

NIH BIOGRAPHICAL SKETCH

NAME: Hafsa Muhammad, PhD

POSITION TITLE: Assistant Professor, Institute of Basic Medical Sciences; Biosafety and Biosecurity Officer, Khyber Medical University, Peshawar, Pakistan

EDUCATION AND TRAINING

Institution and Location	Degree	Completion Year	Field of Study
The University of Punjab, Lahore	BSc	2004	Zoology, Chemistry
PMAS University of Arid Agriculture, Rawalpindi	MSc	2006	Zoology
Quaid-i-Azam University, Islamabad	MPhil	2009	Molecular Genetics
Quaid-i-Azam University, Islamabad	PhD	2016	Forensic Genetics / Human Molecular Genetics
Institute of Biomedical and Genetic Engineering, Islamabad	Post Doc	2017	Molecular Genetics/ Disease Genetics

A. PERSONAL STATEMENT

I am an Assistant Professor of Forensic Sciences and Toxicology and Biosafety and Biosecurity Officer at Khyber Medical University (KMU), Pakistan, where I have led institutional biosafety and biosecurity initiatives since 2017. My expertise integrates molecular genetics, antimicrobial resistance (AMR), infectious disease genomics, molecular diagnostics, laboratory biosafety and biosecurity, and One Health approaches to strengthen biomedical research, public health laboratories, and workforce capacity.

My research has focused on molecular characterization of antimicrobial resistance determinants, pathogen genomics, human genetics, and molecular diagnostics, complemented by leadership in laboratory systems strengthening, biosafety governance, and responsible conduct of life sciences research. I have collaborated with national and international organizations, including WHO, NIH Fogarty International Center, IFBA, UK Health Security Agency, U.S. National Academies of Sciences, Health Security Partners, and Sandia National Laboratories, contributing to research, training, and institutional capacity development.

I hold IFBA Professional Certifications in Biorisk Management, Biosecurity, and Cyberbiosecurity, and have organized and delivered numerous national and international training programs in biosafety, biosecurity, infection prevention and control, laboratory quality management, and responsible conduct of genomic sciences.

My research, leadership, and training experience provide a strong foundation for contributing to the NIH D43 Global Infectious Disease Research Training Program, particularly in strengthening multidisciplinary research, laboratory capacity, and One Health antimicrobial resistance stewardship in Pakistan.

B. POSITIONS, SCIENTIFIC APPOINTMENTS, AND HONORS

Positions and Employment

Years	Position	Institution
2017– Present	Biosafety and Biosecurity Officer	Khyber Medical University, Peshawar, Pakistan
2023– Present	Assistant Professor, Forensic Sciences and Toxicology	Institute of Basic Medical Sciences, Khyber Medical University, Peshawar, Pakistan
2018–2023	Lecturer, Molecular Biology and Genetics	Institute of Basic Medical Sciences, Khyber Medical University, Peshawar, Pakistan
2017-2018	Assistant Professor (IPFP)	Khyber Medical University, Peshawar, Pakistan
2011 2012	- Visiting Researcher	University of Cambridge, Cambridge, UK
2016 2017	- PostDoc Research Fellow	Institute of Biomedical and Genetic Engineering, Islamabad
2008 2016	- Junior Scientist	Institute of Biomedical and Genetic Engineering, Islamabad

Selected Scientific Leadership and Professional Appointments

- Biosafety and Biosecurity Officer, Khyber Medical University (2017–Present)
- Consultant, Association of Biorisk Management and Health Security Partners
- Technical Working Group Member for Institutional Biosafety Committees, Pakistan
- Editorial Board Member, *Advances in Basic Medical Sciences*
- Executive Committee Member, Organization for Women in Science for the Developing World (OWSD) – Pakistan Chapter
- Former Head, Khyber Pakhtunkhwa Chapter, Pakistan Biological Safety Association
- Member, National Forensic Science Society Pakistan
- Member, Publication Committee, Pakistan Biological Safety Association

Professional Certifications

- IFBA Professional Certification in **Biorisk Management**
- IFBA Professional Certification in **Biosecurity**
- IFBA Professional Certification in **Cyberbiosecurity**
- PostGraduate Diploma in **Public Health**
- PG Certificate in **Health Professions Education**

