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Conference Proceedings

# Proceedings of the ANSO-PAS-MAAP Conference on Epidemic and Pandemic Preparedness

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## OVERVIEW

An EPIDEMIC is a disease that affects many people within a community, population, or region. ENDEMIC is something that belongs to a particular people or country. A PANDEMIC is an epidemic that's spread over multiple countries or continents. Epidemics and pandemics are some of the leading threats to global health security. They not only affect people's health and well-being, but they can also have a massive impact on livelihoods and entire societies too. Pandemics can cause sudden, widespread morbidity and mortality as well as social, political, and economic disruption. The world has endured several notable pandemics, including the Black Death, Spanish flu, and human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS). Most new pandemics have originated through the "zoonotic" transmission of pathogens from animals to humans, and the next pandemic is likely to be a zoonosis as well. Zoonoses enter human populations from both domesticated animals (such as farmed swine or poultry) and wildlife. Many historically significant zoonoses were introduced through increased human-animal interaction following domestication, and potentially high-risk zoonoses (including avian influenzas) continue to emerge from livestock production systems. Some pathogens (including Ebola) have emerged from wildlife reservoirs and entered human populations through the hunting and consumption of wild species (such as bushmeat), the wild animal trade, and other contacts with wildlife. Spending and costs specifically associated with pandemic preparedness and response efforts are poorly tracked. There is no widely accepted, consistent methodology for estimating the economic impacts of pandemics.

To highlight strategies to combat pandemics, a three-day ANSO-PAS-MAAP Conference on Epidemic and Pandemic Preparedness was jointly organized by the Pakistan Academy of Sciences (PAS), Alliance of International Science Organization (ANSO), and Monbukagakusho-MEXT Alumni Association of Pakistan (MAAP) organized a three-day ANSO-PAS-MAAP Conference on "Epidemic and Pandemic Preparedness" from December 5 - 7, 2022 in the Pakistan Academy of Sciences, Islamabad. In total, 31 lectures were delivered at the ANSO-PAS-MAAP Conference by leading experts in five technical sessions focused on the surveillance and preparedness against global Pandemics and epidemics. Of these, seven (07) lectures were presented by international speakers and twenty-six (26) lectures were presented by Pakistani speakers. The resource persons were leading foreign experts from different countries i.e., China, New Zealand, Italy, USA, and Pakistan. While 32 posters were presented on various themes of pandemics and epidemics in the Poster competition, in which young scientists from across the country participated. Over 400 academicians, scientists, researchers, and postgraduate students from Pakistan and abroad have registered to participate in the deliberations of the conference through physical and/or virtual (online) presence. In addition to the technical sessions, four group works were conducted to formulate recommendations. Recommendations of the conference will be shared with national and international bodies and research institutions dealing with the development of vaccines for the control of potential epidemic and pandemic-related issues worldwide.

## 1. DAY 1 (5 DECEMBER 2022)

### 1.1 Inaugural Session

The event was inaugurated by Prof. Dr. Mukhtar Ahmed, Chairman, Higher Education Commission. Dr. Mukhtar appreciated the efforts of PAS, ANSO, and MAAP for jointly organizing this useful event for the health and safety of mankind from epidemics and pandemics. He motivated the young scientists and students for their role in diagnosis, control, therapeutic and vaccine strategies for different viruses. He mentioned that HEC has been preempting to have the concept of smart universities to have higher education online. Prof. Dr. CAO Jinghua, Executive Director, ANSO addressed the gathering online on behalf of Prof. Dr. Chun Li Bai, President of ANSO. He appreciated the efforts of the Pakistan Academy of Sciences and COVID-related management in the Country for spreading awareness about the adverse impacts of epidemics and pandemics.

Earlier, Prof. Dr. Tasawar Hayat, Sec. General, PAS, welcomed the Chief Guest, distinguished scientists, speakers, and participants. He shed light on the role of the Academy in facilitating Pakistani academicians, scientists, and researchers for innovative R&D in various scientific disciplines for implications in the domain of health, energy, and technology. Prof. Dr. Zabta Khan Shinwari (President MAAP; Distinguished National Professor; Prof. Emeritus, QAU) presented the keynote address and thanked PAS, ANSO, and HEC for collaborating in the organization of this event and highlighted the improvement in pandemic control-related strategies, risk management and policies against future possible outbreaks. He had a draft strategy to combat future pandemics.

In his inaugural address, Prof. Dr. Khalid M. Khan (President, PAS) congratulated the collaborating institutions and organizing team for their efforts in organizing the event. He talked about the spread and impacts of some devastating pandemics in past (Hong Kong flu, Swine flu, and COVID-19 outbreaks) on mankind. Dr. Muhammad Ali (PI, ANSO Project; Assistant Professor QAU) talked about zoonotic viruses that are responsible for pandemics and endemics, which affect almost every field of life throughout the world. He specifically targeted viruses associated with Bats and that Bats are the main reservoir of viruses. He presented his valuable project and the inevitable struggle for identification and studying these bats and their microbiome all over Pakistan. The inaugural ceremony was concluded with a vote of thanks by the organizers. A group photo was taken after the inaugural session with the Chief Guest (Figure 1).

