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A REVIEW ARTICLE ON ROLE OF ARTIFICIAL INTELLIGENCE IN PHARMACY PRACTICE

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ABSTRACT

Artificial Intelligence (AI) is revolutionizing pharmacy practice by enhancing efficiency, accuracy, and personalized patient care. This review evaluates the integration of AI tools such as IBM Watson, Medisafe, ScriptPro, and BenevolentAI into various pharmaceutical functions, including drug discovery, medication management, clinical decision support, pharmacovigilance, and inventory systems. AI applications in pharmacy contribute to optimizing operations by automating prescription verification, predicting medication adherence, minimizing dispensing errors, and enabling real-time inventory control. In drug development, AI accelerates the identification of potential candidates and repurposes existing drugs, as demonstrated during the COVID-19 pandemic. Furthermore, AI supports personalized medicine by analyzing genetic data and tailoring treatments to individual patient profiles. Clinical decision support systems assist pharmacists by identifying drug interactions, contraindications, and suggesting evidence-based therapies. Despite these advances, the deployment of AI faces challenges such as data privacy, system integration, algorithm reliability, and ethical concerns, including accountability and potential workforce displacement. This review emphasizes that AI should complement—not replace—pharmacists, enhancing their capacity to provide informed, patient-centric services. Additionally, the use of large-scale pharmacy databases (WHO, FDA, IQVIA) for training AI models further strengthens its clinical utility. The results demonstrate that AI holds transformative potential in pharmacy, ensuring improved healthcare delivery, reducing adverse drug reactions, and promoting personalized treatment approaches. To fully harness AI, pharmacists must embrace digital tools, undergo adequate training, and adapt to evolving regulatory frameworks. As AI technology advances, its thoughtful and ethical integration will play a pivotal role in shaping the future of pharmaceutical care.

KEYWORDS: Artificial Intelligence, Pharmacy Practice, Drug Discovery, Personalized Medicine, Medication Management, Pharmacovigilance, Clinical Decision Support, Ethical Issues.

INTRODUCTION

Artificial Intelligence (AI) is increasingly transforming pharmacy practice by enhancing medication management, streamlining workflows, and improving patient safety and outcomes. AI technologies, including machine learning and natural language processing, are being integrated into various aspects of pharmacy practice, enabling pharmacists to make data-driven decisions, optimize therapy, and reduce medication errors [1]. In pharmacy, AI applications range from drug discovery and personalized medicine to inventory control and medication management. For instance, AI-powered systems are now capable of screening millions of chemical structures, repurposing existing drugs, and predicting patient adherence with improved precision.

Tools such as IBM Watson Health, Medisafe, and ScriptPro are already being used to improve dispensing accuracy, automate prescription verification, and support clinical decision-making

Furthermore, AI enhances pharmacovigilance by detecting adverse drug reactions through social media analytics, real-world data analysis, and electronic health record integration. These systems significantly contribute to medication safety, especially when dealing with complex patient cases or polypharmacy.[1,2]

However, despite these advantages, several barriers hinder the full adoption of AI in pharmacy practice. These include data privacy and security issues, lack of interoperability with legacy systems, inadequate infrastructure, and ethical dilemmas surrounding AI-generated clinical decisions.[3]

This review aims to comprehensively explore the applications, benefits, and limitations of AI in pharmacy practice. By evaluating current tools, real-world implementations, and literature, it seeks to understand the transformative potential of AI while addressing the challenges that must be overcome to ensure ethical, efficient, and equitable integration into healthcare systems.[4]

COMPREHENDING ARTIFICIAL INTELLIGENCE WITHIN PHARMACY PRACTICE

Artificial Intelligence (AI) has emerged as a transformative force in the pharmacy sector, revolutionizing how medicines are discovered, managed, and delivered. By employing sophisticated algorithms and data analytics, AI performs tasks traditionally requiring human intelligence, including drug development, medication management, clinical decision-making, and personalized patient care.[5] In drug discovery, AI accelerates the identification of promising compounds by screening millions of molecular structures, predicting drug interactions, and repurposing existing drugs. For instance, during the COVID-19 pandemic, AI models like BenevolentAI helped identify baricitinib as a potential therapeutic agent within weeks.[6]

AI is significantly enhancing medication management by minimizing prescription errors, predicting patient adherence patterns, and supporting medication counselling via AI-powered chatbots and virtual assistants.[7] Predictive analytics tools enable pharmacists to identify patients at risk of non-adherence and provide timely interventions. Automated dispensing systems have transformed pharmacy workflows by reducing human error, optimizing inventory, and improving patient wait times. Robotic systems such as PharmaBot sort, package, and dispense medications with exceptional precision, allowing pharmacists to devote more time to clinical services.[8] Clinical Decision Support Systems (CDSS), powered by AI, analyze vast patient datasets to assist pharmacists in recommending evidence-based therapies, identifying contraindications, and ensuring optimal drug use. IBM Watson for Oncology, for example,

utilizes AI to offer personalized cancer treatment recommendations based on tumor genetics and clinical data.[8] AI also plays a crucial role in personalized medicine, enabling individualized treatment plans based on patients' genetic profiles, lifestyle, and health history, particularly in oncology and rare diseases.[10]

In pharmacovigilance, AI enhances post-marketing drug safety surveillance by detecting adverse drug reactions (ADRs) through real-world data analysis, social media monitoring, and electronic health record mining.[10] AI tools also streamline the process of reporting ADRs to regulatory agencies, enabling faster interventions and improving public safety.

Moreover, AI contributes to pharmaceutical supply chain and inventory management by predicting drug demand, minimizing waste, preventing stockouts, and optimizing logistics for distribution.[11] Despite its transformative benefits, AI adoption faces challenges related to data privacy, integration with legacy systems, model reliability, and ethical concerns such as accountability for AI-generated recommendations.[12] Importantly, AI should augment—not replace—human pharmacists by enhancing their ability to deliver safe and effective care.

Looking ahead, the future of AI in pharmacy is bright. Emerging innovations include AI-driven robotic pharmacies, blockchain-AI integration for transparent drug tracking, wearable technologies for real-time adherence monitoring, and AI-accelerated clinical trials. As these technologies evolve, AI will continue to reshape pharmacy practice, enabling better patient outcomes and operational efficiencies across healthcare systems.

