

ANNUAL REPORT

2022-2023



icmr
INDIAN COUNCIL OF
MEDICAL RESEARCH

RMRCGKP
REGIONAL MEDICAL RESEARCH
CENTRE, GORAKHPUR

**Indian Council of Medical Research
Regional Medical Research Centre, Gorakhpur**

BRD Medical College Campus, Gorakhpur, UP, 273013

Section-I

A. Major projects undertaken during the year 2022-23

1. Viral Research & Diagnostic Laboratory

- In order to deal emerging and reemerging outbreaks/infectious diseases, state level VRDL lab were established at ICMR-RMRC Gorakhpur. A state-of-art facility for timely identification of viruses and other agents causing morbidity in eastern cater the diagnostic/research services to 50 million populations of Uttar Pradesh and Western Bihar.
- Apart from diagnosing seven syndromes (29 viral etiologies), ICMR-RMRC, Gorakhpur, VRDL is also sentinel site for Zika surveillance, till date 1886+ samples have been tested for various etiologies. Out of them, 14 viral and 5 bacterial pathogens were found positive in tested specimens

2. Studies on SARS-CoV 2: The ICMR-RMRC GKP conducted various studies on the diagnosis, epidemiology, molecular characteristics and impact of SARS-CoV-2 infection the on the health care services.

- **Testing:** Since 23 March 2020, COVID cell at centre has tested more than 10.34 Lac samples.
- A pediatric COVID-19 collaborative investigation with BRD Medical College was conducted and observed that fever and dyspnea were more common symptoms during both first and second waves. During the second wave, gastrointestinal symptoms and diarrhea was reported in most of the pediatric patients and this wave was more severe in comparison to first wave.
- **Study on precaution dose of COVID-19 vaccine:** The state of Uttar Pradesh has 75 districts; as on January 2023, Uttar Pradesh had the COVID-19 Vaccine Precautionary dose coverage of more than 35.0%. The highest coverage was found from the studied district of eastern Uttar Pradesh. However, lowest coverage was observed from the studied district of western Uttar Pradesh.

3. Studies on JE/AES:

- **JE/AES Testing and etiological investigations:** Routine investigation of clinically suspected cases of Japanese encephalitis virus (JEV) and Acute Encephalitis Syndrome (AES) cases were carried out. A total of 238 cases were admitted during the year 2022 in BRD medical college, Gorakhpur (a tertiary care centre for AES treatment in eastern part of Uttar Pradesh) . All these AES cases were investigated for detection of anti-Japanese encephalitis (JE) virus-specific IgM (anti-JE IgM), anti- Orientia tsutsugamushi IgM (anti-

OTs IgM), Dengue NS-1 antigen (DEN NS-1 Ag) and Anti-Lepto IgM by ELISA assays as per the ICMR recommendations. Anti-JE IgM positive was documented in 24 cases (10.08%) and anti-OTs IgM was detected in 127 cases (53.3%). Furthermore, anti-Dengue NS-1 and/or IgM was found in 4.6% of cases (n=11), Anti-Lepto IgM positivity in 4.2% cases (n=10) and anti-Chikungunya IgM in 5.04% cases (n=12).

- **Long term disability in children with AES:** Neurological impairments was observed in 43/73 (58.9%) JE positive patients, 58/148 (39.2%) ST positive patients and 67/164 (40.8%) patients of other known/unknown aetiology (OE) with mild to severe level of severity.
- **Point of Care Testing of AES etiologies:** Clinicians and field health care workers have waited long for precise diagnostics that can promptly offer accurate results in order to initiate early treatment and prevent disease severity. Centre is promoting development of rapid testing kits and working on two project entitled “*To develop and validate the nucleic acid based RDT kit to detect Orientia tsutsugamushi*” and “*to develop and validate the CRISPR/Cas based nucleic acid detection RDT kit to detect Orientia tsutsugamushi*” to develop point of care testing for scrub typhus.
- **Socio-behavioural studies:** Two ongoing studies entitled “a study of psycho-neurotic disorders and socio - behavioral changes among AES/JE cases recovered in Gorakhpur” and “A study of cognitive awareness level about Japanese Encephalitis and behaviour Patterns among people belonging to north east districts of UP” are investigating the functional outcome of JE/AES and relation of JE/AES incidence with social behavioral pattern of general population.
- **JE vector study:** In this study abundance of JE vectors were investigated and found that *Culex tritaeniorhynchus* was most prevalent vector during the rainy season where as *Cx. quinquefasciatus* was most prevalent mosquito species in summer and winter season.

