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Research Priorities for a Resilient Healthcare System in India: Integrating Molecular Discoveries, Diagnostic Innovation and Community-Based Interventions

Parikshit Nagda[1] & Mahendra Singh Rathore[1]

[1] Department of Pharmacy Practice, Geetanjali Institute of Pharmacy, Udaipur, India

Corresponding Author: Mahendra Singh Rathore | Email: msrathore78@gmail.com

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Authors:
Parikshit Nagda, Mahendra Singh Rathore

Corresponding author:
Mahendra Singh Rathore

Email:
msrathore78@gmail.com

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ABSTRACT

Healthcare research in India is expanding across molecular biology, clinical medicine, diagnostic technologies and public health. However, the translation of scientific discoveries into accessible healthcare interventions remains a major challenge. Emerging research in biological defence mechanisms, cancer biology, infectious diseases, genetic disorders and clinical therapeutics provides opportunities to strengthen disease prevention and management. At the same time, investigations into healthcare accessibility, community-based screening and primary healthcare delivery highlight the importance of an effective health-system response. This perspective examines selected research developments across these domains and discusses their relevance to strengthening healthcare research and service delivery in India. It also identifies priorities for interdisciplinary collaboration, diagnostic standardisation, regional research infrastructure and evidence-based healthcare implementation.

Keywords: Healthcare research; molecular biology; diagnostic innovation; translational medicine; public health; health systems; India.

1. INTRODUCTION

Healthcare systems require continuous scientific development to respond to emerging diseases, changing population needs and technological advancements. Research contributes to this process by identifying disease mechanisms, evaluating diagnostic approaches and generating evidence for clinical and public health interventions.

In India, healthcare challenges are influenced by geographical variation, socioeconomic conditions, differences in disease burden and unequal access to diagnostic and treatment facilities. Consequently, research priorities should extend beyond laboratory discoveries to include clinical validation and community-level implementation.

Recent publications across biological sciences, clinical medicine and public health demonstrate the multidisciplinary nature of contemporary healthcare research. Connecting these different research areas may help identify opportunities for scientific collaboration and improve the relevance of research to regional healthcare priorities.

2. BIOLOGICAL RESEARCH AND EMERGING MOLECULAR APPROACHES

Fundamental biological research provides the basis for understanding cellular regulation, defence mechanisms and responses to environmental stress. Investigations involving *Arabidopsis thaliana* have examined the molecular regulation of salicylic acid accumulation, jasmonic acid signalling and resistance against bacterial and necrotrophic pathogens [1, 2, 3, 4, 5, 6, 7, 8]. Additional work has explored the relationship between immune priming and thermotolerance [10].

Although these studies concern plant biology, they demonstrate the value of experimental models in investigating complex regulatory pathways and biological defence responses. Such research contributes to fundamental biological knowledge, although its findings should not be directly extrapolated to human disease.

In human disease research, molecular approaches are increasingly being investigated to understand cancer-associated processes and therapeutic resistance. Research on ferroptosis has discussed its molecular mechanisms and potential relevance to cancer treatment, providing another example of how fundamental biological processes can inform future therapeutic investigations [37].

3. DIAGNOSTIC INNOVATION AND DISEASE DETECTION

Timely diagnosis is essential for reducing complications and improving disease management. However, diagnostic accessibility remains a concern in several regions, particularly in rural and tribal populations.

Research examining point-of-care testing for sickle cell disease in resource-limited tribal settings has investigated the feasibility of decentralised diagnostic approaches [13]. The role of primary healthcare providers in sickle cell disease management has also been explored, emphasising the importance of integrating diagnosis with counselling, referral and continuing care [15].

Further research has examined barriers faced by individuals with sickle cell disease and their caregivers when accessing healthcare facilities [25]. Nanotechnology-based diagnostic approaches for sickle cell disease and thalassemia represent another emerging research direction [27].

Laboratory diagnostic research is equally important. Investigations into the temporal stability of human serum for dengue diagnosis using ELISA highlight the relevance of specimen handling and laboratory quality assurance in diagnostic testing [26].

Together, these studies indicate that diagnostic innovation must consider not only analytical performance but also affordability, sample management, operational feasibility and accessibility.

4. CANCER PREVENTION AND EARLY DETECTION

Cancer control requires an integrated approach involving risk reduction, early detection, diagnostic confirmation and access to appropriate treatment.