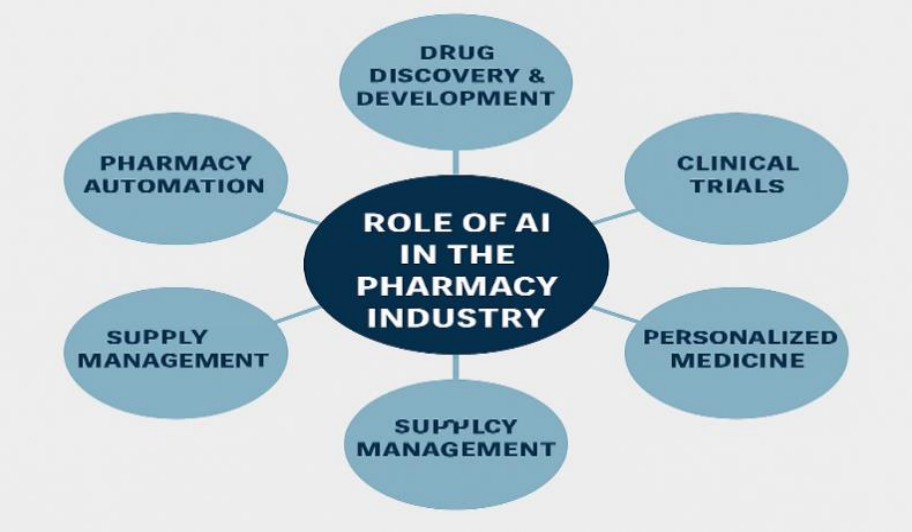

Fig. No.1: Role of AI in the Pharmacy Industry.

ARTIFICIAL INTELLIGENCE (AI) TOOLS AND SOFTWARE IN THE PHARMACEUTICAL INDUSTRY

The pharmaceutical industry is rapidly integrating artificial intelligence (AI) tools and software to enhance efficiency, accuracy, and innovation across various domains such as drug discovery, clinical trials, pharmacovigilance, personalized medicine, and pharmaceutical marketing. AI tools utilize advanced technologies like machine learning (ML), natural language processing (NLP), and data analytics to automate and optimize complex processes. In drug discovery and development, AI can predict how new drug molecules will interact with biological targets, thereby enabling faster identification of potential drug candidates. For instance, AI platforms like Nuclear Wisdom can predict molecular binding and efficacy, significantly reducing the time and cost required in early drug development stages.[13]

In the realm of clinical research, AI supports the recruitment of appropriate participants and enables real-time monitoring of trials to increase safety and success rates. IBM Watson Health is an advanced platform that assists in designing intelligent clinical trials and predicting device or protocol failures, thereby increasing the reliability of research outcomes.[14]

AI also plays a critical role in pharmacovigilance by analyzing vast datasets from patient records, clinical reports, and social media to detect adverse drug reactions. Tools like Aegis AI employ natural language processing and machine learning to scan and classify safety signals, thus enhancing early detection and response mechanisms.[5] Moreover, AI enhances pharmaceutical marketing and sales by evaluating customer behavior to optimize engagement strategies. Salesforce Einstein, for example, supports customer relationship management (CRM) by delivering predictive insights that help refine sales tactics and improve service through AI-driven chatbots.[15]

Personalized medicine is another transformative application of AI in pharmacy. By analyzing a combination of genetic data, clinical history, and lifestyle factors, AI can tailor treatment plans to individual patients. Platforms such as Tempus combine genomic data with AI to personalize cancer therapy and improve treatment outcomes, helping clinicians make data-driven therapeutic decisions.[16] IBM Watson also contributes to personalized healthcare by evaluating patient-specific information to recommend optimal treatment options, especially in oncology. Furthermore, it facilitates pharmacovigilance by scanning thousands of scientific articles and real-world data to identify potential drug safety concerns more efficiently than conventional methods.

APPLICATIONS OF IBM WATSON IN THE PHARMACEUTICAL INDUSTRY

IBM Watson, an advanced artificial intelligence (AI) system, has demonstrated significant utility in various sectors of the pharmaceutical industry by leveraging its capabilities in natural language processing and machine learning. One of its core applications lies in drug discovery, where IBM Watson efficiently analyzes vast repositories of scientific literature, research publications, and biological data to identify potential drug targets and predict drug-drug interactions, thereby accelerating the early stages of drug development.[17] In the realm of clinical trial optimization, Watson uses patient data from Electronic Health Records (EHRs) to match individuals with suitable ongoing trials, aiding in the recruitment process and facilitating the design of more efficient clinical protocols. Moreover, it allows real-time monitoring of trial outcomes to improve efficacy assessments.[5]

Another major contribution of IBM Watson is in the field of personalized medicine. It integrates data from an individual's genetics, lifestyle choices, and medical history to recommend tailored treatment plans, which has proven particularly impactful in oncology for selecting targeted therapies.[18] Furthermore, IBM Watson is instrumental in pharmacovigilance activities. It detects adverse drug reactions (ADRs) not only from structured sources such as medical records and pharmacovigilance databases but also from unstructured data like social media platforms and public health reports. This enhances patient safety, supports early detection of drug-related risks, and ensures better regulatory compliance.[10,19,20] These applications signify IBM Watson's transformative role in advancing pharmaceutical practices by reducing time and cost, enhancing precision medicine, and improving public health outcomes.