### 1.2 Technical Session I: Strengthening Diagnostic and Pandemic Preparedness

After the inaugural session, Technical Session I on Strengthening Diagnostic and Pandemic Preparedness was chaired by Maj. Gen. Dr. Aamer Ikram (Executive Director, NIH, Islamabad) and co-chaired by Dr. Quaid Saeed (CEO, IHRA). The session started with the presentation of a leading foreign expert from China, Prof. Dr. Di Liu from the Wuhan institute of virology, Chinese Academy of Sciences on the topic 'Oxford-Nanopore Technology Rapidly Determination of SARS CoV-2 Genome and TRACE-seq Meta-Transcriptome Detection Method' and Dr. Muhammad Qasim Director Research at Te Rangawairua o Paratene Ngata Research Centre, New Zealand shared his views on Importance of diagnostics in epidemics preparedness and response: Lessons from COVID-19 pandemic. They explained that emerging and re-emerging infectious diseases continuously threaten humanity and timely diagnostics and detection are foundational and starting points for a successful outbreak containment strategy. The development of diagnostic tests, validation, and implementation at a community level is still lacking for those pathogens which are listed by WHO as most likely to cause a future epidemic.

The national experts of this session were Dr. Saeed Khan (Professor of Pathology at DOW Institute of Health Sciences, Karachi), Dr. Hasnain Javed (Lab Head and Focal person of Provincial Public Health Reference Lab Punjab), Dr. Ibrar Ahmad (Head of Alpha Genomics Private Limited, Islamabad, Pakistan), and Dr. Massab Umair (National Institute of Health, Islamabad, Pakistan), shared their experiences and views about strengthening diagnostics and pandemic preparedness. They emphasized on the


**Fig. 1.** Participants of the Inaugural Session of a three-day ANSO-PAS-MAAP Conference on Epidemic and Pandemic Preparedness with the Chief Guest Prof. Dr. Mukhtar Ahmed (Chairman, Higher Education Commission), Prof. Dr. Khalid M. Khan (President, PAS), Prof. Dr. Tasawar Hayat (Secretary General PAS), Prof. Dr. Zabta Khan Shinwari (Chief Organizer, Fellow PAS & President MAAP), Dr. Quaid Saeed (CEO, IHRA) and Dr. Muhammad Ali (PI ANSO Project) organized by the Pakistan Academy of Sciences (PAS), Alliance of International Science Organization (ANSO), and Monbukagakusho-MEXT Alumni Association of Pakistan (MAAP).

availability of timely and accurate diagnostics to combat the spread of pandemics or outbreaks. It is important to equip with the necessary technological advancements to detect and effectively manage the spread of such diseases in the future. It is now thought to be essential to overcome future threats to evaluate the public health systems with creative, coordinated, and collaborative actions across humans, animals, and the environment (One Health).

However, the preparations made by public health laboratories including well-resourced, diagnostic labs, skilled staff, and mobile labs made it possible to overcome the problems. Without these resources, the country would quickly collapse due to immense healthcare and economic burden and there would have been no way to contain outbreaks from then onwards.

### 1.3 Technical Session II: Molecular Pathology and Efforts for Controlling Pandemics

Technical Session II was chaired by Dr. Osman Yusuf (Chief Consultant, Allergy and Asthma Institute, Islamabad) and co-chaired by Dr. Javed Muhammad (Assistant Prof. University of Haripur). The leading topic of this session was "Molecular Pathology and efforts for controlling Pandemics". The session started with the presentation of Prof. Dr. Elisabetta Affabris (University Roma Tre, Rome, Italy), a Professor of Virology. She presented her extensive research study about the human immune system specifically how interferons react and produce viral infection. She explained the role of Type I interferons, the first line of defense in microbial infections, and their critical role in blocking early virus replication, spread, and tropism as well as promoting the adaptive immune response. She elaborated on the role of innate and adaptive immunity during acute viral infection and the production of different interferons. She proposed that the immune evasion of the IFNs system could be a therapeutic tool to reduce the virulence of the disease.

Dr. Ali Talha Khalil (Assistant Professor and Consultant Molecular Biologist at (LRH-MTI), Peshawar) expressed his thoughts about learning from pandemics, it is now generally accepted that the local or global response to public health emergencies is complex and requires a sector-wide coordinated response. However, in preventing pandemics a variety of factors are required. Short-term intervention can help mitigate the immediate threats to life and the economy. Zoonosis and the

spread of zoonotic pathogens to humans are the two main causes of pandemics, requiring global efforts to maintain the stability and integrity of the environment. Future pandemic risk can be controlled by low infectious agent transmission and exposure. It is now thought to be essential to overcome future threats to evaluate the public health system with creative, coordinated, and collaborative actions across human, animal, and environmental (One-Health).