Research examining oral potentially malignant disorders in western Rajasthan provides regional evidence regarding an important group of conditions associated with oral cancer risk [9]. Community-level capacity-building initiatives involving community health officers have also explored methods to strengthen oral cancer screening and early diagnosis in Jodhpur [11].

Molecular docking research investigating pyocyanin from *Pseudomonas aeruginosa* with NADPH oxidase and Toll-like receptor 4 has explored a possible connection between microbial factors and oral cancer-associated pathways [19]. Such computational findings require experimental and clinical validation before any conclusions about carcinogenesis can be drawn.

At the health-system level, systematic reviews examining community and healthcare-related barriers to oral cancer screening have identified implementation challenges in India [20]. Further evidence concerning barriers and facilitators of oral, breast and cervical cancer screening highlights the importance of awareness, service availability and effective referral systems [22].

These studies suggest that early cancer detection requires coordination between research institutions, healthcare professionals and community-based services.

5. INFECTIOUS DISEASES AND INTEGRATED DISEASE MANAGEMENT

Infectious diseases continue to require coordinated clinical and public health responses. Tuberculosis is particularly relevant in populations affected by malnutrition, diabetes and other comorbidities.

Research examining challenges in implementing National Tuberculosis Elimination Programme guidelines at Nutrition Rehabilitation Centres has explored gaps in programme delivery [12]. Studies involving malnourished children have investigated factors associated with pulmonary tuberculosis in rehabilitation-centre settings [16].

The relationship between tuberculosis and diabetes has also been examined among notified patients in Jaipur, Rajasthan [17]. Additional research has described healthcare-seeking patterns and treatment outcomes among patients with tuberculosis-HIV comorbidity [18].

Qualitative investigations of healthcare providers' perceptions of programme implementation and community-based research examining tuberculosis-associated vulnerabilities further emphasise the influence of healthcare access and social conditions on disease management [23, 24].

These findings support the need for integrated healthcare approaches involving screening, early diagnosis, nutritional assessment and continuity of treatment.

6. CLINICAL RESEARCH AND THERAPEUTIC DEVELOPMENT

Clinical research plays an important role in evaluating treatment strategies, understanding disease presentations and improving patient care.

Investigations into myostatin-associated muscle hypertrophy have examined biological mechanisms relevant to skeletal muscle physiology [28]. Research on benign breast diseases has contributed to the clinical understanding of breast-related presentations and diagnostic considerations [29].

The development of robotic surgery and artificial intelligence-based surgical systems has generated interest in improving surgical precision, efficiency and individualised procedures [30]. Meanwhile, studies evaluating pregabalin for postoperative pain management have investigated its potential role in perioperative clinical care [31, 38].

Other publications have explored uncommon clinical presentations, including Andersson lesions in ankylosing spondylitis [32], the possible relationship between thyroid disorders and epilepsy [33], and evolving diagnostic and therapeutic approaches in systemic light-chain amyloidosis [34].

These investigations demonstrate the importance of continued clinical research across different specialties. However, their findings require appropriate study designs and independent clinical evaluation before being incorporated into routine practice.

Correspondence: Mahendra Singh Rathore
Email: msrathore78@gmail.com
Department of Pharmacy Practice, Geetanjali Institute of Pharmacy, Udaipur, India

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7. HEALTHCARE INFRASTRUCTURE AND REGIONAL RESEARCH CAPACITY

The effectiveness of healthcare interventions depends substantially on the availability of trained healthcare professionals, adequate infrastructure and functional referral systems.

Facility-based research examining Health and Wellness Centres and Ayushman Arogya Mandirs in Jodhpur has explored aspects of primary healthcare delivery at the district level [14]. Such assessments can contribute to understanding service availability and identifying areas requiring further evaluation.

Bibliometric research examining the development of implementation science across global and Indian research settings provides an overview of research activity in this evolving field [21].

The need for stronger research infrastructure in Southern Rajasthan has also been discussed through publications proposing an ICMR centre for the region, with particular attention to Udaipur, Salumbar and Pratapgarh [35, 36].

Regional research infrastructure may support locally relevant investigations, inter-institutional collaboration and the development of research capacity. However, infrastructure development should be accompanied by sustainable funding, skilled personnel and clearly defined research priorities.