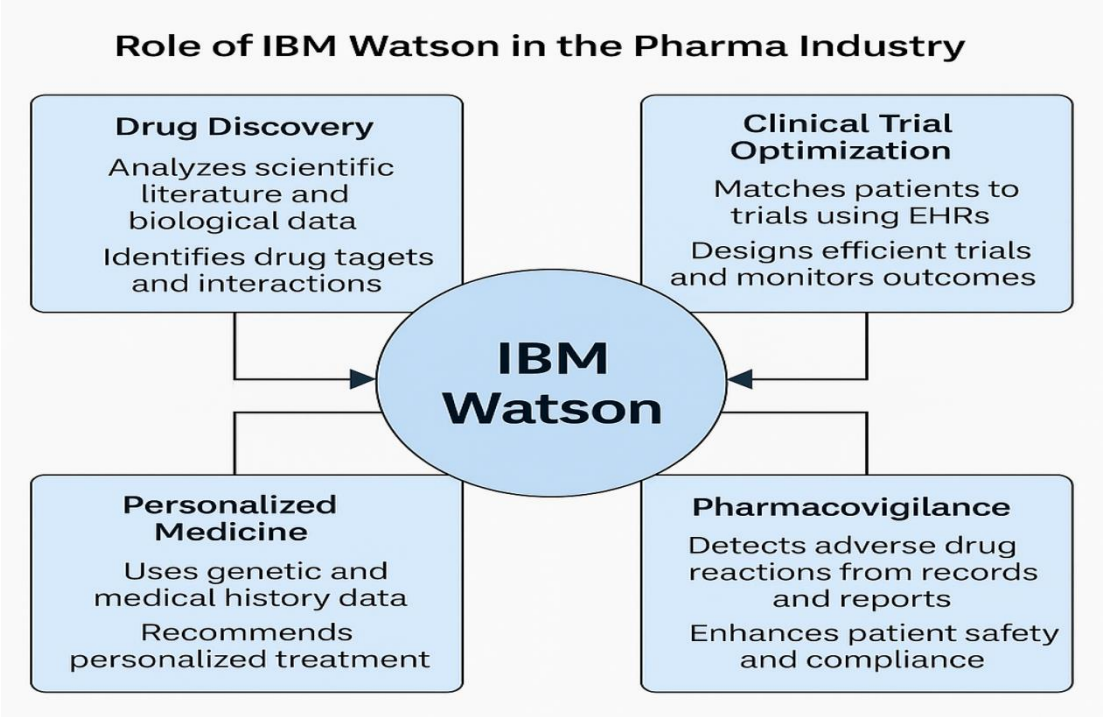

Fig. No. 2: Key Applications of IBM Watson in the Pharmaceutical Industry.

REVOLUTIONIZING PHARMACEUTICAL PRACTICES THROUGH AI: APPLICATIONS OF MEDISAFE, SCRIPTPRO, AND BENEVOLENTAI

Artificial Intelligence (AI) has significantly transformed various aspects of the pharmaceutical industry, from medication adherence to drug discovery and pharmacy automation. One of the notable AI-powered applications is Medisafe, a smart medication management platform that assists patients in following their prescribed treatment regimens. The app integrates with smartphones and smartwatches to send personalized reminders, predict adherence risks, and provide behavioral insights through data analytics. It not only enhances patient compliance but also offers pharmaceutical companies real-world evidence of medication usage patterns.[21]

Another prominent tool, ScriptPro, leverages robotics and AI for pharmacy automation. It is widely used in hospital and retail pharmacy settings to reduce human error in medication dispensing and optimize workflow efficiency. ScriptPro's systems enable real-time monitoring of drug inventory and support intelligent allocation of pharmacy personnel and resources. Its robotic dispensing units ensure high accuracy and patient safety while enhancing operational productivity. As reported in the *American Journal of Health-System Pharmacy*, implementation of ScriptPro systems has led to measurable improvements in pharmacy operations and patient satisfaction.[22] In the domain of drug research and development, BenevolentAI has emerged as a pioneering UK-based biotech firm utilizing AI and machine learning to expedite drug discovery. Its technology platforms mine vast amounts of biomedical literature, patient data, and molecular information to identify novel drug targets and repurpose existing medications for new therapeutic uses. This not only accelerates the R&D timeline but also reduces the cost associated with traditional drug development processes. A review published in *Nature Reviews Drug Discovery* highlights BenevolentAI's contributions to precision medicine and the design of innovative therapies by harnessing AI's predictive power in biomedical sciences (Table No.1).[23-24]

Table No.1: Tool Main Use AI Application Industry Impact.

S. No.	Tool	Main Use	AI Application	Industry Impact
1	Medisafe	Medication adherence	Personalized reminders, risk prediction	Better patient compliance and outcomes
2	ScriptPro	Pharmacy automation	Robotic dispensing, inventory AI	Improved accuracy and efficiency
3	BenevolentAI	Drug discovery & development	Drug repurposing, target identification	Faster, cost-effective R&

PHARMACEUTICAL DATA SOURCES EMPOWERING AI INNOVATION IN HEALTHCARE

In the pharmaceutical industry, Artificial Intelligence (AI) tools rely extensively on access to robust, diverse, and well-structured datasets. These datasets are sourced from a combination of public health organizations, global regulatory authorities, and proprietary pharmaceutical industry databases. Such data banks are critical for training AI models in applications ranging from drug discovery and adverse event detection to clinical decision-making and personalized medicine.[25]

One major source of pharmaceutical data is the World Health Organization (WHO), particularly through its Global Health Observatory (GHO). The GHO offers comprehensive data on global health indicators, disease trends, and medicine use patterns. These insights are instrumental for illness monitoring and prediction, allowing AI systems to forecast disease outbreaks and evaluate treatment effectiveness on a global scale.[26]

Another essential database is maintained by the U.S. Food and Drug Administration (FDA). Its Drugs@FDA portal contains detailed records of approved drugs, their labeling information, and regulatory histories. AI models use this database to enhance pharmacovigilance activities, such as the early detection of adverse drug reactions and drug safety profiling.[27]

In addition to public databases, proprietary data from industry leaders like IQVIA provides in-depth information on commercial drug performance, sales trends, lifestyle behaviors, and real-world drug usage. IQVIA's datasets are particularly valuable in pharmacogenomic studies and support the development of personalized medicine by analyzing interactions between drugs and genetic profiles.[28]

Furthermore, pharmaceutical industry reports offer rich analytical insights and are a vital component of AI-based forecasting and strategic planning. These reports, often published by market research firms or consultancies, include data on drug pipelines, sales forecasts, market dynamics, regulatory updates, and technological innovations in healthcare. Notable publishers include Evaluate Pharma for pipeline analysis, Statista for healthcare market data, and McKinsey & Company for case studies on AI-driven transformations in pharma.[29]

Table No. 2: Highlights these key organizations and their focus areas.

