Project Title: Expanding AMR in the secondary level hospitals

A. **Name of the senior researcher (Principal Investigator):** Dr Aarti Kotwal

B. **Name of the institute:** Himalayan Institute of Medical Sciences

C. **Address with email id and phone no. of PI:** Professor, Department of Microbiology, Himalayan Institute of Medical Sciences (HIMS), Swami Rama Himalayan University (SRHU), Swami Ram Nagar, Jolly Grant, Dehradun 248016, aartiraghuvanshi@yahoo.co.in, 9411548327

D. **Type of organization:** State Private university established by UGC Act-12 in 2013

E. **List of publications in last 7 years:** attached Annexure I

F. **List of research projects undertaken in last 5 years (since 01-01-2019):** Annexure- II attached

G. **Collaboration with ICMR or contribution to ICMR activities in last 5 years (maximum 250 words).**

H. **Rationale of proposed study including the choice of secondary level hospitals to be included where the implementation shall be carried out:** The state of Uttarakhand has reported AMR cases at the rate of …. There are 38 district and sub district public hospitals in the state out of which 4 are tertiary care and 34 are secondary care in addition to 79 PHCs & 578 CHCs. The medical college of the SRHU along with the hospital & Nursing College are about three decades old. Making a humble beginning at the time of Uttarkashi earthquake of 1991, Based on Swami Ram's philosophy of reaching out to the society, HIMS & attached Himalayan Hospital has proven itself to be an excellent patient-driven unit that provided great services before many other hospitals, both in public and private sectors made their appearance. The Hospital has diversified into many specializations having a faculty of about 300 Doctors, an independent Rural Development Institute (RDI) and a Cancer Research Institute (CRI). The University has under its ambit about 27 Secondary and Primary level Hospitals in Haridwar, Pauri and Tehri Districts. The state is yet to have an AMR Action Plan despite that this tertiary care hospital has been witnessing and reporting significant number of drug resistant pathogens. This observation has been made through its established diagnostics facility that is NABL accredited. The university has recently successfully carried out a World Bank project on PPP, where it has created an integrated, technology-enabled health system architecture for various districts of the state. The organisation has offered and supervised primary care, emergency care, and necessary referral services to rural districts of Uttarakhand under World Bank sponsored Uttarakhand Health Systems Development Project for India with enhanced focus on stewardship, service delivery and supplementation of the state's human resource capacity

I. **Implementation Strategy**

The Maternity and Primary Health Centre Chamba Tehri Garhwal, Maternity and General Hospital Vikas Nagar MS Community Health Center Bhadarbad Haridwar, Joint Hospital Rishikesh have been selected as the implementation sites as they have the capability of identification and evaluation of DST (Drug susceptibility testing). A prospective analysis of the sites will be done by focus group surveys, telephonic survey's, on site visits and questionnaires for in depth assessment of the lacunae and interventions required with assistance from the research and implementation team of the mentor institute of SRHU constituting of two Microbiologists, one Community health faculty, one physician, one biostatistician and a faculty from the Rural Institute to study the SOPS on AMR with special emphasis on IPC & AMS being followed at the SRHU. By expanding access to microbiology laboratory services, the existing lacuna at these implementation sites will be filled. Implementation of a quality assurance system in these laboratories to guarantee quality of diagnostic tests including microbial identification, antimicrobial susceptibility tests of clinically significant pathogens and timely and relevant reporting of results will be worked upon. Further, developing/updating SOPs on AMR and IPC surveillance as per standards for the selected laboratories and educating and training the laboratory staff on data collection of the AWaRe listed pathogens and AMC (antimicrobial consumption) will be the other objectives. Guiding the selected laboratories in taking corrective actions and encouraging continuous improvement to overcome the potential difficulties in AMR and its surveillance along with AMC will be done. The SRHU team will monitor and implement real time uploading of data in an electronic database.

Along with these implementations feedback to antibiotic prescribers and infection control programme from time to time at these centres will be ensured. There will be regular monitoring of the laboratory performance and activities for enhancement of AMR surveillance through proficiency panel testing with the tertiary care Lab. The laboratory-based surveillance will be a phased approach beginning with AWaRe listed pathogens with experience and adequate resources, the bacterial agents could be expanded to include other pathogens as well.