4. Other Important Studies:

- **ARI/SARI surveillance study:** Hospital based surveillance to identify the circulating strains of respiratory pathogens among pediatric population in the region. Human parainfluenza virus was the most prevalent virus followed by Adeno virus and Respiratory syncytial virus.
- **Multicentric study on One Health to address Zoonotic and Transboundary Diseases:** 100% screening of 1st year target samples for AES has completed with positivity rate 22.2% and 14.8% for JE and Cysticercosis respectively. In the case of AFI maximum positivity for screened samples are for Scrub Typhus followed by Brucella and Q-fever.
- **CRISPR/Cas based isothermal detection platform for diagnosis of Dengue and Chikungunya:** Four pair of primers were designed for isothermal amplification of CHIKV nucleic acid for Twistdx Basic RPA assay. The

primers were checked using the cloned E1 plasmid DNA and all primers were found to perform optimally.

- **Prevalence and determinants of anemia study:** Out of 692 children, 360 (52.02%) (Fig-1) and out of 535 mothers, 110 (20.5%) were anemic. Most of the children belongs to the upper lower class of family.
- **Complete genome sequencing and molecular characterization of dengue viruses:** Total 541 NS1 positive samples have been collected from different hospitals of Gorakhpur district. DENV-2 serotype was detected from most of the samples followed by DENV-1 and DENV-3. DENV-4 serotype was not detected from any of the tested sample.
- **Molecular and vector surveillance of dengue viruses:** A total of 343 samples were positive in real time PCR screening for Dengue virus from Gorakhpur region and *Aedes aegypti* was most abundant vector at studied areas and scrap tyres were most preferred breeding site of this mosquito in this region.

B. Major achievements having public health importance

1. **SARS-CoV2 Studies:** The centre conducted and successfully completed multiple studies on SARS-COV 2:
 - **Vaccine interchangeability study:** The vaccine interchangeability (after heterologous vaccination by Covishield followed by Covaxin) study was conducted to determine the vaccine effectiveness, immunogenicity and reactogenicity. This study also characterizes the immune response to precautionary third dose of COVISHIELD/COVAXIN among healthy adult population.
 - The findings suggest that immunization with a combination of Covishield and Covaxin was not only safe but also elicited better immunogenicity.
 - A multi-centric study was conducted **to understand the clinical spectrum and course of disease caused by Omicron VOC** in which Omicron variant, with BA.1 (6.2%), BA.1.1 (2.7%), BA.1.1.1 (0.7%), BA.1.1.7 (5.5%), BA.1.17.2 (0.7%), BA.1.18 (0.7%), BA.2 (30.8%), BA.2.10 (50.7%), BA.2.12 (0.7%), and B.1.617.2 (1.3%) lineages.
2. **Establishment of a Health and Demographic Surveillance System [HDSS], Gorakhpur, Uttar Pradesh:** The HDSS coupled with GIS mapping identified morbidity and mortality pattern, data on prevalent communicable and non-communicable diseases, socio-economic and nutritional status of 1 lac population from HDSS villages.
3. **Gap in Spatial distribution of disease density and health facilities in rural Gorakhpur:** This study was conducted to map the prevailing disease in the region and available healthcare facilities in the region and to estimate the out of the pocket expenditure of the healthcare facilities.
4. **HRD**

Two DHR Young Scientists joined the centre and one MSc and one MD dissertation was completed during the year.

- **DHR projects under young scientist scheme (YSS) includes:** Development of CRISPR/Cas based isothermal detection platform for rapid and accurate diagnosis of Dengue and Chikungunya” and “To study the pattern of long-term disability and poor prognostic factors for disability among children with Acute Encephalitis Syndrome (AES)”
- **PhD program: One UGC JRF was enrolled for PhD.**
- **MD dissertation project:** During this year three MD dissertation projects have been completed.
- **MSc dissertation project:** A total of seventeen M. Sc. dissertation thesis was completed and eighteen new students are enrolled for MSc dissertation program at this centre.
- **MSc Public Health Entomology:** MSc PHE course has initiated this year (2022-2023) at ICMR-RMRC, Gorakhpur. Ten seats have been allotted to this Centre. Out of 10 allotted seats nine seats are filled and one seat is remained vacant. There are two categories of students: Category I Student admitted through All India Entrance Exam. Seven admitted students come from this group. Category II: Students sponsored by State Government. Two in-service candidates join this course in this category.