Organization/Firm	Focus Area
IQVIA	Drug sales data, real-world evidence, AI tools
Evaluate Pharma	Drug pipeline analysis, forecasts
Statista	Market size, revenue, AI in healthcare trends
Frost & Sullivan	Technology trends, AI innovation reports
Global Data Healthcare	Pharma analytics, M&A, pipeline intelligence
McKinsey & Company	Pharma insights, AI transformation case studies

By integrating data from such diverse sources, AI tools are significantly enhancing the capabilities of the pharmaceutical industry in optimizing drug development, improving patient outcomes, and predicting healthcare trends. These databases are not only the backbone of intelligent analytics but also serve as the foundation for the next generation of evidence-based and patient-centered pharmaceutical care.[21]

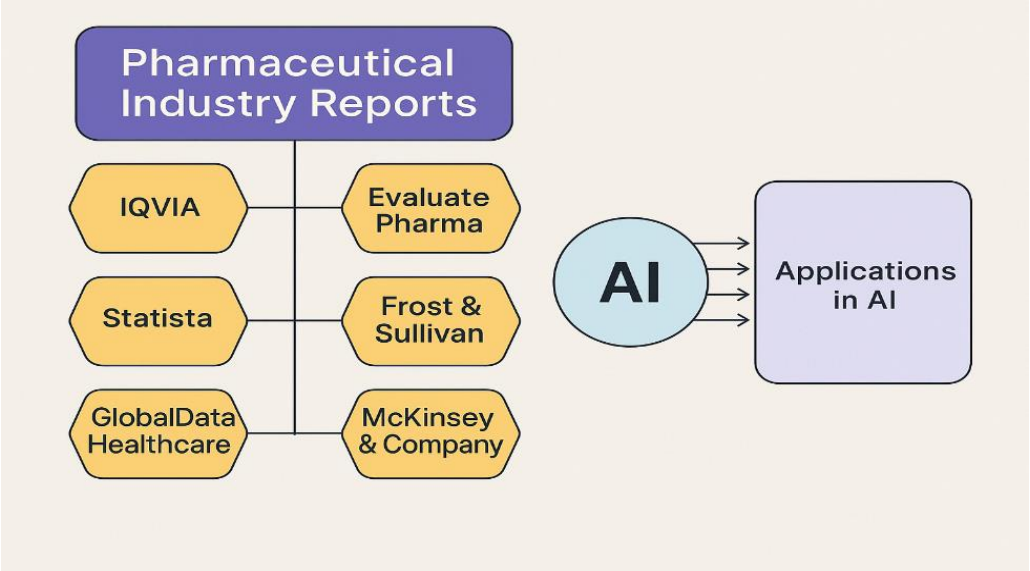

Fig. No. 3: Pharmaceutical Industry Reports as Key Enablers for AI Applications.

DISCUSSION

Artificial Intelligence (AI) is redefining pharmacy practice by integrating advanced computational tools to support clinical, operational, and research activities. The evidence presented in this review underscores AI's significant contributions across the pharmaceutical value chain—from drug discovery and development to personalized medicine, pharmacovigilance, inventory control, and patient adherence. Its multifaceted application has not only improved the accuracy and speed of pharmacy services but also facilitated data-driven decision-making, enabling a paradigm shift toward precision healthcare.

AI technologies such as IBM Watson, Medisafe, ScriptPro, and BenevolentAI exemplify the real-world implementation of machine learning, natural language processing, and predictive analytics in pharmacy. Tools like IBM Watson Health contribute meaningfully to drug discovery by analyzing massive biomedical datasets, identifying novel therapeutic targets, and assisting in personalized treatment planning. Its application in clinical trial optimization and pharmacovigilance further enhances the efficiency of pharmaceutical R&D and patient safety.

Similarly, Medisafe promotes patient engagement by providing real-time adherence tracking through wearable-integrated reminders, which is particularly important in chronic disease management and geriatric care. ScriptPro's integration of AI in robotic dispensing systems has automated pharmacy workflows, reduced medication errors, and enabled pharmacists to focus more on clinical consultations and patient care. BenevolentAI has accelerated the pace of drug repurposing and molecular target identification, which is especially beneficial in scenarios like the COVID-19 pandemic, where rapid therapeutic identification is critical.

Furthermore, the role of AI in pharmacovigilance is notably impactful. By mining structured and unstructured data from electronic health records, social media, and clinical documentation, AI enhances early detection of adverse drug reactions (ADRs), thus promoting proactive patient safety measures. In personalized medicine, platforms like Tempus and IBM Watson harness genomics and patient history data to recommend tailored treatments, especially in oncology and rare diseases.

Data remains the cornerstone of AI innovation in pharmacy. Reliable data sources from WHO's Global Health Observatory, FDA databases, IQVIA, and Evaluate Pharma provide critical training grounds for AI algorithms, allowing them to learn from real-world evidence and generate actionable insights. The integration of pharmaceutical data repositories ensures robust predictive modeling for demand forecasting, safety surveillance, and health trend analyses.

However, despite these advancements, the integration of AI into pharmacy practice is accompanied by several challenges. Data privacy and security concerns, regulatory ambiguity, limited interoperability with legacy systems, and the ethical dilemma of clinical responsibility for AI-driven decisions hinder widespread adoption. Ensuring transparency, explainability, and accountability in AI algorithms is essential to foster trust among pharmacists, physicians, patients, and regulatory authorities. Additionally, infrastructure development and adequate training of healthcare professionals in AI literacy are critical for successful implementation.

Looking ahead, the future of AI in pharmacy is promising. Developments such as blockchain-integrated AI systems for drug traceability, AI-powered clinical trial simulations, and wearable biosensors for real-time pharmacovigilance are on the horizon. These innovations hold the potential to bridge existing gaps in care delivery, optimize treatment efficacy, and promote equitable healthcare access.

