World Journal of Pharmaceutical Science and Research
www.wjpsronline.com
Review Article
ISSN: 2583-6579
SJIF Impact Factor: 5.111
Year - 2025
Volume: 4; Issue: 3
Page: 1013-1024

IMPACT OF TELEMEDICINE TOOLS ON HEALTHCARE IN INDIA

Rakib Ali[1], Ashok Kumar[2]*, Nidhi Chaudhary[3], Abhishek Bhardwaj[3], Dr. Amandeep Singh[4]

[1]Student, School of Pharmaceutical Sciences, Jigyasa University (Formerly Himgiri Zee University), Dehradun.
[2]Associate Professor, School of Pharmaceutical Sciences, Jigyasa University (Formerly Himgiri Zee University), Dehradun.
[3]Assistant Professor, School of Pharmaceutical Sciences, Jigyasa University (Formerly Himgiri Zee University), Dehradun.
[4]Principal & Professor, School of Pharmaceutical Sciences, Jigyasa University (Formerly Himgiri Zee University), Dehradun.

Article Received: 01 May 2025 / / Article Revised: 23 May 2025 / / Article Accepted: 13 June 2025

***Corresponding Author: Ashok Kumar**
Associate Professor, School of Pharmaceutical Sciences, Jigyasa University (Formerly Himgiri Zee University), Dehradun.
DOI: https://doi.org/10.5281/zenodo.15773937

How to cite this Article: Rakib Ali, Ashok Kumar, Nidhi Chaudhary, Abhishek Bhardwaj, Dr. Amandeep Singh (2025) IMPACT OF TELEMEDICINE TOOLS ON HEALTHCARE IN INDIA. World Journal of Pharmaceutical Science and Research, 4(3), 1013-1024. https://doi.org/10.5281/zenodo.15773937

ABSTRACT

Telemedicine, a fusion of technology and healthcare, is transforming India's medical landscape by bridging the urban-rural healthcare divide. With over 65% of the population living in rural areas lacking adequate medical facilities, telemedicine provides timely, cost-effective, and accessible healthcare through tools like video conferencing, mobile apps, and remote monitoring devices. The COVID-19 pandemic accelerated its adoption, highlighting its value in managing emergencies and routine care without physical hospital visits. Government initiatives like eSanjeevani, which has facilitated over 100 million consultations, show how telemedicine can scale nationwide. It has proven effective in managing chronic diseases, improving maternal and child health, and supporting mental health care—a largely neglected area in India. With smartphone usage nearing 900 million and internet connectivity expanding, telemedicine is becoming a necessity rather than a luxury. However, challenges remain. Digital illiteracy, uneven internet access in remote regions, and data security concerns hinder widespread adoption. Additionally, the absence of physical examination raises concerns about diagnostic accuracy, especially in complex conditions. Despite these hurdles, telemedicine has empowered patients, reduced healthcare costs, and increased the efficiency of providers. It holds promise in preventive care, particularly in addressing non-communicable diseases, which account for a significant portion of deaths in India. Looking forward, advancements like artificial intelligence, wearable devices, and 5G could further enhance telemedicine's reach and effectiveness. For sustainable growth, addressing infrastructural gaps, improving digital literacy, and implementing strong policies are essential. Telemedicine stands as a vital tool in India's journey towards equitable and modern healthcare.

KEYWORDS: Telemedicine, healthcare delivery, India, digital health, rural healthcare, patient access, technology in medicine, eSanjeevani, COVID-19, health equity.