C. Highly significant achievements of 2022-23

- **Mobile BSL 3 of ICMR-RMRC, Gorakhpur:** one of the remarkable achievements of the year was the receiving of mobile BSL 3 facilities from the ICMR. The training of involved team was trained by NIV Pune BSL3 and 4 team. Now the facility is in last phase of validation.
- A **rapid detection kit for *Orientia tsutsugamushi*** diagnosis has been developed by this institute. This technology is based on isothermal recombinase polymerase amplification and lateral flow analysis.
- **State Level Viral Diagnostics Laboratory (VRDL)** became fully functional and investigations on major outbreaks were initiated.
- **Next generation sequencing laboratory** has been fully functional and ready to perform deep sequencing related genomic studies.
- Studies on **One Health** were also initiated under the **consortium** coordinated by DBT.
- **Health and Demographic Surveillance System [HDSS], Gorakhpur, Uttar Pradesh** study was successfully completed and establish 1 lakh population cohort for further studies on communicable and non-communicable diseases.
- **First Batch of MSc Public health Entomology course** has begun after getting in principle approval of Pondicherry University.

D. Patents in year 2021-22 obtained/ applied: Nil

E. List of publications

Publications indexed / non indexed with impact factor during time period 2022-23

1. L Preethi, MS Alina, Lakshmi Chandran, S Asvin, M Jagadeesan, TM Vijayakumar, V Chitra, Ashok Kumar Pandey, Mahendra M Reddy, BR Misra, Rajni Kant, PL Bhukya, Gururaj Deshpande, Priya Abraham, Gajanan Sapkal and Kamran Zaman (2022). Duration of Seroprotection of the live attenuated SA-14-14-2 Japanese encephalitis vaccine in children in India. *Journal of Travel Medicine*, 2022, 1–8. <https://doi.org/10.1093/jtm/taac147> (IF: 39.194).
2. Gunjan Kumar et al with Rajni Kant as a co-author (2022). Characterizing the third wave of COVID-19: An analysis from the National Clinical Registry of COVID-19. *Indian Journal of Medical Research*, 155. DOI:10.4103/ijmr.ijmr_276_22. (IF: 5.274)
3. Tulsi Adhikari with Rajni Kant as Co-author (2022). Factors associated with COVID-19 stigma during the onset of the global pandemic in India: A cross sectional study. *Frontiers in Public Health*. DOI10.3389/fpubh.2022.992046. (IF: 6.461)
4. Gaurav Raj Dwivedi, Rajni Kant, Ayush Mishra, Manoj Kumar, Atul Kumar Singhal, and Sandeep Pathak (2022). Health Status of tribes of Uttar Pradesh with special reference to health seeking behaviour of uncharted Tharu tribe: A mapping review. *Indian Journal of Medical Research*, 2022;156: 186-190. DOI: 10.4103/ijmr.ijmr_3271_21 (IF:5.274).
5. Kumar N, Misra BR, Reddy MM, Deval H, Zaman K, Rajni Kant (2022). COVID-19 transmission among vaccinated laboratory workers during the second wave in eastern Uttar Pradesh, India. *J Med Virol*. 2022;94(8):3512-3514. doi:10.1002/jmv.27788 (IF: 20.693)
6. Zaman K, Shete AM, Mishra SK, Kumar A, Reddy MM, Sahay RR, Yadav S, Majumdar T, Pandey AK, Dwivedi GR, Deval H, Singh R, Behera SP, Kumar N, Patil S, Kumar A, Dudhmal M, Joshi Y, Shukla A, Gawande P, Kavathekar A, Kumar N, Kumar V, Kumar K, Singh RS, Kumar M, Tiwari S, Verma A, Yadav PD, Rajni Kant (2022). Omicron BA.2 lineage predominance in severe acute respiratory syndrome coronavirus 2 positive cases during the third wave in North India. *Front Med (Lausanne)*. 2022 Nov 2;9:955930. doi: 10.3389/fmed.2022.955930. PMID: 36405589; PMCID: PMC9666497. (IF: 5.058)
7. Saritha Nair and COVID-19 Stigma Team as Rajni Kant as Co-Author (2022) Development and Validation of Scales to assess stigma related to COVID-19 in India". *Indian Journal of Medical Research*, 2022, DOI:10.4103/ijmr.ijmr_2455_21. (IF: 5.274).
8. Pooja Bharadwaj, Rajni Kant, S.P Behera, Gaurav Dwivedi and Rajeev Singh (2022). Next-Generation Diagnostic with CRISPR/Cas: Beyond Nucleic Acid Detection. *International Journal of Molecular Sciences*, 2022; 23:6052.<https://doi.org/10.3390/ijms23116052>. (IF:6.208)
9. Gajanan Sapkal, Rajni Kant, Gaurav Dwivedi, Rima R. Sahay, Pragya D. Yadav, Gururaj R. Deshpande, Rajeev Singh, Dimpal A. Nyayanit, Deepak Y. Patil, Anita M. Shete-Aich, Kamran Zaman, Anil K. Chaudhari, Nivedita Gupta, Samiran Panda, Priya Abraham and Balram Bhargava, (2022). Immune responses against different variants of SARS-CoV-2 including Omicron following 6 months of administration of heterologous prime-boost COVID-19 vaccine. *Journal of Travel Medicine*, 2022, 1–4 <https://doi.org/10.1093/jtm/taac033>. (IF: 39.194)