CONCLUSION

Artificial Intelligence (AI) is revolutionizing the field of pharmacy by transforming how medications are discovered, developed, dispensed, and monitored. As this review highlights, AI tools—ranging from IBM Watson, Medisafe, and ScriptPro to advanced platforms like BenevolentAI—have already demonstrated substantial value in improving clinical decision-making, enhancing medication adherence, supporting pharmacovigilance, and accelerating drug discovery. AI-driven systems offer precision and efficiency by analyzing vast datasets, predicting patient behaviors, and enabling personalized treatment plans. These advancements not only optimize therapeutic outcomes but also reduce human error and administrative burdens, allowing pharmacists to focus more on patient-centered care.

The integration of AI in pharmacy practice is also reshaping pharmaceutical supply chain management, clinical trial design, and adverse drug reaction detection. Through access to comprehensive datasets from global health bodies like the WHO and FDA, AI tools are able to deliver insights that are crucial for real-time decision-making, risk mitigation, and strategic planning in healthcare.

Despite these remarkable benefits, challenges such as data privacy concerns, lack of interoperability with legacy systems, regulatory hurdles, and ethical ambiguities must be addressed for AI to achieve its full potential. It is crucial to view AI as a supportive tool that augments—rather than replaces—human expertise.

Going forward, a collaborative approach involving pharmacists, clinicians, technologists, and policymakers is necessary to ensure the safe, ethical, and equitable adoption of AI technologies. With proper regulatory frameworks, continuous education, and robust data infrastructure, AI has the capacity to profoundly improve pharmacy practice and contribute to a more efficient, personalized, and patient-focused healthcare system.

REFERENCES

1. Krati, Dr. Martolia Jaya, et. al, A comprehensive review on in-vitro methods for anti- microbial activity, IP International Journal of Comprehensive and Advanced Pharmacology, 2024; 9(3).
2. Neeru, Shilpi Kashyap, Esha Vatsa, Jitendra Singh and Ankush Sundriyal "Determination of Total Phenolic Content, Total flavonoid Content and Total Antioxidant capacity of different extracts of Roylea elegans Wall. (aerial parts)" World journal of pharmacy and pharmaceutical sciences (WJPPS), 2016; 5(6): 1884-1891.
3. Neeru, Esha Vatsa, Jitendra Singh and Ankush Sundriyal "Pharmacognostic Standardization Parameters of Roylea elegans Wall. (Aerial Parts)" International Journal for Pharmaceutical Research Scholars (IJPRS), 2016; 5(2): 133-140.
4. Kundan Singh Bora and Esha Vatsa "Pharmacognostic Evaluation of Dendrobium macraei Lindl." Universities Journal of Phytochemistry and Ayurvedic Heights (UJPAH), 2016; 1(20): 29-36.
5. Amit Sharma, Bharat Parashar, Esha Vatsa, Shilpa Chandel and Surbhi Sharma "Phyto chemical screening and Anthelmintic activity of leaves of Cedrus deodara (Roxb.)" World journal of pharmacy and pharmaceutical sciences (WJPPS), 2016; 5(8): 1618-1628.
6. Amit Sharma, Surbhi Sharma, Shilpa Chandel, Esha Vatsa and Dr. Bharat Parashar "A review on Morchella esculanta: Therapeutically Potent plant" World journal of pharmacy and pharmaceutical sciences (WJPPS), 2016; 5(9): 685- 699.
7. Esha Vatsa and Kundan Singh Bora "Memory Enhancing Activity of Dendrobium macraei Lindl. in Swiss Albino Mice" British Journal of Pharmaceutical Research (BJPR), 2016; 13(2): 1-11.
8. Vatsa Esha, Chandel Shilpa, Parashar Bharat, Neeru "Physico-Chemical and Phytochemical Evaluation of Dendrobium macraei Lindl. (Whole Plant)" International Journal of Pharmacognosy and Phytochemical Research (IJPPR), 2016; 8(11): 1801-1811.
9. Esha Vatsa, Mehak Aggarwal, Shipra Gautam "Formulation and Evaluation of Polyherbal Facial Scrub" Just Agriculture multidisciplinary e-Newsletter, Article ID: 023, 2021; 1(9): 1-6.
10. Shipra Gautam, Madhubala Thakur, Mehak Aggarwal, Esha Vatsa "Azadirachta indica- A Review as a Potent Anti- Diabetic drug" Just Agriculture multidisciplinary e-Newsletter, Article ID:98, 2021; 1(10): 1-6.
11. Esha Vatsa, Samriti Faujdar, Nidhi Sharma, Shilpa Chandel, Mehak Aggarwal "Dendrobium macraei Lindl.: A review on medicinally potent orchid on the basis of recent evidences" Chinese Journal of Medical Genetics, 2022; 31(3): 560-571.
12. Krati, Babita Rawat, Abhishek Bhardwaj, Amandeep Singh, A Comprehensive Review on Indian Barnyard Millet (Echinochloa frumentacea), International Journal of Pharmaceutical Technology and Biotechnology, 2025; 12(1): 01-07.
13. Krati, Dr. Martolia Jaya, et. al, A Comprehensive review on in-vitro methods for antimicrobial activity" Educational administration: Theory and Practice". 2024; 30(6): 8 (2977-2984).