In this session, the next speaker was Dr. Yasir Waheed (Director, ORIC at Shaheed Benazir Bhutto Hospital Islamabad, Pakistan). He elucidated the importance of Global and Local Efforts to control Hepatitis Epidemics. He enlightened the annual death related to hepatitis globally and talked about the world's first hepatitis day celebrated in 2008. He highlighted the strategies like; Find the Missing Millions of the World Health Organization (WHO) for the detection and elimination of Hepatitis by 2030, using five different impact targets including, HBV vaccination, HBV mother-to-child transmission, blood safety, harm reduction, and HBV/HCV diagnosis and treatment. He further talked about progress in 2022, that has been made to achieve targets for blood donation screening, treatment, reduction in drug pricing, and decreasing incidence of HBV and HCV. He also discussed that Pakistan has the 2nd highest burden of HCV in the world. A hepatitis control program was initiated which needs good investment to control the hepatitis epidemic.

Another admirable speaker was Dr. Muhammad Rafiq a professor of Mathematics at the University of Central Punjab, Lahore. He delivered his research study on Mathematical Modeling for "Transmission Dynamics of Infectious Diseases: A COVID-19 Perspective". In his talk, he discussed the importance of a Mathematical model for the analysis and control of infectious diseases in a population. He further elaborated a mathematical model that included some important theories that are built and tested, and some quantitative speculations were made, that lead to a better strategy to overcome the transmission of infectious diseases.

Dr. Saima Saleem, Associate Professor (Tenured) at Dr. A.Q. Khan Institute of Biotechnology and Genetic Engineering (KIBGE), University of Karachi. She presented a topic about Leadership and Communication for Epidemic and Pandemic Preparedness: An Awareness Program for Researchers on SARS-CoV-2. In her talk she discussed a training program designed for the education of leaders, focusing on behaviors, and nurturing their workforce to prepare, protect, and promote the frontline research scientists and healthcare workers in the biological research laboratories during the pandemic of SARS-CoV-2. A workshop was conducted at The Karachi Institute of Biotechnology and Genetic Engineering (KIBGE), University of Karachi, Pakistan in collaboration with Safer Behaviors (SB) in Atlanta Georgia, USA. She said that the training program aimed to evaluate the behavioral-based biosafety culture and provide biosafety training according to international standards in the biosafety parameters were engineering control, personal protective equipment (PPE), standard operating procedures (SOP), and administrative control. Moreover, she mentioned the biosecurity aspects which were monitored as physical, personal, material, and information security protocols. In the last, she concluded that leadership is not an authoritative title but a philosophy that demonstrates the highest and lowest levels within an organization.

Mr. Zakir Hussain, Agriculture Officer, IPM, Department of Agriculture Gilgit Baltistan. He elucidated Armyworm (*Mythimna unipuncta*) outbreak scenario in horticultural crops under the impact of climate change in Gilgit-Baltistan, Pakistan. He mentioned the major crops that grow in the region and mentioned its constrained production due to the negative impacts of climate change and pest population. He further highlighted that due to climate changes in GB over from last 4-5 years, in the early days of April 2022, the outbreak of *Mythimna unipuncta* has been observed in all agricultural fields of Gilgit which gradually flared up throughout GB till the end of May 2022. He suggested that farmer awareness of climate change and climatic factors influencing pest prevalence within the GB is highly needed to be prioritized. He also proposed that risk assessment maps are needed to be prepared and improved by collaborating with the different stakeholders and farmers to manage insect pests under changing climatic situations.

At the end of technical session 2, the audience were invited for discussion regarding the topics discussed in today's session, where they highlighted different issues that were effectively addressed by the experts present at the conference.

## 2. DAY 2 (6 DECEMBER 2022)

The second day of the conference started by welcoming the participants and speakers of the day by Prof. Dr. Zabta Khan Shinwari, he also gave an overview of the first day of the conference to the participants (physical and online).

### 2.1 Technical Session III: One Health, Zoonotic, and Animal Diseases

Technical Session III on "One Health, Zoonotic and Animal Diseases" was Chaired by Prof. Dr. Muhammad Mukhtar (Vice Chancellor, National Skills University Islamabad), and co-chaired by Dr. Ali Talha Khalil (Assistant Professor, LRH Peshawar). Prof. Dr. David Hayman (Professor of infectious disease, Massey University, New Zealand) was the first speaker of the session. His topic of the presentation was "One health approach and pandemic disease prevention". He discussed the objectives of "one health summary" presented by WHO along with different health, agriculture, and food organizations to identify the source of the SARS-CoV-2 (Severe Acute Respiratory Syndrome-Coronavirus 2) including the route of introduction to the human population. His study aimed to prevent both reinfections with the virus in humans, and identify potential zoonotic reservoirs to reduce future risks of zoonotic disease. He discussed the unprecedented and unsustainable level of anthropogenic environmental changes including agriculture intensification, climate change, and wildlife trade likely increasing pandemic risk. One health high-level expert panel (OHHLEP) guidance on pandemic risk through policy-relevant, scientific assessment of health at the human and animal ecosystem, and research gaps. Long-term strategic approaches to reduce zoonotic risk. He also discussed floods in Pakistan that covered 1/3 of the country. His concluding remarks were a rational approach for global pandemic policies that reduce the drivers of pandemics along with current efforts by intergovernmental science-policy platforms on biodiversity and ecosystem services to implement health approaches.