10. Hirawati Deval, Dimpal A. Nyayanit, Shailendra Kumar Mishra, Pragya D. Yadav, Kamran Zaman, Prem Shankar, Brij R. Misra, Sthita Pragnya Behera, Niraj Kumar, Abhinendra Kumar, Pooja Bhardwaj, Gaurav Raj Dwivedi, Rajeev Singh, Anita M. Shete, Priyanka Pandit, Ashok K. Pandey, Girijesh Kumar Yadav, Shashi Gupta, Manoj Kumar, Asif Kavathekar, Ravi Shankar Singh, Sanjay Prajapati and **Rajni Kant** (2022). Genome Sequencing Reveals a Mixed Picture of SARS-CoV-2 Variant of Concern Circulation in Eastern Uttar Pradesh, India. *Frontiers in Medicine*, 2022; 8: Article 781287, 1-10. **(IF: 5.058)**
11. Mahendra M. Reddy, Kamran Zaman, Rajaram Yadav, Priyanka Yadav, Kaushik Kumar and Rajni Kant (2022). Prevalence, Associated Factors, and Health Expenditures of Noncommunicable Disease Multimorbidity—Findings from Gorakhpur Health and Demographic Surveillance System. *Frontiers in Public Health*, 2022; published: March 2022 doi: 10.3389/fpubh.2022.842561. **(IF: 6.461)**
12. Pratima Pandey, Rajashree Sahoo, Khusbu Singh, Sanghamitra Pati, Jose Mathew, Avinash Chandra Pandey, Rajni Kant, Ihn Han, Eun-Ha Choi, Gaurav Raj Dwivedi and Dharmendra K Yadav (2021). Drug Resistance Reversal Potential of Nanoparticles/Nanocomposites via Antibiotic's Potentiation in Multi Drug Resistant *P. aeruginosa*. *Nanomaterials*, 2022;12:117. Doi.org / 10.3390 /nano 12010117. **(IF: 5.719)**
13. Parmanik A, Das S, Kar B, Bose A, Dwivedi GR, Pandey MM. Current Treatment Strategies Against Multidrug-Resistant Bacteria: A Review. *Curr Microbiol.* 2022 Nov 3;79(12):388. **(IF: 2.048)**
14. Naresh SJ, Reddy MM, Suryanarayana R, Bhattacharyya A, Kamath PBT. Awareness, practices and myths related to COVID-19 among rural people in Kolar District, South India? A community based mixed methods study. *J Educ Health Promot* 2022;11:57. **(IF: 1.59)**
15. Khan IA, Bashar MA, Tewari HC, Reddy MM. Perception of Medical Professionals from Tertiary Care Teaching Institutes towards the Specialty of Community Medicine and its Specialists during the COVID-19 Pandemic Times. *Int J Med Public Health.* 2022;12(2):71-5.
16. Krishna N. Mishra, Sonam Singh, Harish C. Upadhyay, Swaroop Sanket, Manoj Kumar, Umme Yashmeen, Rajni Kant and Gaurav R. Dwivedi (2022). Synergy Potential of Ursolic Acid-Based Hybrid Molecules. *Letters in Drugs and Discovery* **(IF:1.15)**.
17. Tanuja Mishra, Shweta Goswami, Hirawati Deval, Ranjit Vaid and Rajni Kant (2022). Recent public health concerns of the high-altitude tribal population of Lahaul and Spiti, Himachal Pradesh. *Journal of Family Medicine and Primary Care*, 2022 (Accepted- in Press). **(IF: 2.82)**
18. S.P.Behera, Pooja Bhardwaj, Hirawati Deval, Neha Srivastava, Rajeev Singh, Brij Ranjan Misra, Awdhesh Agrawal, Asif Kavathekar, Rajni Kant (2022). Co-Circulation of all the four Dengue virus serotypes during 2018-2019: First Report from Eastern Uttar Pradesh, India. *Peer J*, 11:e14504. DOI 10.7717/peerj.14504. **(IF:3.061)**.
19. Malik D, Gupta ED, Rajni Kant, Juneja NS (2022). A School-based Health Awareness Program MISSION SHAKTTI, with an Assessment of Health Literacy among School Children of Delhi: A Qualitative Study. *Online J Health Allied Sci.* 2022;21(2):3. **(IF: 0.2)**
20. Srivastava N, Deval H, Mittal M, Deoshatwar A, Bondre VP, Rajni Kant, Yadav R (2022). Extent of disability among paediatric Japanese encephalitis survivors and predictors of poor outcome: a retrospective cohort study in North India. *BMJ Open.* 2022 Oct 31;12(10):e060795. doi: 10.1136/bmjopen-2022-060795. PMID: 36316071; PMCID: PMC9628649. **(IF: 3.007)**
21. Neha Srivastava, Hirawati Deval, Nikhat Khan, Rajni Kant and Aparup Das (2022). Decline of Japanese Encephalitis in Eastern Uttar Pradesh, India, 2009-2019. *Asian Pacific Journal of Tropical Medicine*, 2022; 15 (5): 230-31. **(IF:3.041)**
22. Rajaram Yadav, Kamran Zaman, Ayush Mishra, Mahendra M Reddy, Prem Shankar, Priyanka Yadav, Kaushik Kumar and Rajni Kant (2022). Health seeking behaviour and healthcare utilization in a rural cohort of North India. *Healthcare* (Basel) 2022 Apr 19;10(5):757. doi: 10.3390/healthcare10050757 **(IF:3.160)**
23. Hirawati Deval, Kalichamy Alagarasu, Neha Srivastava, Rupali Bachal, Mahima Mittal, Apoorv Agrawal, MinalBote, Aniket Gondhalekar, Vijay Bondre, Rajni Kant (2022)