14. Esha Vatsa, Dr. Samriti Faujdar, Shilpa Chandel, Nidhi Chaudhary, Ashok Kumar, Neeru, "Studies on anti-inflammatory activities of whole plant of Dendrobium macraei Lindl." European Chemical Bulletin, 2023; 12(Special Issue 1): 657-664.
15. Esha Vatsa, Dr. Samriti Faujdar, Nitin Kumar, Nidhi Chaudhary, Shilpa Chandel, Neeru, Mehak Aggarwal "Current studies to justify the medicinal potential of the orchid Dendrobium macraei Lindl." European Chemical Bulletin, 2023; 12(S3): 5822-5830.
16. Divya Negi Rawat, Anjali Bisht, Esha Vatsa, Deepika Chandra, Nidhi Chaudhary, Ashok Kumar "Urinary bacterial profile and antibiotic susceptibility pattern among patients of urinary tract infections" High Technology letters, 2023; 29(10): 115-128.
17. Mehak Aggarwal, Ujjwal Nautiyal, Harmeet Singh, Esha Vatsa, Nidhi Chaudhary, Anjali Bisht, Divya Negi "Development and evaluation of drug delivery system containing luliconazole" High Technology letters, 2023; 29(11): 633-652.
18. Jagriti Gairola, Prashant Kukreti, Anjali Bisht, Divya Negi, Nidhi Chaudhary, Esha Vatsa "Development of Chronotherapeutic Delivery System for the Oral Administration of Aceclofenac for Rheumatoid Arthritis by Using Different Polymers" Journal of Chemical Health Risks, 2023; 13(6): 1180-1192.
19. Nidhi Chaudhary, Dr. Deepak Nanda, Dr. Esha Vatsa, Mithilesh Kesari, Harshita Chandra, Simran Singh Rathore "The Promise of Usefulness of the Evergreen Shrub Cassia auriculata" Journal of Advanced Zoology, 2023; 44(4): 1249-1261.
20. Ms Pooja Yadav, Dr. Esha Vatsa, Dr Arti Rauthan, "Enhancing Menstrual Awareness among Adolescent Girls: Evaluating the Influence of School Initiatives" Journal of Chemical Health Risks, 2024; 14(02): 3141-3149.
21. Mehak Aggarwal, Esha Vatsa, Nidhi Chaudhary, Shilpa Chandel, Shipra Gautam, "Formulation and Evaluation of Polyherbal Face Pack" Research Journal of Pharmacy and Technology, 2024; 17(6): 2481-2485.
22. Esha Vatsa, Mehak Aggarwal, Nidhi Chaudhary, Shipra Gautam, Neeru, Nitin Kumar, "Comparison Based on Pharmacognostical and Pharmacological Profile of Thuja Orientalis Linn. And Thuja Occidentalis Linn.: A Review" Naturalista Campano, 2024; 28(1): 3208-3219.
23. Priya Pandey, Esha Vatsa, Gaurav Lakhchora, Md Shamsher Alam, Niyaz Ahamad Ansari, Mohammad Dabeer Ahamad, Sarafarz Ahamad, Mukul Singh, Nitin kumar, "Nano Medicine Advancements in Addressing Rare Neurological Disorders: A Focus on Globoid Cell Leukodystrophy (Krabbe's Disease) Treatment" African Journal of Biological Sciences, 2024; 6(3): 2654-2684.
24. Esha Vatsa, Nidhi Chaudhary, Priya Khadwal, Mehak Aggarwal, Tanya Aggarwal, and Nishant Bhardwaj, "In vitro Antidiabetic Effect and Phytochemical Screening of Cassia biflora Mill." Indian Journal of Natural Sciences, 2025; 15(88): 87726-87733.
25. Anil Kumar, Dr. Esha Vatsa, "AI-Powered Embryo Selection is revolutionized: A Review" South Eastern European Journal of Public Health, 2025; XXVI (1): 6223-6230.
26. Lohani, V., A R, A., Kundu, S., Akhter, M. Q., & Bag, S. Single-Cell Proteomics with Spatial Attributes: Tools and Techniques. ACS omega, 2023; 8(20): 17499–17510. https://doi.org/10.1021/acsomega.3c00795.
27. Amandeep Singh, Deepak Nanda, Ashok Kumar and Abhishek Bhardwaj. In vitro evaluation of anti-inflammatory activity of ageratum conyzoides leaves by Human Red Blood Cell (HRBC) membrane stabilization method, International Journal of Research in Pharmaceutical and Nano Sciences, 2023; 12(6): 196-202.

28. Amandeep Singh, Deepak Nanda, Ashok Kumar, Abhishek Bhardwaj. In vitro evaluation of anti-inflammatory activity of ageratum conyzoides leaves by Human Red Blood Cell (HRBC) membrane stabilization method, International Journal of Research in Pharmaceutical and Nano Sciences, 2023; 12(6): 196-202.
29. Singh A, Nanda D, Bhardwaj A, Kumar A. A pharmacological investigation for therapeutic potential of Callistemon citrinus as an anthelmintic agent (Bottle-Brush Plant). IP Int J Comprehensive Adv Pharmacol, 2024; 9(3): 206-210.
30. Yogesh Tiwari, Amandeep Singh, Bhupendra Kumar, Ashok Kumar. "In Vitro Evaluation of Alpha Amylase Activity of Bark Extracts of Ficus Auriculata". International Journal of Innovative Science and Research Technology. December, 2017; 2(12): 88-92.
31. Bhupendra Kumar, Amandeep Singh, Yogesh Tiwari, Ashok Kumar. UV PROTECTIVE ACTIVITY OF GLYCINE MAX SEEDS. Indian Research Journal of Pharmacy and Science, 2017; 15: 1190-1195.
32. Reena Bhatt, Ashok Kumar, Ankita Sharma. Formulation and evaluation of shampoo formulated by glycine max seeds. Indian Research Journal of Pharmacy and Science; 15(2017): 1232-1238.
33. Kumar A, Nanda D and Gupta A. "A Prospective Study on the Risk Determinants and Economic Burden of Adverse Drug Reactions in Tertiary Care Hospital". Indian Journal of Natural Sciences, 2025; 15(88): 87957-87961.
34. Ashok Kumar, Deepak Nanda and Abhishek Gupta A holistic approach to adverse drug reactions in hospitals: Classification, risk factors, assessment and economic evaluation- A review. J. Exp. Zool. India, 2024; 27: 2337-2348. DOI: https://doi.org/10.51470/jez.2024.27.2.2337
35. Sakshi Garg, Ashok Kumar, Varsha Deva, Preeti Biswas, Harsh Rastogi, Heena Farooqui. Immediate-Release Drug Delivery System, Current Scenario, and Future Perspective-A Narrative Review. Jundishapur Journal of Microbiology, 2022; 15(1): 6509-6519.
36. Ashok Kumar, Deepak Nanda, Abhishek Gupta Pattern of Adverse Drug Reactions and Their Economic Impact on Admitted Patients in Medicine Wards of a Tertiary Care Hospital. Library Progress International, 2024; 44(4): 1120-1139.
37. Alisha Rawat, Meenakshi Sajwan, Yamini Chandola, Nidhi Gaur "Assaultive role of thiamine in coalition with selenium in treatment of liver cancer", Journal of emerging technologies and innovative research, 2022; 9(1); 2349-5162.
38. Ghildiyal, P., Bhatt, A., Chaudhary, N., Narwal, S.,Sehgal, P. "Study of various biochemical parameters on atrazine induced glucose-6-phosphate dehydrogenase deficiency in brain" International Journal of Health Sciences, 2022; 6(S7): 2552-2558.
39. Alok Bhatt, Arun Kumar, Pallavi Ghildiyal, Jyoti Maithani, Nidhi Chaudhary, Manish Nawani, Sonia Narwal "Phytochemical Profile of Melissa parviflora Benth" Neuro Quantology, 2022; 20(9); 2426-2428.
40. Palika Sehgal, Alok Bhatt, Sonia Narwal, Deepak P. Bhagwat, Nidhi Chaudhary et.al Formulation Characterization Optimization and In Vitro Evaluation of Aceclofenac Topical Emulgel, Neuro Quantology, 2022; 20(14): 1-09.
41. Sneha Rawat, Praveen Kumar Ashok, Abhishek bhardwaj "A review on Oro dispersible Tablet of Telmisartan" Org-Journal of Emerging Technologies and Innovative research (JETIR), May 2023; 10(5):i104-i112.
42. Jaison Varghese, Nitin kumar, Sapna Chaudhar, Abhishek Bhardwaj(2024) "Comparative In-Vitro Antioxidant and Antimicrobial Potential of Some Medicinal Plants" African Journal of Biological Sciences, https://doi.org/10.48047/AFJBS.6.Si3.2024.3340-3346.