J. **Address feasibility and scalability**

The project will be undertaken under the supervision of mentor institute with the guiding documents and policies of the parent institute being the reference material. The sustainability will be ensured by roping in other stakeholders including the state health authorities as and when required.

Successful establishment of AMR and IPC protocols and policies along with multicentre surveillance systems to monitor the resistance profiles and dynamics of clinical strains, especially MDROs(Multi drug resistant organisms) in the mentee centres will be pivotal in expansion of this surveillance network to other resource constraint districts of state.

K. **Research Team** The research team will multidisciplinary consisting of two microbiologists, one community health faculty member, one physician, one biostatistician, one clinical trial expert and faculty from the Rural Institute

departments of Swami Rama Himalayan University, with each member dividing the work profile between themselves. Details are given below:

An advisory committee will be formulated comprising of hospital administrator, diagnostic microbiologists, Physicians, Infection control team members and a clinical research expert . The long-term goals of this committee will be to **Plan** and develop locally relevant guidelines for the adopted centres, **Perform** Educational interventions to inculcate habit of rational use of antimicrobials, **Act** by giving regulatory inputs and building systematic approach and Real time monitoring and gathering data on locally prevalent microbial profile, susceptibility pattern and antimicrobial consumption.

L. **Any ongoing National/International collaborations relevant to the call:** SRHU, Jollygrant, Dehradun is organizing a National conference titled "Trends in AMR" Research Priorities and Action Plan" along with IIT-Roorkee and AIIMS, Rishikesh in order to bring research and clinical players in the state on a single platform and in close network discussions so as to sensitize relevant healthcare groups/establishments on to the significance of IPC and AMS. It is believed that many joint national/International research projects may emerge as also a draft State Action Plan that would be submitted to the State Healthcare Authorities.

List of Advisors, Principal Investigators and Co Investigators

Advisor: **Dr Ashok Deorari,** Dean/ Principal, Himalayan Institute of Medical Sciences, Swami Rama Himalayan University, Swami Ram Nagar, Jolly Grant, Dehradun

Technical Advisor: **Dr Bindu Dey,** Director Research, Swami Rama Himalayan University, Swami Ram Nagar, Jolly Grant, Dehradun

CV of Principal Investigators

Name	**Dr Aarti Kotwal**
Current Position & Affiliation	Professor, Department of Microbiology, Himalayan Institute of Medical Sciences(HIMS), Swami Rama Himalayan University(SRHU), Swami Ram Nagar, Jolly Grant, Dehradun 248016, aartikotwal@srhu.edu.in
Academic & Professional Qualification	MBBS and MD (Microbilogy)
Up to five most relevant research grants	
1. Tuberculosis Drug Susceptibility profile, treatment and outcomes: retrospective study from DOTS catering centre of Uttarakhand,2023, SRHU 2. Molecular profile of Drug resistant isolates from CSF of Tuberculous Meningitis patients. July 2022, SRHU 3. Investigatory question of a correlation of microbiological analysis and radiological finding of COVID-19 infected-A retrospective study from a tertiary care hospital. 2021, SRHU 4. Clinical and radiological characteristics of patients with active tuberculosis (pulmonary and extrapulmonary) co-infected with SARS Cov2 in a tertiary care hospital of Uttarakhand, India,2021, SRHU 5. Frequency of antinuclear autoantibodies in asymptomatic SARS-CoV-2 infected individuals- A prospective study.2021, SRHU	
Up to five most relevant research publications	
1. Sethi V, Raghuvanshi S, Kotwal A, Khanduri RS, Jethani V. Multidrug-Resistant Musculoskeletal Tuberculosis: An Aggressive Clinical, Radiological and Molecular Confirmation With Genotypic Drug Susceptibility Testing Approach. Cureus. 2022 Sep 3;14(9):e28720. doi: 10.7759/cureus.28720. PMID: 36204016; PMCID: PMC9527867. 2. Garg A, Chatterjee B, Kotwal A, et al. Evaluating a Modified Ziehl-Neelsen Technique with Triton X-100 for Detecting Acid-fast Bacilli in Sputum. Indian J Chest Dis Allied Sci 2022;64(2):124–125. 3. Bhandari R, Gaur DS, Kotwal A, Kusum A.Comparison of Ziehl - Neelsen (ZN) Staining and Fluorescent (FL) Staining in Suspected Cases of Tuberculosis. Int J Pathol Clin Res.2021;7(1):122. doi.org/10.23937/2469-5807/1510122 4. Jethani V, Sindhwani G, Mehrotra V, Kotwal A, To assess diagnostic utility of pleural fluid adenosine deaminase (ADA), interferon gamma (IFN), lymphocyte/neutrophil ratio (L/N) and its combination in differentiating tubercular and non-tubercular exudative pleural effusion. IP Indian J Immunol Respir Med 2019;4(1):68-72 5. Raghuvanshi S, Kotwal A, Maheshwari R, Sindhwani G. Evaluation of line-probe assay for molecular analysis and drug susceptibility of extra-pulmonary tuberculosis. Int J Tuberc Lung Dis. 2018 Sep 1;22(9):1077-1081.	