Dr. Zengyun Hu, Professor at Xinjiang Institute of Ecology and Geography (XIEG), Chinese Academy of Sciences (CAS) topic of discussion was "Future features of COVID-19 with the SARS-CoV-2 omicron in Pakistan". He discussed the rapid transmission of the SARS-CoV-2 variant to a record-breaking case incident rate around the world. He discussed the importance of future features of the omicron variant in Pakistan. He explained the SECIR disease dynamical model and autoregressive integrated moving average (ARIMA) to investigate the future variation of COVID-19. He concluded his presentation by saying these two models are important to reduce the spread of COVID-19 in Pakistan.

Dr. Muhammad Usman, Assistant Professor of Microbiology, GCU Faisalabad presented his work entitled "Coexistence of blaNDM and mcr-1 producing *Escherichia coli* isolated from human, poultry and environment water from Pakistan- A one health concern". He explained the emergence and spread of New Delhi metallo-β-lactamase (NDM) and mcr-1-producing *E. coli* as a serious threat around the globe, particularly in developing countries like Pakistan. His study aimed to determine the prevalence of both blaNDM and mcr-1-producing *E. coli* in poultry cloacal swabs, environmental water, and human samples. The highest number of positive cases were found in poultry samples, in which 22 *E. coli* were positive for mcr-1 and 17 E. coli were NDM producers. Dissemination of blaNDM mcr-1-producing *E. coli* from clinical, poultry, and environmental water is a matter of great concern for both livestock and public health.

Dr. Azam Jan Afridi (Assistant Professor in Biology at GDC Darra Adam Khel, TSD Kohat) topic of his presentation was "Lumpy skin disease in Tehsil Bara District Khyber; An emerging threat to livestock in Pakistan". He explained transmission and infection caused by Lumpy skin disease. The objective of his study was to check the ongoing outbreak of Lumpy skin disease and its effects in Tehsil Bara. The data was collected through a questionnaire method from cattle and dairy farmers from five selected areas in Tehsil Bara. The highest cases were found in the Shlobar area where the

infection rate was 96.28 % and the mortality rate was 12.66 %. The lowest cases were reported in Nala Sour Dandh where the infection rate was 53.30 % and the mortality rate was 4.65 %. He recommended the multi-task role of government, and private sector, as well as the isolation of infected animals and prevention of illegal transportation across the border.

Dr. Yasir Mehmood Yousafzai (Associate Professor and Director, Public Health Reference Laboratory, Institute of Pathology and Diagnostic Medicine, Khyber Medical University, Peshawar) enlightened "The vital role of Khyber Medical University in pandemic preparedness and response during Covid-19". He explained how this medical university volunteered to play a front-line role in the prevention, detection, and control of the pandemic. This engagement aimed to provide significant assistance to the department of health, Khyber Pakhtunkhwa (KP) while continuing to teach safely. During the COVID Pandemic, PCR testing capacity was rapidly enhanced increasing up to 6000 tests/day with a total of 1.6 million PCR tests so far. Twenty-eight (28) PCR labs were established within the first six months of the pandemic response. Telemedicine services provided valuable support to the community when hospital OPDs were shut down. A drive-through vaccination center was established.

### 2.2 Poster Session

The poster competition was held, in which young scientists from across the country participated. Out of Eighty-two (82) posters received, Thirty-two posters were short-listed. A three-member evaluation committee was formulated comprising of Prof. Dr. Masoom Yasinzai (Former Rector, IIU, Islamabad), Maj Gen. Dr. Aamer Ikram, S.I.(M) (Executive Director, NIH, Islamabad), and Prof. Dr. Mushtaq Ahmad, Fellow PAS and Chairman Department of Plant Sciences, Quaid-i-Azam University, Islamabad). The following six (06) posters were selected for prizes as indicated by their names shown in Table 1. Glimpses from the poster session are shown in Figure 2.

### 2.3 Technical Session IV: Vaccines and Public Health

Prof. Dr. Saeed Khan (Professor, Dow University of Health Sciences; President, PBSA) along with Dr. Tariq Khan (Lecturer, University of Malakand) moderated the Technical Session on Vaccines and Public Health. The session started with the intriguing title, Monkeypox: poxviruses are back? Prof. Maria R. Capobianchi (Saint Camillus International University of Health Sciences, Rome, Italy) presented major findings on the respective topic. The disease killed between 15 and 30 % of individuals in the 20$^{th}$ century in Africa and has started to spread again even in individuals not traveling from Africa. The growing global pandemic was deemed a Public Health Emergency of International Concern on July 23, 2022, by WHO Director-General Tedros A. Ghebreyesus. By the middle of October, 111 different nations had recorded more than 60,000 cases. Monkeypox belongs to the Orthopox Virus, which is an enveloped, Double-stranded DNA virus, prevalent in Equatorial Africa, where hundreds of cases of human infections are reported annually. The mode of transmission for this virus is usually from wild animals, like rodents to humans. However, in the present outbreak, mode of transmission from human to human is involved too, including homosexuals, and are considered the main risk factor of monkeypox outbreak. Further, she emphasized on the fact that understanding the viral mode of transmission and its epidemiological patterns can help in preventing further disease spread and a better approach towards epidemic preparedness.