43. Asima Imtiyaz, Ajay Singh, Abhishek Bhardwaj(2024) "Green synthesis of iron oxide nanoparticles from Iris kashmiriana (Mazar-Graveyard) Plant Extract its characterization of biological activities and photocatalytic activity" Journal of Industrial and Engineering Chemistry, https://doi.org/10.1016/j.jiec.2024.09.004.
44. Hem Chandra Pant, Bhawana Goswami, Ashok Kumar, Abhishek Bhardwaj, Shanti Rauthan and Amita pandey "A Review Paper on Bacopa monniera and Role of Artificial Intelligence (AI) in Medicinal Plant for Management and Treatment of Various Diseases" Indian Journal of Natural Sciences, 2025; 15(88): 01-10.
45. Vishwajeet Bachhar, Vibha Joshi, Ajay Singh, M. Amin Mir, Abhishek Bhardwaj(2025)"Antibacterial, Antioxidant, and Antidiabetic Activities of TiO2 Nanoparticles Synthesized Through Ultrasonication Assisted Cold Maceration from Stem Extract of Euphorbia hirta" Nano Bioscience, https://doi.org/10.33263/LIANBS141.001.
46. Nidhi Chaudhary, "A review on: The deciduous shrub "Punica granatum", European journal of biomedical and pharmaceutical sciences, 2016; 3(7); 2349-2388.
47. Singh Harmeet and Nidhi Chaudhary, "Evaluation of Lakshadi Guggul on experimentally induced global cerebral ischemia/reperfusion injury". World journal of Pharmacy and Pharmaceutical Sciences, 2016; 6(1); ISSN 2278-4357.
48. Nidhi Chaudhary and Harmeet Singh, "Evaluation of Punica Granatum Leaves Extract In Scopolamine Induced Learning And Memory Impairment In Mice". World journal of Pharmacy and Pharmaceutical Sciences, 6(6); 1677-1703.
49. Amandeep Singh, Pankaj Nainwal, Deepak Nanda,D.A. Jain, SOLUBILITY ENHENCEMENT OF PIOGLITAZONE WITH COMPLEXATION OF HYDROXYPROPYL-β-CYCLODEXTRIN, Digest Journal of Nanomaterials and Biostructures, Apr 2012 2(4): p.91-97.
50. Pankaj Nainwal Deepak Nanda, Amandeep Singh, D. A. Jain, Quantitative spectrophotometric determination of domperidone tablet formulations using ibuprofen sodium as hydrotropic solubilizing agent, Digest Journal of Nanomaterials and Biostructures, 2012; 2(4): 751 – 753
51. Deepak Nanda, Pankaj Nainwal, Amandeep Singh, D.A.Jain, Review on mixed-solvency concept: a novel concept of solubilization, Deepak Nanda et al.,Journal of Pharmacy Research, 2012; 3(2):411-413
52. Pankaj Nainwal, Amandeep Singh, Deepak Nanda, D.A.Jain, NEW QUANTITATIVE ESTIMATION OF ROSUVASTATIN BULK SAMPLE USING SODIUM BENZOATE AS HYDROTROPIC SOLUBILIZING AGENT, Journal of Pharmacy Research, 2012; 3(1): 6-8
53. Nainwal.P, Bhagla.A, Nanda.D, STUDY ON ANTIOXIDANT POTENTIAL AND WOUND HEALING ACTIVITY ON THE AQUEOUS EXTRACT OF FRUITS OF GARCINIA MANGOSTANA, IJPI's Journal of Pharmacognosy and Herbal Formulations, Volume-1
54. Pankaj Nainwal, Kapil Kalra, Deepak Nanda, Amandeep Singh, STUDY OF ANALGESIC AND ANTI-INFLAMMATORY ACTIVITIES OF THE ETHANOLIC EXTRACT ARIAL PARTS OF FUMARIA VAILLANTII LOISEL, Asian Journal of Pharmaceutical and Clinical Research, 2011; 4(1).
55. Amandeep Singh, Pankaj Nainwal, Deepak Nanda, D.A.Jain, SOLUBILITY ENHANCEMENT STUDY OF PIOGLITAZONE USING SOLID DISPERSION AS SOLUBILIZATION TECHNIQUE, International Journal of Science Innovations and Discoveries, Amandeep Singh et al., IJSID, 2011; 1(2): 95—100