CV of the Co- investigators

Name and Contact Detail	**Dr Nikku Yadav**

Current Position and Affiliation	Assistant professor (Clinical Research), Department of Community Medicine, Himalayan Institute of Medical Sciences (HIMS), Swami Rama Himalayan University (SRHU), Swami Ram Nagar, Jolly Grant, Dehradun 248016, nikkuyadav@srhu.edu.in
Academic & Professional Qualification	PhD Medical Biotechnology, MPH, M Pharma

Up to five most relevant research grants

1. Stroke Prediction and Analysis using Artificial Intelligence: A hospital study based from Hilly areas of Uttarakhand IIT Roorkee @175 Partnership event, 2022
2. Establishment of population specific reference range of thyroid hormones in iodine deficient population during pregnancy: Uttarakhand Himalaya sanctioned by Uttarakhand State Council of Science & Technology dt 31 March 2020.
3. Predicting Blood levels of Hemoglobin & Bilirubin using Photographic images of eye: A machine learning approach. May 2021, SRHU
4. Conducting sponsor initiated trial of Zydus Healthcare, Pfizer, Novartis, Virchow and Astra Zeneca for NSLC, Multiple myeloma, Cardiovascular events, Arthritis and Breast cancer respectively

5. Up to five most relevant research publications

1. **Nikku Yadav**, Dilip K Saini, Akanksha Uniyal, Nidhi Yadav (2023). Prediction of Omicron cases in India using LSTM: An advanced approach of Artificial Intelligence. Journal of Interdisciplinary Mathematics, 26:3, 361-370.
2. Rajeev Bijalwan, Ruchira, **Nikku Yadav** (2023). Repercussions of Covid 19 pandemic on prenatal & antenatal care in Bahadarbad block of District Haridwar (Uttarakhand, India). Indian Journal of Community Health, 35(1) : 94-98
3. **Nikku Yadav**, Charu Rai, Lovnish Thakur, Nidhi Yadav (2022). COVID 19 variants: Molecular insight into mutations. Acta Scientific Microbiology, 5(6):8-17.
4. Lovnish Thakur, Prerna Vadhera, **Nikku Yadav** (2020). Combating SARS-COV-19 by phytochemicals: an in silico study. Innovare Journal of Life Sciences, 8(4): 1-4.
5. **Nikku Yadav,** Atul Kathait, DS Malik, Madanjeet Pasricha, Sunil K Mishra, Asha Chandola Saklani (2018). Trimester specific thyroid hormone dynamics, iodine reserve and pregnancy outcomes: A longitudinal study. Thyroid Research and Practice;15(3):105-112 (DOI: 10.4103/TRP_23_18).

Name and Contact Detail	**Dr. Smita Chandra**
Current position and Affiliation	Professor and Head, Department of Pathology, Himalayan Institute of Medical Sciences (HIMS), Swami Rama Himalayan University (SRHU), Swami Ram Nagar, Jolly Grant, Dehradun 248016, smitachandra@srhu.edu.in
Academic & Professional Qualification	MD Pathology, FUICC, MIAC

Up to five most relevant research grants

1. Study of bone marrow infections in tertiary care centre (HIMS, SRHU)
2. 2. Cytopathology vis-à-vis Histopathology in diagnosis of lung lesions (HIMS, SRHU)