Afterward, another interesting topic, Roadmap for vaccine development and its indigenization in Pakistan was presented by Dr, Liaqat Ali Khan (Assistant Professor, Department of Biological Sciences, National University of Medical Sciences, Rawalpindi). He discussed the importance of vaccines that vaccines have significantly lessened the burden of many infectious diseases, supporting human development and well-being on a global scale. He highlighted the fact that vaccines are expected to save the lives of 25 million individuals in the upcoming decade and remain the foundation of public health initiatives. It is estimated that six of every ten infectious diseases are zoonotic, this way, vaccines are not limited to humans but to animals as well. He further discussed the developmental stages and myths of vaccines and stressed on the fact that the lack of new and improved vaccinations to fight against infectious diseases, particularly in under-resourced countries remains a problem. The

**Table 1.** Result of the poster competition

| S. No. | TITLE | PRESENTER AND AFFILIATION | Evaluation Criteria | Position/ Ranking in Competition |
|---|---|---|---|---|
| 1. | Macrophage targeting with the novel carbopol based miltefosine-loaded transfersomal gel for the treatment of cutaneous leishmaniasis: in vitro and in vivo analyses | **Sibgha Batool**<br>Ph.D. Scholar<br>Nanomedicine Research Group, Department of Pharmacy, Faculty of Biological Sciences, Quaid-i-Azam University, Islamabad, Pakistan | | First Position |
| | *In vivo* immunostimulatory effect of Syringic Acid on cyclophosphamide induced immunosuppression | **Khoula Sharif Mughal**<br>Ph.D. Scholar<br>Department of Pharmacy<br>COMSATS University Islamabad, Abbottabad Campus | • Layout & Graphics Quality | |
| 2. | Origin, Pathogenesis, Diagnosis and Treatment Options for SARS-CoV-2: A Review | **Humna Sajjad**<br>M.Phil. Scholar<br>Department of Biotechnology, Quaid-i-Azam University, Islamabad | • Contents / Text Quality<br>• Presentation Skills | |
| | Serotyping and Characterization of Non-Structural Genes of Dengue Virus Circulating in Pakistan. | **Muhammad Bilal Khan**<br>Laboratory Technologist<br>Department of Biological Sciences, National University of Medical Sciences (NUMS), Rawalpindi | • Quality of Results & Conclusions | 2nd Position |
| 3. | The potential of plant biotechnology in preparing us for pandemics; a case for plant in vitro cultures and plant-based products | **Reema Iqbal**<br>M.Phil. Scholar<br>Agriculture university Peshawar | | 3rd Position |
| | Control of Charcoal rot Disease in Mung bean by using Plant Growth Promoting Rhizobacteria | **Amjid Khan**<br>Ph.D. Scholar<br>Department of Plant Sciences, Quaid-i-Azam University, Islamabad | | |

progression of the necessary scientific and technical skill set, adequate funding, and governance of a framework that supports research and innovation are direly needed. In the end, he highlighted a point that Pakistan is very far from the world of vaccine development and production. Considering the fact that Pakistan's population is continuously expanding and the dangers of newly developing infections and bioterrorism are a major health concern, a constant effort is needed from all stakeholders to excel in this country's capabilities in the respective field.

Later, Dawood Ghafoor (Wuhan Institute of Virology, CAS) presented a novel methodology to design a multi-epitopes subunit vaccine against the Hantaan virus. The Bunyaviridae family of viruses,

**Fig. 2.** Glimpses from the poster session. A three-member committee comprising of Prof. Dr. Masoom Yasinzai (Former Rector, IIU, Islamabad), Maj Gen. Dr. Aamer Ikram, S.I.(M) (Executive Director, NIH, Islamabad), and Prof. Dr. Mushtaq Ahmad, Fellow PAS and Chairman, Plant Science Department, QAU evaluated the posters.

which includes the Hantaan virus, is an emerging group of viruses that cause hemorrhagic fevers. The virus is widespread around the world, and as of right now, no effective antiviral medication or vaccine has been created to guard against viral infections. Dawood Ghafoor discussed a potential approach in which B and T-cell epitopes for the Hantaan virus's enveloped protein and poly-protein were predicted using a variety of computational tools. A prospective multi-epitope subunit vaccine was created by connecting B and T-cell epitopes with their respective linkers after the individual epitopes were modeled for docking with their respective HLAs. Furthermore, 3-D modeling and docking analysis with TLR-4 was done and a number of physiochemical characters were assessed. Later, the docked complexes of vaccine-TLR-4 were evaluated for residual interactions, and immune simulations were performed by the C-IMMSIM server. In the end, he predicted the natural immune response by immune simulation analysis and evaluated the expression analysis through in-silico cloning using *E. coli*. The overall values suggested that the vaccine is efficient and causes high immunogenicity. In the end, he concluded that this was a computational study and further *in-vitro* studies are required to confirm the effectiveness of this vaccine.

