*NCAPBS-26-IL-004*

# Artificial intelligence in modern pharmaceutical sciences: shaping the future of drug development and patient outcomes

Jaya Gopal Meher*

Ph.D., Scientist, Ferring Hyderabad Product Development Center (FHPDC),
Ferring Pharmaceuticals Pvt. Ltd., Hyderabad

*Corresponding author

## ABSTRACT

Artificial intelligence (AI) is rapidly transforming pharmaceutical sciences by accelerating innovation across discovery, development, and manufacturing. Traditional R&D processes remain slow, costly, and characterized by high failure rates, whereas AI offers early prediction, faster iteration, and enhanced decision-making that reduce development time and cost. AI-driven drug discovery enables target identification, protein structure prediction, and rapid molecule screening, facilitating quicker access to life-saving therapies. In formulation development, AI predicts excipient compatibility, models stability, and optimizes bioavailability, enabling patient-specific and more effective formulations. Manufacturing is undergoing a paradigm shift from reactive, manual processes to predictive, automated, and data-driven systems. Digital twins, predictive maintenance, and real-time analytics promote consistent quality, fewer deviations, and efficient scale-up. In bioprocessing, AI enhances media optimization, yield prediction, and upstream–downstream balancing. AI also strengthens regulatory science through NLP-based document consistency checks and improves clinical trial design via optimized site selection, automated patient recruitment, and trial success prediction. Furthermore, integration of real-world data enables continuous safety monitoring, early detection of adverse events, and dynamic benefit–risk evaluation. Overall, AI enhances rather than replaces scientific expertise, enabling a more efficient, patient-centric, and globally responsive pharmaceutical ecosystem.

***Keywords:*** *AI in Pharma, Drug Discovery, Formulation Development, Smart Manufacturing, Predictive Maintenance, Patient-Centric Healthcare*



DOI: 10.21467/abstracts.8.4 ISBN: 978-81-989164-5-7 (eBook), 978-81-998984-7-9 (Paperback)