8. PRIORITIES FOR FUTURE RESEARCH

Several priorities emerge from these diverse areas of research.

First, stronger collaboration between laboratory scientists, clinicians, epidemiologists and public health professionals is needed to improve the translation of research findings into practical interventions.

Second, diagnostic technologies should be evaluated in real-world settings, particularly in underserved populations. Studies should examine operational feasibility, affordability and diagnostic performance under routine healthcare conditions.

Third, greater attention should be given to prospective multicentre investigations and independent validation of emerging diagnostic and therapeutic approaches.

Fourth, regional research institutions should prioritise locally relevant health problems and develop collaborations with primary healthcare facilities. This may help reduce the gap between research development and healthcare implementation.

Finally, research findings should be communicated through appropriate clinical guidelines, capacity-building programmes and evidence-informed public health policies.

9. CONCLUSION

Contemporary healthcare research encompasses a broad range of scientific and clinical disciplines. Developments in molecular biology, cancer research, diagnostic technologies, infectious disease management and clinical therapeutics provide opportunities to address important healthcare challenges. However, scientific progress must be accompanied by effective implementation, accessible diagnostic services and stronger regional research capacity. An integrated approach connecting biological discovery with clinical evaluation and community-based healthcare may help strengthen the contribution of research to India's evolving healthcare system.