Subsequently, Dr. Niamatullah Kakar (Assistant Professor, Department of Natural and Basic Sciences, University of Turbat (Kech), Pakistan) presented on a topic, Epidemiological, clinical, and laboratory findings of COVID-19 positive patients in a hospital in Quetta, Pakistan. He highlighted the demographic, clinical, and laboratory data of COVID-19-positive patients. He conducted his study from September 2020 to March 2021 at Sheikh Khalifa Bin Zaid Hospital and Fatima Jinnah Institute of Chest Disease. 199 patients out of which 127 were males and 72 were females tested positive for COVID-19 and were included in the study. He further discussed the disease outcomes with respect to age, gender, ethnic background, and employment status. He concluded that a significant number of cases were

reported from the age group 51-75 Years and the mortality rate was higher (>22 %) in older age and was recognized in males than females. Similarly, based on ethnic background and region most of the patients were from KPK and Baluchistan. Furthermore, with respect to employment status, non-health workers were more prone to COVID-19 infection. Among the hospitalized patients diagnosed with comorbidities, 45 (22.61 %) were diabetic, 24 (2.01 %) with respiratory disease, and 4 (2.01 %) with chronic kidney conditions. Patients who tested positive had a significantly higher white blood cell, neutrophil, and lower red blood cell count. They also had higher C-reactive protein, D-dimer, urea, creatinine, glucose fasting, and lactate dehydrogenase levels in serum. In a nutshell, he presented different indicators that play an important role in the intensity of the disease. These findings will help to fight against the disease with better diagnosis and treatment.

After that, Engr. Adnan Bashir (Chief Executive Officer, Health Information Systems Program) gave his wonderful presentation on a very peculiar topic, Dynamics of Health Information Systems (HIS) in Pakistan; How to Best Utilize What We Have. He highlighted the point that modern health information systems provide an integrated framework for managing many responsibilities in the healthcare system. The COVID-19 pandemic presented how fragile our health system was. Later on, he pinpointed the importance of public health and its role in evaluating program impact, monitoring progress, and determining populations to target for intervention and barriers to care. He then discussed major information systems and their role in outbreak detection and response with preparedness. In the end, he discussed the fragmented structure of the Health Information System (HIS) in Pakistan and the dire need for a centralized health information system to make sure that health-related data are produced and integrated at the provincial and national levels. This system can be achieved in Pakistan to combat the upcoming pandemics and outbreaks.

In the end, Dr. Tahir Usman (Assistant Professor, Abdul Wali Khan University Mardan, KP) presented the topic, Knowledge, Attitude, and Practice Regarding COVID-19 Pandemic in Pakistan. He studied the psychosocial impact of COVID-19 on the general population. He used knowledge, attitude, and perceptions (KAPs) as an indicator to analyze the psychology of a certain person. A cross-sectional study was conducted from September 1, 2021, to December 31, 2021, in Pakistan. The questionnaire included socio-demographic information, awareness, attitudes toward the disease, safety precautions, and opinions about it. According to the analysis, there was a strong association between the knowledge score and gender, marital status, and education. 94.5 % (n=700) of the participants believed that elder people were more prone to COVID-19 infection. Moreover, the majority of the participants showed their concern for their family members regarding COVID-19 and it can be controlled if the standard SOPs are followed. In the end, he discussed that the general population has good awareness and perceptions about COVID-19 and that effective health education programs can further improve the gap between KAP and COVID-19.

The session was concluded by moderators of the session, Dr. Saeed khan and Dr. Tariq Khan. In addition, souvenirs were given to the speakers and moderators and the session ended with a big round of applause.

## 3. DAY 3 (7 DECEMBER 2022)

The Third day of the conference started by welcoming the participants and speaker of the day by Dr. Muhammad Ali (PI, ANSO Project), he also gave an overview of the second day of the conference to the participants (physical and online). After the welcome address, he invited the Chairs of the session and technical session three which was based on Antimicrobial and Nano Biology was initiated.

### 3.1 Technical Session V: Antimicrobials and Nanobiology

The final technical session on Antimicrobials and Nanobiology was chaired by Prof. Dr. M. Aslam Baig (Distinguished National Professor, National Center for Physics; Professor Emeritus, QAU) and Prof. Dr. Mushtaq Ahmad (Chairman, Department of Plant Sciences, QAU) along with Dr. Muhammad Ovais as moderator. They welcomed the speakers and participants.

Dr. Afreenish Amir (Medical Microbiologist, Technical Officer AMR, Project Director National Fungal Disease Surveillance, National Institute of Health, Islamabad, Pakistan) was the first speaker of the day. She talked about "antifungal agents; mechanism of actions, resistance, and newer agents". Fungal infection is an emerging threat to public health that is being neglected. Antifungal resistance is increasing because of little antifungal production and also because everyone is using antibiotics and antifungals without prescriptions. She discussed some new antifungal agents that are in clinical trials with enhanced activity and fewer side effects. She talked about stewardship that can help to save the existing antifungal agents, besides it, there was a strong emphasis on one health approach for future therapies and interventions.