- Association of single nucleotide polymorphisms in the *CD209*, *MMP9*, *TNFA* and *IFNG* genes with susceptibility to Japanese encephalitis in children from North India. *Gene*, 2022; 808:145962.(IF: 3.913).
24. Rajni Kant (2022). Mahatma Gandhi and Public Health in India In: *Gandhi in the Twenty First Century* -Idea and Relevance, edited by Anshuman Behera, Shailesh Naik, Published by Springer, p 161-171.
 25. Rajashree Sahoo, A Swaroop Sanket, Sanghamitra Pati, Rajni Kant and Gaurav Raj Dwivedi (2022). Nanoparticles: Warheads to overcome the Resistance Mechanism of Bacterial Superbugs. **Book Chapter**, Springer.
 26. Swati Sagarika Panda Khusbu Singh, Sanghamitra Pati, Rajeev Singh, Rajni Kant and Gaurav Raj Dwivedi (2022). *Pseudomonas aeruginosa*: Pathogenic Adapter Bacteria. **Book Chapters**, Springer.
 27. Bhardwaj P, Behera SP, Nanaware N, Zaman K, Deval H, Kant R, Kulkarni S, Kumar R, Dwivedi GR, Singh R. Phylogenetic and immunological investigations of complete TSA56 ORF of *Orientia tsutsugamushi* present in acute encephalitis syndrome cases from eastern Uttar Pradesh, India. *Arch Microbiol.* 2023; 205(5):178. doi: 10.1007/s00203-023-03492-1. PMID: 37029825. (IF = 2.66)
 28. Bhardwaj P, Kant R, Behera SP, Dwivedi GR, Singh R. Next-Generation Diagnostic with CRISPR/Cas: Beyond Nucleic Acid Detection. *Int J Mol Sci.* 2022;23(11):6052. doi: 10.3390/ijms23116052. PMID: 35682737; PMCID: PMC9180940. (IF = 6.2)

Future plan:

1. A demonstration project for reduction of tuberculosis in India- a multicentric study to support NTEP in accelerating TB elimination at district level by promoting early case detection as a part of end TB initiative of Govt. of India by treatment adherence, contact tracing and preventive therapy through innovative approaches.
2. Demonstration of reduced burden of JE/AES: A Pan India Study.
3. Antimicrobial resistance profiling and elucidation of novel mechanism of antibiotic resistance of emerging pathogens at tertiary care health facilities in Gorakhpur
4. Molecular characterization of the major viral and bacterial isolates associated with ARI and SARI cases in eastern Uttar Pradesh.
5. Studying the prevalence of asymptomatic malaria and vector bionomics in eastern Uttar Pradesh
6. Establishment of Model Rural Health Research Unit (MRHRU) at CHC Pali (Tharrapar), Shajanwa Gorakhpur was sanctioned in March 2022 under mentorship of ICMR-RMRC Gorakhpur. The civil work of MRHRU building is undergoing.
7. Community based research cum intervention projects on Anaemia, communicable & non communicable disease shall be started at MRHRUs soon after getting space / rooms within the CHC