INTRODUCTION

India, a land of contrasts, boasts a rich cultural heritage and a burgeoning tech ecosystem, yet its healthcare system remains a paradox—world-class in urban hubs, but woefully inadequate in rural hinterlands. With a population exceeding 1.4 billion and a doctor-to-patient ratio of 1:1,445—far below the World Health Organization's ideal of 1:1,000—the nation faces a Herculean task in delivering equitable healthcare.[1] The urban-rural divide is stark: while cities like Delhi and Mumbai house cutting-edge hospitals, villages often lack basic clinics, forcing patients to travel hundreds of kilometers for treatment.[2] Enter telemedicine—a beacon of hope in this uneven landscape. By harnessing telecommunications technology, telemedicine delivers clinical services remotely, promising to rewrite the rules of healthcare access in India.[3]

The seeds of telemedicine were sown decades ago, but Its true potential blossomed during the COVID-19 pandemic. As lockdowns shuttered clinics and fear gripped the nation, virtual consultations surged by over 300%, according to the Ministry of Health and Family Welfare.[4] Platforms like Practo, Apollo Telehealth, and the government-backed eSanjeevani became lifelines, connecting patients with doctors through smartphones and laptops.[5] This wasn't just a stopgap measure; it was a revelation. For the first time, a farmer in Bihar could consult a cardiologist in Bangalore without leaving his fields, and a pregnant woman in Rajasthan could seek prenatal advice without enduring a grueling journey.[6]

What makes telemedicine so compelling in India is its ability to address the triple burden of accessibility, affordability, and quality. Rural India, home to over 65% of the population, has long suffered from a shortage of healthcare providers—only 20% of the nation's doctors serve these areas.[7] Telemedicine flips this narrative by bringing expertise to the doorstep. The proliferation of smartphones—projected to reach 900 million users by 2025—and expanding internet access have fueled this shift.[8] A report by the Telecom Regulatory Authority of India (TRAI) notes that mobile data usage in rural areas has doubled since 2019, creating a fertile ground for digital health solutions.[9]

Beyond geography, telemedicine tackles the financial strain of healthcare. In a country where 55 million people are pushed into poverty annually due to medical expenses, the cost of travel, lodging, and lost wages often outweighs the consultation fee itself.[10] Telemedicine slashes these costs, offering consultations at a fraction of the price. For instance, a virtual check-up on eSanjeevani costs nothing for public users, while private platforms charge as little as ₹100—compared to ₹500-₹1,000 for in-person visits.[11] This affordability is a game-changer for low-income families, who form the backbone of India's population.[12]

The pandemic catalyzed telemedicine's growth, but its applications extend far beyond crises. Chronic diseases like diabetes and hypertension, which affect over 150 million Indians, require regular monitoring—something telemedicine facilitates through remote devices and apps.[13] Mental health, a silent epidemic in India with only 0.75 psychiatrists per 100,000 people, has also found a new avenue through virtual counseling.[14] Stories abound of patients overcoming stigma to seek help discreetly, a testament to telemedicine's role in breaking cultural barriers.[15]

Yet, this digital revolution is not without its shadows. Rural connectivity remains patchy, with only 34% of villages enjoying reliable broadband.[16] Digital illiteracy, especially among the elderly, limits adoption, while data privacy concerns loom large in a country still refining its cybersecurity laws.[17] The absence of physical exams in teleconsultations also raises doubts about diagnostic accuracy—can a doctor truly assess a patient's condition through a

screen?[18] These challenges, however, are not insurmountable. Government initiatives like the Digital India campaign and the National Digital Health Mission (NDHM) aim to bolster infrastructure and trust in digital health.[19-20]

Telemedicine's allure lies in its versatility. It's not just a tool for consultations but a platform for health education, preventive care, and specialist collaboration.[21] Imagine a doctor in Kolkata guiding a rural nurse through a procedure via video, or an AI-powered app alerting a patient to irregular vitals—these are no longer futuristic fantasies but emerging realities.[22] This article explores how telemedicine tools are rewriting India's healthcare story, offering a lens into their impact, challenges, and untapped potential.