56. Amandeep Singh, Pankaj Nainwal, Deepak Nanda, D. A. Jain, THE SOLUBILITY ENHANCEMENT STUDY OF PIOGLITAZONE USING DIFFERENT SOLUBLIZATION TECHNIQUIES, International Journal of Pharmacy & Pharmaceutical Sciences, 2012; 4(2).
57. Deepak Nanda, Pankaj Nainwal, Amandeep Singh, D.A.Jain, SOLUBILITY ENHANCEMENT STUDY OF DOMPERIDONE USING DIFFERENT SOLUBILIZATION TECHNIQUES, International Journal of Pharmacy and Pharmaceutical Sciences 2012; 2(3).
58. Pankaj Nainwal, Priyanka Sinha, Amandeep Singh, Deepak Nanda, D.A.Jain, A COMPARATIVE SOLUBILITY ENHANCEMENT STUDY OF ROSUVASTATIN USING SOLUBILIZATION TECHNIQUES, International Journal of Applied Biology & Pharmaceutical Technology, Oct - Dec -2011; 2(4).
59. Pankaj Nainwal, Deepak Nanda, Amandeep Singh, D. A. Jain, FORMULATION AND EVALUATION OF SOLID DISPERSION OF ROSUVASTATIN WITH VARIOUS CARRIERS,Pharmacie Globale International Journal Of Comprehensive Pharmacy, Issn 0976-8157.
60. Pankaj Nainwal, Amandeep Singh1, Deepak Nanda, D.A.Jain, SOLUBILITY ENHANCEMENT OF AN ANTIHYPERLIPIDEMIC DRUG ROSUVASTATIN BY SOLID DISPERSION TECHNIQUE, International Journal of PharmTech Research IJPRIF ISSN: 0974-4304, March-June 2012; 2: 3.
61. Kshitiz Agrawal, Pragati Bailwal, Amandeep Singh. Prem Saini, DEVELOPMENT OF QUALITY STANDARDS OF SUPRABHATAM CHURNA: A POLY HERBAL FORMULATION, International Journal of Pharmaceutical Research & Development,IJPRD, 2011; 4, June 2012.
62. Kapil Kalra, Amandeep Singh, Manisha Gaur, Ravindra P. Singh, and D. A. Jain, ENHANCEMENT OF BIOAVAILABLITY OF RIFAPENTINE BY SOLID DISPERSION TECHNIQUE, International Journal Of Pharmacy & Life Sciences, Kalra et al., April, 2011; 2(4).
63. Pankaj nainwal, Ranveer batsa, Amandeep singh, Deepak nanda, MEDICINAL PLANT STUDIES INFLUECED BY THE BIOTECHNOLOGICAL METHODS: A UPDATED REVIEW, International Journal of Pharma and Bio Sciences Apr-June-2011; 2(2).
64. Amandeep Singh, Sandhiya Pal, Prem Saini, IN- VITRO EVALUTION OF ANTI-INFLAMMATOTRY ACTIVITY OF TERMANALIA ARJUNA BARK EXTRACT, Journal of Innovative trends in Pharmaceutical Sciences,Vol-1(1): 9-12.
65. Amandeep Singh, Pramila Chauhan, Prem Saini, IN-VITRO ANTI-INFLAMMATORY EVALUTION OF HYDROALCOHALIC LEAVES EXTACT OF PINUS ROXBURGHII BY HRBC METHOD, International journal of Research in Pharmaceutical and Nano Sciences, 2013; 2(3): 268-271.
66. Amandeep Singh, Sumit Negi, Prem Saini, In Vitro Anti-Inflammatory Evaluation Of Leaves Using Hydroalcohalic Extract Of "Mangifera indica" International Journal of Pharmacy and Integrated Life Sciences, V1-(I7) PG (93-98).
67. Aman Deep Baghla, Kshitij Agarwal, Ramesh Verma and Deepak Nanda, Wound Healing Effect of the Aqueous Extract of the Leaves of Psidium guajava Linn., International Journal of chemicals and Life Sciences, 2013; 02 (03): 1104-1106.
68. Aman Deep Baghla, Kshitij Agarwal, Ramesh Verma and Deepak Nanda, WOUND HEALING EFFECT OF THE AQUEOUS EXTRACT OF THE LEAVES OF PSIDIUM GUAJAVA LINN., International Journal of chemicals and Life Sciences, 2013; 02(03): 1104-1106.

69. Bhupendra Kumar, Meenakshi Ghildiyal, Yogesh Tiwari, Deepika Chauhan, Amandeep Singh, IN-VITRO ANTI-INFLAMMATORY ACTIVITY OF GLYCINE MAX SEEDS, Indo American Journal Of Pharmaceutical Sciences, 2018; 05(02): 868-871.
70. Piyali Dey, Jyoti Pandey, Bhupendra kumar, Amandeep Singh, IN VITRO ANTHELMINTIC ACTIVITY OF BARK EXTRACTS OF ARTOCARPUS HETEROPHYLLUS, International Journal of Pharmacy & Pharmaceutical Research, 2018; 03(11): 33-40.
71. Bhupendra Kumar, Yogesh Tiwari, Amandeep Singh, Vineet Kumar, IN VITRO ANTIUROLITHIC ACTIVITY OF FICUS PALMATA LEAVES, International Journal Of Pharmaceutical Technology And Biotechnology, 2019; 6(1): 01-09.
72. Md. Daneyal Khurshid, Vivek Shukla, Bhupendra Kumar and Amandeep A Review Paper on Medicinal Properties of Phyllanthus emblica, International Journal of Pharmacy and Biological Sciences, 2020; 10(3): 102-109.
73. Mr. Dwivedi Vishal, Mrs. Nisha A Bhatt, Dr. Amandeep Singh PREPARATION AND STANDARDIZATION OF NAVKARSHIKA CHURNA, World Journal of Pharmacy and Pharmaceutical Sciences, 2020; 9(8).
74. Mitun Saha1, Mr. Bhupendra Kumar, Dr. Amandeep Singh Review Article on Various Phytochemicals and Different Medicinal Activities of Haritaki International Journal of Innovative Science and Research Technology, June 2020; 5(6).