REFERENCES

1. Giri MK, Swain S, Gautam JK, Singh S, Singh N, Bhattacharjee L, et al. The Arabidopsis thaliana At4g13040 gene, a unique member of the AP2/EREBP family, is a positive regulator for salicylic acid accumulation and basal defense against bacterial pathogens. J Plant Physiol. 2014;171(10): 860-867. doi:10.1016/j.jplph.2013.12.015. ↩
2. Gautam JK, Giri MK, Singh D, Chattopadhyay S, Nandi AK. MYC2 influences salicylic acid biosynthesis and defense against bacterial pathogens in Arabidopsis thaliana. Physiol Plant. 2021;173(4):2248-2261. doi:10.1111/ppl.13575. ↩
3. Giri MK, Gautam JK, Rajendra Prasad VB, Chattopadhyay S, Nandi AK. Rice MYC2 (OsMYC2) modulates light-dependent seedling phenotype, disease defence but not ABA signalling. J Biosci. 2017;42(3):501-508. doi:10.1007/s12038-017-9703-8. ↩
4. Singh V, Singh D, Gautam JK, Nandi AK. RSI1/FLD is a positive regulator for defense against necrotrophic pathogens. Physiol Mol Plant Pathol. 2019;107:40-45. doi:10.1016/j.pmpp.2019.04.005. ↩
5. Gautam JK, Nandi AK. APD1, the unique member of Arabidopsis AP2 family influences systemic acquired resistance and ethylene-jasmonic acid signaling. Plant Physiol Biochem. 2018;133:92-99. doi:10.1016/j.plaphy.2018.10.026. ↩
6. Mittal D, Gautam JK, Varma M, Laie A, Mishra S, Behera S, et al. External jasmonic acid isoleucine mediates amplification of plant elicitor peptide receptor (PEPR) and jasmonate-based immune signalling. Plant Cell Environ. 2024;47(4):1397-1415. doi:10.1111/pce.14812. ↩
7. Bhattacharjee L, Singh D, Gautam JK, Nandi AK. Arabidopsis thaliana serpins AtSRP4 and AtSRP5 negatively regulate stress-induced cell death and effector-triggered immunity induced by bacterial effector AvrRpt2. Physiol Plant. 2017;159(3):329-339. doi:10.1111/ppl.12516. ↩
8. Singh D, Patil V, Kumar R, Gautam JK, Singh V, Nandi AK. RSI1/FLD and its epigenetic target RRTF1 are essential for the retention of infection memory in Arabidopsis thaliana. Plant J. 2023;115(3):662-677. doi:10.1111/tpj.16252. ↩
9. Gautam JK, Mohanty SS, Babu BV. Prevalence and determinants of oral potentially malignant disorders in western Rajasthan. Sci Rep. 2025;15(1):15611. doi:10.1038/s41598-025-98096-8. ↩
10. Nishad A, Gautam JK, Agarwal I, Nandi AK. Immune priming promotes thermotolerance, whereas thermopriming suppresses systemic acquired resistance in Arabidopsis. Plant Cell Environ. 2025;48(5):3352-3363. doi:10.1111/pce.15364. ↩
11. Gautam JK, Anand PK, Chouhan M, Babu BV. Capacity building of community health officers for optimizing the screening and early diagnosis of oral cancer in Jodhpur, Rajasthan, India. Sci Rep. 2025;15(1):16027. doi:10.1038/s41598-025-00225-w. ↩
12. Anand PK, Patel D, Dewasi G, Gautam JK. Challenges and barriers in implementation of National Tuberculosis Elimination Program guidelines at Nutrition Rehabilitation Centers in India: a systematic review. J Epidemiol Glob Health. 2026;16(1):121. doi:10.1007/s44197-026-00538-7. ↩
13. Thakor M, Gautam JK, Panigrahi A, Garasiya D, Brhamnia SL, Mohanty SS. Operational feasibility of point-of-care testing for sickle cell disease in resource-limited settings of tribal sub-plan region of India. Diagnostics (Basel). 2025;15(3):348. doi:10.3390/diagnostics15030348. ↩
14. Gautam JK, Dewasi G, Khan A, Bhardwaj P. Assessment of Health and Wellness Centres/Ayushman Arogya Mandir in Jodhpur District, Rajasthan, India: a facility-based cross-sectional study [Preprint]. Research Square; 2026 Jun 24. doi:10.21203/rs.3.rs-9933554/v1. ↩
15. Gazta P, Gautam J, Thakor M, Bhardwaj P, Mohanty SS. Role of the primary healthcare providers in sickle cell disease management: a scoping review. J Community Genet. 2026;17(2):35. doi: 10.1007/s12687-026-00867-x. ↩
16. Anand PK, Patel D, Lata S, Gautam JK, Chaudhary M, Singh M, et al. Factors associated with pulmonary TB in malnourished children admitted to rehabilitation centres. Int J Tuberc Lung Dis. 2026;30(1):21-26. doi:10.5588/ijtld.25.0338. ↩
17. Gautam JK, Thanvi A, Soni P, Anand PK. Estimation of the proportion and determinants of diabetes mellitus among notified tuberculosis patients in Jaipur, Rajasthan, India. Cureus. 2025;17(3). doi:10.7759/cureus.80319. ↩
18. Anand PK, Kumari R, Gautam JK. Disparities in healthcare seeking and treatment outcomes among tuberculosis-human immunodeficiency virus comorbidity cases: a case series from Jaipur, Rajasthan, India. J Public Health Prim Care. 2026;7(1):77-80. doi:10.4103/jphpc.jphpc_34_25. ↩
19. Choudhary S, Kumar P, Mohanty SS, Anand PK, Gautam JK. Molecular docking of pyocyanin from Pseudomonas aeruginosa with NADPH oxidase and Toll-like receptor 4: exploring the link between oral microbiome and oral cancer pathogenesis [Preprint]. bioRxiv; 2025 Aug 27. doi: 10.1101/2025.08.24.671957. ↩