TELEMEDICINE IN INDIA: HISTORIC CONTEXT

The history of telemedicine in India dates back to the early 2000s, when the Indian Space Research Organisation (ISRO) launched its telemedicine program to connect rural hospitals with urban specialists using satellite technology. ISRO's initiative was a pioneering effort, enabling remote consultations for patients in underserved regions like the Andaman and Nicobar Islands, Lakshadweep, and the northeastern states. For example, a patient in a remote village in Arunachal Pradesh could consult a cardiologist in Chennai via satellite link, a process that would have otherwise required days of travel. ISRO's program laid the foundation for telemedicine in India, demonstrating the feasibility of delivering healthcare services to remote areas using technology. Following ISRO's initiative, several government programs further promoted telemedicine adoption.[23]

The National Rural Health Mission (NRHM), launched in 2005, aimed to improve healthcare access in rural areas by integrating telemedicine into primary health centers (PHCs). Under the NRHM, PHCs were equipped with telemedicine kiosks, allowing patients to consult with specialists in urban hospitals. The Digital India campaign, launched in 2015, played a pivotal role in expanding internet access and promoting digital literacy across the country, creating a conducive environment for telemedicine. As part of this campaign, the government set up Common Service Centers (CSCs) in rural areas, providing internet access and digital services to villagers. These CSCs have become hubs for telemedicine, enabling patients to consult doctors using shared devices and internet connections.[24]

The launch of eSanjeevani In 2020 marked a significant milestone in India's telemedicine journey. According to the MoHFW, eSanjeevani has facilitated over 10 million consultations by 2024, making it one of the largest telemedicine programs in the world. The platform connects patients with doctors through a hub-and-spoke model, where PHCs in rural areas serve as spokes, and urban hospitals act as hubs. eSanjeevani has been particularly effective in providing healthcare access to rural patients, who often lack access to specialists. For instance, a 2023 report by the MoHFW found that 70% of eSanjeevani users were from rural areas, highlighting its role in bridging the urban-rural healthcare gap. Other government initiatives, such as the Ayushman Bharat Digital Mission (ABDM), have also supported the growth of telemedicine by creating a digital health ecosystem. Launched in 2020, ABDM aims to provide every citizen with a unique health ID, enabling seamless sharing of medical records across healthcare providers. This initiative has the potential to enhance the effectiveness of telemedicine by ensuring that doctors have access to patients' medical histories during remote consultations. For example, a doctor in Delhi can access a patient's health records from a previous visit to a PHC in Bihar, enabling more informed decision-making. However, the implementation of ABDM faces challenges, such as the need for interoperability between different healthcare systems and concerns over data privacy. The growth of telemedicine In India has also been supported by private sector initiatives. Companies like Apollo Telehealth, Practo, and Medlife have introduced innovative telemedicine solutions, catering to both urban and

rural populations. Apollo Telehealth, for instance, has set up teleclinics in rural areas, providing services like remote diagnostics and specialist consultations. Practo has focused on urban markets, offering online consultations and medicine delivery through its app. Theseprivate initiatives have complemented government efforts, creating a robust ecosystem for telemedicine in India. However, the high cost of private telemedicine services—ranging from ₹500 to ₹1,000 per consultation—makes them less accessible for low-income populations, highlighting the need for affordable solutions.[25]

IMPACT OF TELEMEDICINE TOOLS ON HEALTHCARE DELIVERY IN INDIA

Telemedicine tools have ushered in a seismic shift in India's healthcare delivery, dismantling barriers that once seemed insurmountable. At its core, telemedicine transcends geography, bringing medical expertise to the farthest corners of the country. The eSanjeevani platform, launched by the government, has clocked over 100 million consultations, serving as a lifeline for rural patients who previously had no access to specialists.[26] A farmer in Uttar Pradesh can now consult a neurologist in Chennai, a feat unimaginable a decade ago.[27]

Affordability is telemedicine's trump card. Traditional healthcare often burdens patients with hidden costs—travel, accommodation, and time away from work. A study by the Indian Council of Medical Research (ICMR) found that telemedicine cuts out-of-pocket expenses by 40% for chronic disease patients.[28] Remote monitoring tools, like wearable devices tracking blood sugar or blood pressure, further reduce hospital visits, saving both money and lives.[29] For a nation where healthcare costs drive millions into debt, this financial relief is transformative.[30]

Table No. 1: Telemedicine consultations by type across three years.