The next Speaker, Dr. Fazal Mehmood Khan (Post-doctoral Fellow, Institute for Advanced Study, Shenzhen University China) discussed "LysAB54, an Acinetobacter baumannii Bacteriophage Endolysin with potent Antibacterial Activity Against a broad range of Gram-Negative Bacteria". A. baumannii and other gram-negative bacteria have emerged and also antimicrobial resistance is increasing. It takes years to develop a new antibiotic, synthetic phages can be a better option to cope with antibiotic resistance. They have a wider host spectrum. He presented his research work on endolysin therapeutic agents. He also provided information on the limitation of the use of endolysin as it lost activity in the serum, limit to use on the skin surface but can be used as a disinfectant in hospital wards. He invited collaborations from different institutes around the world.

Dr. Tariq khan (Lecturer, Department of Biotechnology, University of Malakand) presented a topic on "Nano-biotechnology against a resistant pathogen; a way forward in preventing pandemic". He said that antimicrobial resistance may be the next pandemic. Antimicrobial resistance may be due to treatment failure, approval of new antibiotics, and lack of awareness. He stated nano-biotechnology as a novel strategy to overcome antimicrobial resistance. He concluded his talk by saying that antibiotic–nanomaterial conjugate can be a good way forward. Low molecular weight nanomaterial based on antibiotics could be very effective against multi-drug resistance.

Dr. Ikram Ullah (Assistant Professor, Department of Biotechnology and Genetic Engineering, University of Hazara, Pakistan) topic of the presentation was "Biogenic silver nanoparticles (AgNPs) stimulates J774 macrophage cells to induce the production of nitric oxide (NO) and reactive oxygen species (ROS) that have leishmanicidal effects". *Leishmania* is the 3$^{rd}$ most important vector-borne disease that may lead to a pandemic. Currently available treatments have side effects so there is a need for alternative treatments. He presented nanobiotechnology as a non-toxic alternative therapy and of low cost. Further, *in-vivo* studies are required to use nanoparticles as anti-leishmanial agents.

Dr. Fakhar-ud-Din (Assistant Professor, Department of Pharmacy, Faculty of Biological Sciences Quaid-i-Azam University, Islamabad) talked about "Nanomedicines for tumor targeting" as cancer is increasing rapidly and current treatments are unable to cope with a problem that may be due drug delivery issues. Site Specific drug delivery is necessary because conventional drug delivery systems have many problems associated with them. He presented a smart drug delivery system that may be able to cope with all these problems.

Dr. Zul Kamal (Department of Pharmacy, Shaheed Benazir Bhutto University, Sheringal) talked about "surface functionalization/coating of nanoparticles with red blood cell membrane for own demand antibiotic delivery". He gave an idea about a cell-based drug delivery system. He worked on erythrocytes as the cell to load his drugs that can be used against microbial resistance. He talked about the problems associated with the nanoparticles as these can be easily picked by the immune system so there is a need to prepare drug delivery on demand to reduce toxicity and make it more receptor specific.

### 3.2 Concluding Session

H. E. Mr. Agha Hassan Baloch, Federal Minister for Science and Technology chaired the Concluding Ceremony of the International 3-day ANSO-PAS-MAAP Conference on "Epidemic and Pandemic preparedness" organized by the Pakistan Academy of Sciences (PAS), in collaboration with the Alliance of International Science Organization

(ANSO), and Monbukagakusho-MEXT Alumni Association of Pakistan (MAAP) held on December 07, 2022, in the Pakistan Academy of Sciences. H. E. Mr. Agha Hassan Baloch congratulated the Pakistan Academy of Sciences for organizing the International conference on such an important topic, he emphasized that Pakistan must have an integrated health system to cope with future epidemics. As exemplified by the ongoing coronavirus disease (COVID-19) pandemic major infectious diseases and epidemics have devastating impacts on human lives, destroying long-term social and economic development. Global health crises threaten to overwhelm already overstretched health systems, disrupt global supply chains, and cause unequal devastation of the livelihoods of people, including women and children, and the economies of the poorest and most vulnerable countries.

Federal Minister for Science and Technology stated that Covid-19 is a human tragedy. But it has also created a generational opportunity. An opportunity to build back a more equal and sustainable world. The response to the pandemic and to the widespread discontent that preceded it must be based on a new social contract and a new global deal that create equal opportunities for all and respect the rights and freedoms of all. This is an urgent need to have a robust health system, that reaches those who are vulnerable or in vulnerable situations. There is a great need of raising awareness, the exchange of information, scientific knowledge and best practices, quality education, and advocacy programs on epidemics at the local, national, regional, and global levels as effective's measures to prevent and respond to epidemics. He further added I am confident that the participants will utilize the knowledge and skills gained through this event in their research so that the objectives of the conference can be fully realized. His Excellency distributed shields among the Winners of the poster competition held during the conference at the Pakistan Academy of Sciences.