20. Gautam JK, Parashar D, Dewasi G, R T, Gibi J, Anand PK, et al. Community and health system challenges in oral cancer screening in India: a systematic review. BMC Oral Health. 2026. doi: 10.1186/s12903-026-10216-6. ↩
21. Anand PK, Raika GR, Gautam J, Bhardwaj P. Mapping the evolution of implementation science: a bibliometric analysis of global and Indian research landscapes. Clin Epidemiol Glob Health. 2026;42:102488. doi:10.1016/j.cegh.2026.102488. ↩
22. Gautam JK, R T, Dewasi G, Parashar D, Bhardwaj P. Barriers and facilitators of oral, breast, and cervical cancer screening in India: a systematic review. BMC Public Health. 2026. doi:10.1186/s12889-026-29309-6. ↩
23. Anand PK, Patel D, Vats K, Gautam JK. Perceptions of healthcare providers in the implementation of National Tuberculosis Elimination Program guidelines at malnutrition treatment centres in Jodhpur, Rajasthan, India: a qualitative study [Preprint]. Research Square; 2026 Aug 31. doi: 10.21203/rs.3.rs-10701101/v1. ↩
24. Anand PK, Banerjee P, Dewasi G, Gautam JK. Tuberculosis and associated vulnerabilities among rural residents in Jaipur District, Rajasthan, India: a community-based cross-sectional study [Preprint]. Research Square; 2026 Aug 14. doi:10.21203/rs.3.rs-10364362/v1. ↩
25. Singh J, Gazta P, Gautam JK, Bhardwaj P, Mohanty SS. Exploring barriers to healthcare access among individuals with sickle cell disease and their caregivers in the tribal areas of Rajasthan: application of socio-ecological model. BMC Public Health. 2026. doi:10.1186/s12889-026-28301-4. ↩
26. Jain R, Chouhan D, Gautam JK, Kumawat R. Temporal stability of human serum for the diagnosis of dengue virus by ELISA. Journal on Communications. 2026;21(9):1-7. ↩
27. Kaur M, Gautam JK, Sharma AR, Singh V, Chouhan D, Baghel A, et al. Nanotechnology-based detection of sickle cell disease and thalassemia: a systematic review. Biosensors (Basel). 2026;16(7):373. doi:10.3390/bios16070373. ↩
28. Dewasi G, Nagda P, Bahl G, Jain V, Gupta SK. Myostatin-driven muscle hypertrophy: a double-edged sword in muscle physiology. J Rare Dis. 2025;4:29. doi:10.1007/s44162-025-00086-x. ↩
29. Halder C, Dewasi G, Nagda P. From fibroadenomas to phyllodes: unraveling the spectrum and clinical profile of benign breast diseases. Curr Trends Med Clin Res. 2025;1(1). doi:10.5281/zenodo.16986117. ↩
30. Pareek A, Kanwar P, Bansal R, Maheshwari B, Joshi A, Dewasi G, et al. Surgeon-in-the-loop AI systems in robotic surgery: enhancing precision, efficiency, and personalization: a short narrative review. Curr Trends Med Clin Res. 2025;1(1). doi:10.5281/zenodo.16947522. ↩
31. Dewasi G, Jain S, Saraf M, Vaghela JS. Evaluation of preemptive single dose of pregabalin for postoperative pain control after laparoscopic cholecystectomy: a prospective comparative study from western India. Dolor. 2026;41(2):31-37. doi:10.24875/DOL.M25000032. ↩
32. Tanwar CS, Jain V, Nagda P, Ramani K, Bahl G, Dewasi G, et al. A rare presentation of chronic lower back ache radiating to lower limb in a patient with ankylosing spondylitis with Andersson lesion managed by methotrexate: a case report [Preprint]. Research Square. 2025 May 13. doi: 10.21203/rs.3.rs-6459382/v1. ↩
33. Dewasi G. Possible role of thyroid in epilepsy. J Sci Res Technol. 2023;1(6):44-47. doi:10.5281/zenodo.8308519. ↩
34. Nagda P, Rathore UBS, Dewasi G. Systemic light-chain amyloidosis: evolving diagnostic paradigms and emerging therapeutic strategies beyond ANDROMEDA. Curr Trends Med Clin Res. 2026;5(4). doi:10.5281/zenodo.23790867. ↩
35. Nagda P, Dewasi G, Jain S, Godara R. Why Southern Rajasthan needs an ICMR centre: a case for Udaipur, Salumbar and Pratapgarh. Curr Trends Med Clin Res. 2026;5(4). doi:10.5281/zenodo.23791067. ↩
36. Nagda P, Dewasi G, Jain S. The case for an ICMR centre in Southern Rajasthan: a review with focus on Udaipur, Salumbar and Pratapgarh. Curr Trends Med Clin Res. 2026;5(4). doi:10.5281/zenodo.23791206. ↩
37. Dewasi G, Jain S. Ferroptosis in cancer: molecular mechanisms, tumour microenvironment, therapeutic resistance, and clinical translation. J Egypt Natl Canc Inst. 2026;38(1):80. doi:10.1186/s43046-026-00419-x. ↩
38. Dewasi G, Nagda P, Jain S, Soni S. Pre-operative single 150 mg dose of pregabalin for postoperative pain management in laparoscopic cholecystectomy: a systematic review and meta-analysis [Preprint]. medRxiv. 2026 Jul 13. doi:10.64898/2026.07.11.26357848. ↩

Correspondence: Mahendra Singh Rathore
Email: msrathore78@gmail.com
Department of Pharmacy Practice, Geetanjali Institute of Pharmacy, Udaipur, India

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