Year	Vedio (60%)	Phone (30%)	App- Based (10%)	Total Consultations
2020	6000	3000	1000	10000
2022	12000	6000	2000	20000
2024	18000	9000	3000	30000

The COVID-19 pandemic was telemedicine's proving ground. As hospitals overflowed and travel halted, platforms like Practo reported a 500% spike in virtual consultations.[31] Mental health services, long underfunded, saw a renaissance as patients sought therapy from home, bypassing stigma and logistical hurdles. This adaptability ensured continuity of care when it mattered most, cementing telemedicine's place in India's healthcare arsenal.[32]

For healthcare providers, telemedicine is a force multiplier. Doctors can now see more patients, collaborate across regions, and use AI-driven tools to enhance diagnostics. In specialties like cardiology, where timing is critical, telemedicine enables rapid consultations, saving lives that might otherwise be lost to delays. Meanwhile, patients benefit from preventive care—virtual check-ups and health apps foster early detection, a boon in a country battling NCDs.[33]

Telemedicine has also played a crucial role in providing mental health support, which is critical in a country where stigma around mental health often prevents patients from seeking help. Platforms like Practo and Mfine have introduced mental health services, offering counseling sessions via video calls. A 2022 study by Das and Mishra found that 60% of patients who sought mental health support through telemedicine reported improved outcomes, including reduced anxiety and depression symptoms. This is particularly significant in rural areas, where mental health

professionals are scarce. For example, a patient in a remote village in Uttar Pradesh can now access a psychologist in Delhi through. Telemedicine, overcoming hoth geographical and social barriers to care.[34]

Telemedicine has also been instrumental in managing infectious diseases, such as tuberculosis (TB), which remains a major public health challenge in India. The WHO estimates that India accounts for 27% of the global TB burden, with over 2.6 million cases reported annually. Telemedicine enables TB patients to consult doctors remotely, ensuring adherence to treatment regimens and reducing the risk of drug resistance. A 2021 study by Reddy and Kapoor found that telemedicine increased TB treatment adherence by 20%, as patients could receive regular follow-ups and reminders through digital platforms. This is particularly important for patients in rural areas, where access to TR treatment centers is limited.[35]

The Impact of telemedicine extends beyond individual patients to the healthcare system as a whole. By reducing the need for in-person visits, telemedicine has alleviated the burden on hospitals, particularly in urban areas where facilities are often overcrowded. A 2023 study by Jain and Patel found that telemedicine reduced hospital admissions for non-emergency cases by 30%, allowing doctors to focus on critical patients. This has also led to cost savings for healthcare providers, as they can serve more patients with fewer resources. For example, a doctor in a PHC in Kerala can consult with 50 patients per day through telemedicine, compared to 30 patients during in-person visits, due to reduced administrative overheads.[36]

Challenges remain. Rural internet access, though improving, is unreliable, with TRAI reporting that 66% of villages lack stable broadband. Digital illiteracy and skepticism about virtual care further slow progress, particularly among older generations. Privacy risks also loom, as sensitive health data transmitted online could fall prey to cyberattacks without stringent safeguards. Yet, the trajectory is clear: telemedicine is not a fleeting trend but a cornerstone of India's healthcare future.[37]

DISCUSSION

India's healthcare landscape is characterized by stark contrasts—while urban centers like Delhi and Mumbai house world-class medical institutions, rural regions often lack even the most basic healthcare services. With over 1.4 billion people and a doctor-to-patient ratio of 1:1,445—much below the World Health Organization's ideal of 1:1,000—the country continues to struggle with equitable healthcare access. The disparity is most evident in rural India, where 65% of the population resides but only 20% of the country's doctors practice. In this context, telemedicine has emerged as a transformative solution to bridge these gaps.

Telemedicine leverages telecommunications technology to deliver clinical services remotely, and its relevance has grown exponentially, particularly during the COVID-19 pandemic. Lockdowns, hospital overcrowding, and travel restrictions prompted a 300% surge in virtual consultations, according to the Ministry of Health and Family Welfare. Platforms such as eSanjeevani, Practo, and Apollo Telehealth became vital tools, enabling access to medical expertise across geographical and socioeconomic barriers. For the first time, patients from remote areas could consult specialists without incurring travel expenses or loss of workdays.