Up to five most relevant research publications

1. Chandra H, Chandra S, Bhatt NK, Sharma A. Clinicohaematological profile of infections in bone marrow-Single centre experience in North Himalayan region of India. Hematology. 2011; 16: 255-257.(PubMed, PMID: 21756544)
2. Chandra S, Chandra H, Chauhan N, Gaur DS, Gupta H, Pathak VP, Burathoki SK. Male Genitourinary Tuberculosis-13 Years Experience in a Tertiary Care Centre of Himalayan Region in India. The Southeast Asian Journal of Tropical Medicine and Public Health. 2012; 43:364-369. (PubMed, PMID:23082588)
3. Chandra S, Chandra H. Role of hematological indicators as an indicator of acute malarial infection in Uttarakhand state of India. Mediterranean Journal of Hematology and Infectious Diseases. 2013; 5: e 2013009. (PubMed, PMID: 23350022)
4. Pandey A, Chandra S, Nautiyal R, Shrivastav V. Expression of p16INK4a and human papillomavirus 16 with associated risk factors in cervical premalignant and malignant lesions. South Asian Journal of Cancer. 2018;7:236-9. (PubMed; PMID:30430091)
5. Chandra S, Kusum A, Gaur DS, Chandra H. Analytical and post analytical phase of an ISO 15189:2012 certified cytopathology laboratory-A five year institutional experience. Journal of Cytology. 2022;39:37-43. (PubMed: PMID: 30566946)

Name	**Dr Varuna Jethani**
Current Position & Affiliation	Associate Professor, Department of Respiratory medicine, Himalayan Institute of Medical Sciences (HIMS), Swami Rama Himalayan University (SRHU), Swami Ram Nagar, Jolly Grant, Dehradun 248016, **kjethani14@gmail.com,varunajethani@srhu.edu.in**

Academic & Professional Qualification	MBBS and MD (Pulmonary medicine)

Up to five most relevant research grants

1. To assess diagnostic utility of pleural fluid adenosine deaminase(ADA) and interferon gamma release assay(IGRA) and lymphocyte/neutrophil (L/N) ratio in differentiating tubercular and non tubercular exudative pleural effusion.2016,SRHU
2. Retrospective study of clinical profile and management of patient with swine flu at tertiary care hospital.2017,SRHU
3. Clinical profile of patients with Empyema Thoracis: At Tertiary care center – Retrospective study.2017,SRHU
4. Efficacy of pleural brush cytology in the diagnosis of pleural diseases.2018,SRHU
5. Clinical and radiological characteristics of patients with active tuberculosis(pulmonary and extrapulmonary) co-infected with SARS-Cov2 in tertiary care hospital of Uttarakhand, India.2021,SRHU

Up to five most relevant research publications

1. **Dr Varuna Jethani,**Aarti Kotwal, Dr Anuradha Kusum,Dr Sushant Khanduri. . Journal of Chemical Health risks.ISSN:2251-6719 E-ISSN:2251-6727(2023) (ahead to print)
2. Namita Bhutani, **Varuna Jethani**, Sumit Jethani, Karuna Ratwani. Coagulation profile and platelet parameters in pregnancy induced hypertensive cases and normotensive pregnancies:A cross sectional study.Annals of Medicine and Surgery.2022 Aug;80:104124
3. Sharma Deepen, Rakhee Khanduri, Shailendra Raghuvanshi, Smita Chandra, Sushant Khanduri, **Varuna Jethani**, and Manoj Kumar. 2022. "Clinical, Radiological and Histopathological Profile of Patients With Endobronchial Lesions on Fibreoptic Bronchoscopy". Monaldi Archives for Chest Disease 93 (3). https://doi.org/10.4081/monaldi.2022.2312
4. Sethi V, Raghuvanshi S, Kotwal A, Khanduri RS**, Jethani V.** (September 03, 2022) Multidrug-Resistant Musculoskeletal Tuberculosis: An Aggressive Clinical, Radiological and Molecular Confirmation With Genotypic Drug Susceptibility Testing Approach. Cureus 14(9): e28720. DOI 10.7759/cureus.28720
5. Aggarwal, A., Kumar, S., **Jethani, V**., Khanduri, S., Khanduri, R., Sharma, A. Pleural Fluid Adenosine Deaminase, C -Reactive Protein levels and Lymphocyte/ Neutrophil Count Ratio in Differentiating Tubercular and Non-Tubercular Pleural Effusion. J Cardiothorac Med. 2022; 10(3): 1017-1024