Selected Honors and Professional Recognition

- Selected participant, International Training Course on Pathogen Detection and Biosecurity, International Centre for Genetic Engineering and Biotechnology (ICGEB), Italy (2026)
- Fellow, Youth for Biosecurity Initiative, Biological Weapons Convention Implementation Support Unit (UNODA)
- Facilitator, Women in Leadership Programme, British Council

- Multiple national and international invitations as trainer and resource person in biosafety, biosecurity, laboratory systems, and One Health capacity development

C. CONTRIBUTIONS TO SCIENCE

1. Molecular Genetics and Genomics for Human Health and Forensic Applications

My research has focused on applying molecular genetics and genomic technologies to human disease, forensic genetics, and biomedical investigations. My work has included genetic polymorphism analysis, mutation detection, hereditary disorders, human genetic variation, short tandem repeat (STR) analysis, and molecular approaches relevant to forensic science and precision medicine. These studies have strengthened the application of molecular biology in human identification, inherited disease research, and translational biomedical sciences.

Selected publications

- Hameed A, Muhammad H, et al. Investigation of paternally inherited STR mutation leading to parent-child mismatch. *Proceedings of the Pakistan Academy of Sciences*. 2024.
- Hameed A, Muhammad H, et al. Bioinformatics analysis of EDAR gene mutation associated with hypohidrotic ectodermal dysplasia. *Proceedings of the Pakistan Academy of Sciences*. 2024.
- Muhammad H, et al. Association of HSD17B1 gene polymorphisms with male infertility in the Khyber Pakhtunkhwa population. *Pakistan BioMedical Journal*. 2025.
- Muhammad H, et al. Haploinsufficiency of EXT1 and hereditary multiple exostoses in a Pakistani family. *Medicina*. 2023.

2. Antimicrobial Resistance, Molecular Microbiology, and Genomic Surveillance

My research has contributed to understanding antimicrobial resistance through molecular detection and characterization of resistance determinants, pathogen genomics, and molecular epidemiology of clinically important bacterial pathogens. This work supports evidence-based surveillance systems and laboratory strengthening for antimicrobial resistance stewardship under the One Health framework. I have also contributed to genomic surveillance and molecular diagnostics during the COVID-19 pandemic.

Selected publications

- Hameed F, Khan MA, Muhammad H, et al. Plasmid-mediated **mcr-1** gene in *Acinetobacter baumannii* and *Pseudomonas aeruginosa*: First report from Pakistan. *Revista da Sociedade Brasileira de Medicina Tropical*. 2019.
- Naeem S, Bilal H, Muhammad H, et al. Detection of **blaNDM-1** gene in ESBL-producing *Escherichia coli* and *Klebsiella pneumoniae*. *Journal of Infection in Developing Countries*. 2021.
- Shah MW, Muhammad H, et al. SARS-CoV-2 variants and genomic surveillance in north-west Pakistan. *Biotechnology & Biotechnological Equipment*. 2024.
- Ahmad N, Muhammad H, et al. Effectiveness of PCR pool testing for screening of COVID-19 infection. *Journal of Ayub Medical College Abbottabad*. 2022.

3. Leadership in Biosafety, Biosecurity, and One Health Capacity Development

As Biosafety and Biosecurity Officer at Khyber Medical University since 2017, I have led institutional initiatives to strengthen laboratory biosafety governance, biological risk management, laboratory quality systems, and responsible conduct of life sciences research. My work has included establishing institutional biosafety practices, supporting biosafety committee development, conducting laboratory risk assessments, and developing training programs for researchers, healthcare professionals, and public health laboratories. I also designed and led One Health as a core course for postgraduate students at KMU, in addition to reviewing, updating, and facilitating the training and curriculum for Biosafety and Biosecurity.

I have served as faculty, organizer, or scientific facilitator for more than one hundred national and international workshops, courses, and professional development programs on biosafety, biosecurity, cyberbiosecurity, laboratory quality management, infection prevention and control, genomic sciences, and One Health laboratory preparedness. These activities have been conducted in partnership with well-reputed international collaborators, contributing to sustainable workforce development and strengthening laboratory systems across Pakistan.