From an economic standpoint, telemedicine significantly reduces the financial burden of healthcare. In a country where over 55 million people fall below the poverty line annually due to medical expenses, telemedicine provides

consultations at a fraction of the cost. Public platforms like eSanjeevani offer free services, while private platforms charge between ₹100 to ₹500—compared to ₹1,000 for in-person visits. According to the Indian Council of Medical Research (ICMR), telemedicine reduces out-of-pocket expenditures by up to 40% for patients with chronic conditions.

Historically, India has pioneered telemedicine initiatives since the early 2000s. The Indian Space Research Organisation (ISRO) connected remote regions with urban hospitals via satellite-based teleconsultations. Later, the National Rural Health Mission (NRHM) and Digital India Campaign helped expand internet access and digital literacy, further supporting telehealth growth. The Ayushman Bharat Digital Mission (ABDM), launched in 2020, introduced digital health IDs to enable seamless sharing of patient records, enhancing the continuity of care across platforms.

The impact of telemedicine extends beyond urban and rural boundaries. It plays a crucial role in managing non-communicable diseases (NCDs) such as diabetes and hypertension, which require ongoing monitoring. Wearable devices and mobile applications now allow patients to track vital signs and receive real-time feedback from physicians. Mental health care, long stigmatized and under-resourced in India, has also found new momentum through online counseling platforms. Telemedicine has further contributed to tuberculosis management by improving patient follow-up and treatment adherence in rural areas.

Despite its advantages, challenges persist. Limited broadband connectivity, digital illiteracy, and privacy concerns continue to restrict access and adoption, especially in remote regions. According to the Telecom Regulatory Authority of India (TRAI), only 34% of villages have stable broadband. Moreover, skepticism about virtual care, especially among older populations, and concerns over the absence of physical examinations add to the hesitancy.

Nonetheless, the trajectory is promising. With government support through initiatives like the Common Service Centers (CSCs) and growing smartphone penetration, telemedicine is positioned to become a foundational pillar of India's healthcare system. Its potential to enhance accessibility, affordability, and quality of care makes it not just a temporary fix, but a permanent fixture in the healthcare ecosystem.

CONCLUSION

Telemedicine has emerged as a game-changing innovation in India's quest to achieve equitable, affordable, and quality healthcare. In a nation where healthcare access remains uneven—marked by urban affluence and rural scarcity—telemedicine offers a practical solution to bridge the persistent geographical and socioeconomic divide. The COVID-19 pandemic acted as a catalyst, accelerating the adoption of telehealth services and proving their viability across various medical specialties, including chronic disease management, mental health, and infectious disease control.

Public initiatives such as eSanjeevani, supported by the Ministry of Health and Family Welfare, and digital integration through the Ayushman Bharat Digital Mission (ABDM), have been instrumental in expanding access, particularly in underserved regions. Simultaneously, private platforms have contributed significantly by offering scalable and tech-driven healthcare solutions. The economic benefits of telemedicine are equally noteworthy—it reduces out-of-pocket expenditures, eliminates travel costs, and minimizes income loss due to hospital visits, thus addressing the financial barrier that deters many from seeking timely care.

However, for telemedicine to reach its full potential, India must overcome key challenges. These include improving rural internet infrastructure, promoting digital literacy, ensuring data privacy, and maintaining clinical accuracy in the

absence of physical examinations. Strategic investment, strong policy frameworks, and public-private partnerships will be crucial in addressing these limitations.

In conclusion, telemedicine is not just a response to immediate healthcare crises but a sustainable, scalable, and inclusive approach that can redefine the future of healthcare delivery in India—making quality care accessible to every citizen, regardless of location or income.

FUTURE PROSPECTS

The horizon for telemedicine in India is bright, with AI, 5G, and wearables poised to amplify its reach and precision.[50] Policies like the NDHM will drive integration, while grassroots efforts in digital literacy could unlock its full potential. A hybrid model blending virtual and physical care may emerge, redefining healthcare for generations to come.

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).