Name	Dr.Arpana Singh
Current position and Affiliation	Assistant Professor, Department of Microbiology, Himalayan Institute of Medical Sciences (HIMS), Swami Rama Himalayan University (SRHU), Swami Ram Nagar, Jolly Grant, Dehradun 248016, **arpanaaa5687@gmail.com**
Academic & Professional Qualification	MBBS.MD (Microbiology)

Up to five most relevant research grants

1. Comparative evaluation of rapid diagnostic antigen test kit with RT-PCR in suspected COVID 19 patients. Funded by SCI-CELL SOLUTIONS LLP(2020)(AIIMS Rishikesh

Up to five most relevant research publications

1. **Singh A**, Bhatia M, SasiRekha, Diksha, Kamboj P, Chakraborty D et al. Comparative Evaluation of Colistin Broth Disk Elution Method With Two Commercially Available Systems for Colistin Susceptibility Testing Against Carbapenem-Resistant Klebsiell pneumoniae: A Single-Center Exploratory Study Cureus. 2022 ;14(5):e25549. doi:10.7759/cureus.25549
2. **Singh A**, Gupta P, Mathuria YP, Kalita D, Prasad A, Panda PK et al. Comparative Evaluation of Nasopharyngeal and Oropharyngeal Swab Based Rapid SARS-CoV-2 Antigen Detection and Real-Time RT-PCR for Diagnosis of COVID-19 in Tertiary Care Hospital. *Cureus*. 2021;13(7):e16785. doi:10.7759/cureus.16785
3. Kalita D, Bhatia M ,SasiRekha, **Singh A.** The Mystery of Mucormycosis in COVID-19: A Multifactorial Menace or an Enigmatic Delta Variant Associated Phenomenon? An Exploratory Study from a Tertiary Care Centre in North India with a Brief Literatu Review. *Journal of pharmacy & bioallied sciences.2022; 14*(1): 46-51.https://doi.org/10.4103/jpbs.jpbs_658_21
4. **Singh A**, Bhardwaj A ,Ravichandran N, Malhotra M . Surviving COVID-19 and multiple complications post total laryngectomy. *BMJ Case Rep*. 2021;14(7):e244277. doi:10.1136/bcr-2021-244277
5. Malik Y, Omar BJ, **Singh A.** Bacteriological analysis of street-vended fruit juices available in Rishikesh, Uttarakhand. *J Family Med Prim Care*. 2020;9(2):938-942. doi:10.4103/jfmpc.jfmpc_818_19

Name	Akanksha Uniyal
Current position and Affiliation	Lecturer, Department of Biostatistics, Himalayan Institute of Medical Sciences (HIMS), Swami Rama Himalayan University (SRHU), Swami Ram Nagar, Jolly Grant, Dehradun 248016, **akankshauniyal97@gmail.com**
Academic & Professional Qualification	M.Sc. (Statistics)

Up to five most relevant research grants
1.Epidemiological Serosurvey of SARS-CoV-2 Antibodies among General Population and its Association with ABO Blood Typing in Foot Hills and Middle Hills of Uttarakhand 2.A comprehensive approach to substance abuse amongst adolescents and youth in rural Dehradun- EK KOSHISH
1. Abhinav Bahuguna, **Uniyal A.,** Sharma N., & Semwal, J. (2023). Comparison of exponential smoothing and ARIMA time seri models for forecasting COVID-19 cases: a secondary data analysis. International Journal of Research in Medical Sciences, 11(1727–1734. 2. Semwal J, Bahuguna A, **Uniyal A,** Vyas Shaili. 2023). A Study to Analyse Covid-19 Outbreak Using Multiple Linear Regression Supervised Machine Learning Approach. 14. 82-89. 10.55489/njcm.140220232656. 3. Yadav Nikku, Dilip Kumar Jang Bahadur Saini, **Uniyal A**, Yadav Nidhi et al. (2023). Prediction of Omicron cases in India usi LSTM: An advanced approach of Artificial Intelligence. JIM-T- 1667