Representative publications/ Abstracts

- Muhammad H. Biosecurity: From Policy Formulation to Implementation. *Advances in Basic Medical Sciences*. 2022.
- Presented peer-reviewed research at the 60th Asia Pacific Advanced Network (APAN 60) Conference, Hong Kong SAR, China (July 28–August 1, 2025), entitled "Waste Management System of Healthcare Facilities as a Reflection of Biosafety and Infection Prevention and Control System Strength."
- Hafsa Muhammad, Tayyab Rehman, Najma Baseer, Zilli Huma, Samreen Sarwar. Situational analysis of biosecurity in higher educational institutions and private diagnostics laboratories in Khyber Pakhtunkhwa, Pakistan. IFBA Virtual Biosafety Conference: A vision of tomorrow. November 1-3, 2021.
- Hafsa Muhammad, Tayyab Rehman, Yasar Yousafzai, Zilli Huma. The Evolution of Khyber Medical University Biosafety Program: Feb 2017-Present. A tale of blood, sweat and tears. National Virtual Biological Risk Management Conference organized by Pakistan Biological Safety Association and FIC/NIH, USA on June 4th – 5th, 2021.
- Hafsa Muhammad, Yasar Yousafzai, Zilli Huma, Sajjad Ahmad, Tayyab Rehman. Biosafety as the backbone of Public Health Labs: A Practical Experience. National Virtual Biological Risk Management Conference organized by Pakistan Biological Safety Association and FIC/NIH, USA on June 4th – 5th, 2021.
- Zilli Huma, Hafsa Muhammad, Yasar Yousafzai, Sajjad Ahmad, Rafiullah, Tayyab Rehman. Implementation of High Reliability Organization Principles in Life Sciences Research and Diagnostic Laboratories. National Virtual Biological Risk Management Conference organized by Pakistan Biological Safety Association and FIC/NIH, USA on June 4th – 5th, 2021.
- Usman Waheed, Hafsa Muhammad Chishti, Hasan Abbas Zaheer. Evaluation of General Perception regarding Biosecurity and Biosafety among Medical Technologists / Technicians working in Diagnostic Laboratories of Rawalpindi and Islamabad. First Annual Conference, Pakistan Association of Medical Laboratory Sciences (PAMLS), Faisalabad, May 16, 2010.

4. Research Training, Capacity Building, and International Collaboration

A major component of my career has been developing scientific capacity through interdisciplinary education and mentorship. I have contributed to curriculum development, professional training, and laboratory workforce development in biosafety, biosecurity, laboratory quality management, molecular diagnostics, genomic sciences, and infection prevention and control. I have also coordinated collaborative initiatives involving universities, public health laboratories, government institutions, and international organizations to strengthen sustainable research capacity in Pakistan.

These activities have established collaborative platforms that integrate molecular biology, public health, laboratory systems, and One Health principles to address emerging infectious diseases and antimicrobial resistance.

Representative publications

- Shah MW, Muhammad H, et al. SARS-CoV-2 variants and genomic surveillance in north-west Pakistan. *Biotechnology & Biotechnological Equipment*. 2024.
- Hameed F, Khan MA, Muhammad H, et al. Plasmid-mediated *mcr-1* gene in multidrug-resistant pathogens. *Revista da Sociedade Brasileira de Medicina Tropical*. 2019.

Complete list of Publications

https://scholar.google.com/citations?view_op=list_works&hl=en&hl=en&user=Dqid9OsAAAAJ

D. RESEARCH SUPPORT

Ongoing Research (Grants as PI)

- Association of Onco-Viruses with brain cancer: Viral detection and in-vitro growth inhibition of patient-derived brain cancer cell cultures using viral vaccines. PKR 17,334,336.40. NRPU 2021, HEC, Pakistan

Completed Research Projects (Grants as PI)

- Biological Weapons Convention and biosecurity awareness-raising among life scientists. \$2970 USD. Centre of Excellence project, Health Security Partners. USA.
- Genetic Aspects of Aggressive Behavior. PKR 500,000.00. FARE Grant. ORIC, Khyber Medical University, Peshawar.
- “Biosecurity Situation Analysis of Life Science Research Projects at KP Universities and Biosecurity Training for the Security Guards,” \$4270 USD. Centre of Excellence project, Health Security Partners. USA.