM, Flower RJ, Henderson G. *Rang and Dale's Pharmacology*. 8th ed. Elsevier, 2016.
17. Green BN, Johnson CD, Adams A. Writing narrative literature reviews for peer-reviewed journals. *J Chiropr Med*. 2006; 5(3): 101–117.
18. Higgins JPT, Thomas J, Chandler J, et al. *Cochrane Handbook for Systematic Reviews of Interventions*. Version 5.1.0, 2011.
19. Tripathi B. *Charaka Samhita (Commentary) VIMANA 8/87*. Varanasi: Chaukhambha Surbharati Prakashan, 2013.
20. Sushruta. Sushruta Samhita. Sutra Sthana 34/22–23. Varanasi: Chaukhambha Sanskrit Series, 2012.
21. Mukherjee PK. *Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals*. 1st ed. New Delhi: Business Horizons, 2002.
22. Shinde A, Gahunge P, Rath S. The real concept of substitution in Ayurveda literature and adulteration: the misleading concept of modern era. *JAIMS* 2018; 3(3): 149-158.
23. Agnivesha. Charaka Samhita, sutra sthan 1/75 and Kalpa Sthana 1/10. Varanasi: Chaukhambha Orientalia, 2014.
24. Sushruta. Sushruta Samhita. Sutra Sthana 37/6. Varanasi: Chaukhambha Sanskrit Series, 2012.
25. Agnivesha. Charaka Samhita, Kalpa Sthana 1/11; Varanasi: Chaukhambha Orientalia, 2014.
26. Singh AN, Dubey SD. Basic Concepts of Dravyaguna Vijnana. Varanasi: Chaukhambha Vishvabharati, 2014.
27. Agnivesha. Charaka Samhita. Chikitsa Sthana 1/1/15. Varanasi: Chaukhambha Orientalia, 2014.
28. Agnivesha. Charaka Samhita. Vimana Sthana 1/15. Varanasi: Chaukhambha Orientalia, 2014.
29. Agnivesha. Charaka Samhita. Sutra Sthana 26/85–103. Varanasi: Chaukhambha Orientalia, 2014.
30. Genser D. Food and drug interaction: consequences for the nutrition/health status. *Ann Nutr Metab*. 2008; 52(Suppl 1): 29–32.

31. Schmidt LE, Dalhoff K. Food–drug interactions. *Drugs*. 2002; 62(10): 1481–502.
32. Neuvonen PJ. Interactions with the absorption of tetracyclines. *Drugs*. 1976; 11(1): 45–54.
33. Shargel L, Yu AB. *Applied Biopharmaceutics and Pharmacokinetics*. 7th ed. New York: McGraw-Hill, 2016.
34. Medarov BI. Milk-alkali syndrome. *Mayo Clin Proc*. 2009; 84(3): 261–7.
35. Hurrell RF, Reddy MB, Cook JD. Inhibition of non-haem iron absorption by polyphenolic-containing beverages. *Br J Nutr*. 1999; 81(4): 289–95.
36. Lönnerdal B. Dietary factors influencing zinc absorption. *J Nutr*. 2000; 130(5S Suppl): 1378S–83S.
37. Holbrook AM, Pereira JA, Labiris R, et al. Systematic overview of warfarin and its drug and food interactions. *Arch Intern Med*. 2005; 165(10): 1095–106.
38. Atal CK, Dubey RK, Singh J. Biochemical basis of enhanced drug bioavailability by piperine. *J Pharmacol Exp Ther*. 1985; 232(1): 258–62.
39. Bailey DG, Dresser GK, Arnold JM. Grapefruit–medication interactions: forbidden fruit or avoidable consequences? *CMAJ*. 2013; 185(4): 309–16.
40. Tripathi B. *Rasaratna Samuccaya*. Varanasi: Chaukhambha Surbharati Prakashan, 2012.
41. Fugh-Berman A. Herb–drug interactions. *Lancet*. 2000; 355(9198): 134–8.
42. Markowitz JS, Donovan JL, DeVane CL, et al. Effect of St John's wort on drug metabolism by induction of cytochrome P450 3A4 enzyme. *JAMA*. 2003; 290(11): 1500–4.
43. Rahman K. Effects of garlic on platelet biochemistry and physiology. *Mol Nutr Food Res*. 2007; 51(11): 1335–44.
44. Bent S, Goldberg H, Padula A, Avins AL. Spontaneous bleeding associated with Ginkgo biloba: a case report and systematic review. *J Gen Intern Med*. 2005; 20(7): 657–61.
45. Shalansky SJ, Lynd LD, Richardson K, et al. Risk of warfarin-related bleeding events and drug interactions. *Pharmacotherapy*. 2007; 27(9): 1237–47.
46. Singh YN. Kava: an overview. *J Ethnopharmacol*. 2004; 93(2–3): 267–76.
47. Ulbricht C, Basch E, Szapary P, et al. Guggul for hyperlipidemia: a review. *J Cardiovasc Pharmacol*. 2005; 46(5): 660–6.
48. Deng R. Therapeutic effects of Guggul and its constituents. *J Altern Complement Med*. 2007; 13(9): 1113–9.
49. *The Ayurvedic Pharmacopoeia of India*. Part I. Vol. 1–9. New Delhi, Ministry of AYUSH, Government of India, 2001–2019.
50. Bhavamishra. *Bhavaprakasha Nighantu* (commentary by Chunekar KC, Pandey GS). Varanasi: Chaukhambha Bharati Academy, 2013.