On behalf of the Pakistan Academy of Sciences, and the Organizing Committee of the ANSO- PAS- MAAP Conference on "Epidemic and Pandemic Preparedness", Prof. Dr. Tasawar Hayat, Secretary General PAS thanked the Honourable Chief Guest of today's session, His Excellency, Agha Hasan Baloch Sahib (Federal Minister for Science & Technology) for sparing time from his very busy schedules to grace the occasion with his participation to conclude the event. His physical presence in this session indeed shows his keen interest in the scientific activities of this country, and it is also a source of motivation, inspiration, and encouragement for us all and especially the young scientists and researchers who are physically and virtually attending this conference.

Further, extended deepest gratitude to ANSO for financially supporting the event as well as MAAP for joining hands with the Pakistan Academy of Sciences in the organization of the Conference in Islamabad on topics of immense importance for scientists, researchers, medical specialists, and technologists who are engaged in developing innovative vaccines, medicines, and technologies to combat COVID-19 and alike pandemics and epidemics across the globe for the health and safety of the mankind. Very special thanks are also due to Prof. Dr. Khalid Khan, President PAS, and Prof. Dr. Zabta Khan Shinwari, Chief organizer of the Conference, Dr. Muhammad Ali (PI, ANSO Collaborative Project), and organizers for their efforts, valuable inputs, and dedication that we have been able to host this conference. A group photo was taken after the concluding session with the Chief Guest H. E. Mr. Agha Hassan Baloch, Federal Minister for Science and Technology (Figure 3).

The conference was well attended; in addition to the speakers, the participants for deliberations on topics of vital importance for scientists, researchers, medical specialists, and technologists who are engaged in developing novel vaccines, medicines, and technologies to fight pandemics and similar diseases around the world for the wellbeing and safety of humanity


**Fig. 3.** Participants of the Concluding Session of a three-day ANSO-PAS-MAAP Conference on Epidemic and Pandemic Preparedness with the Chief Guest H. E. Mr. Agha Hassan Baloch, Federal Minister for Science and Technology, Prof. Dr. Tasawar Hayat (Secretary General PAS), Prof. Dr. M. Aslam Baig (Distinguished National Professor, National Center for Physics; Professor Emeritus, QAU) and Dr. Muhammad Ali (PI ANSO Project) organized by the Pakistan Academy of Sciences (PAS), Alliance of International Science Organization (ANSO), and Monbukagakusho-MEXT Alumni Association of Pakistan (MAAP).

## 4. RECOMMENDATIONS

In the culmination of the ANSO-PAS-MAAP Conference, participants worked together to compile a list of recommendations that would further help in developing a better and more effective pandemic response. These recommendations are enlisted below;

- Should improve the information system to establish a global network of groups worldwide that identify any outbreak and develop new strategies and stop the spread of infection and identify and report novel pathogens. To make a systematic database that collects and shares authentic viral genetic information and can identify any new viral variant and took timely measures against infections.
- The public health communication system should be improved. It's been very challenging to stop misinformation about infectious diseases, partly because of a widespread lack of trust between communities, governments, and healthcare systems. Controlling the misinformation spread by religious scholars and proposing the strategy to bring them on the same platform without discrimination of science with religion. Standardized nomenclature system for viruses and variants to avoid infodemics.
- Adopt a serious plan for domestic and international pandemic preparedness, such as one that suggests building new infrastructure and making global and national investments to promote pandemic preparedness. Initiate a review of the responsibilities for pandemic preparedness and response among public health authorities at the tribal, local, federal, and state levels. Adopt national guidelines and standards for pandemic preparedness to strengthen health equity in healthcare systems.
- Before the next pandemic strikes, take quick action to identify the populations that are most susceptible to epidemic disease, attempt to reduce these gaps and strengthen the resilience of these communities. Make international efforts to develop national, global, and modern epidemic surveillance and forecasting capacity. Pandemic planning and preparedness activities are not only based on worst-case scenarios. They should be flexible and adaptable.
- Healthcare personnel should be prioritized, recruited, and trained. Because a healthy population will typically be more resistant to infection and should take public health

seriously. In healthcare settings, authorities should be empowered, by using examples of best practices from hospital and health center administrators.

- To develop strategies for implementing pandemic interventions, there should be effective communication among healthcare professionals, the public, and other stakeholders. Healthcare professionals should play a significant role in promoting the use of vaccines as a preventive step among the general public. Avoidance of false paradigms in health care regulation system.
- Increase the number of Mobile Healthcare Units with their effective use. Biotechnologists and Microbiologists should be authorized to supervise healthcare labs independently.
- Telemedicine investment to provide access to patient populations in underdeveloped areas. Hospital bed capacity and personnel equipment tracking systems that are centrally managed to promote resource sharing within and between healthcare systems at the local and regional levels.
- It is recommended that more training and educational activities (e.g., conferences, workshops, seminars, symposiums, etc.) should be available for healthcare workers. Authorities and medical professional associations address vaccination uptake, including a discussion of the leadership responsibilities of healthcare professionals and their moral/professional duty to accept vaccination and support public health preventative initiatives. Policymakers should be part of conferences. Awareness of the rural population should be sponsored.
- It is recommended to reduce population vulnerabilities to the Pandemic and Endemic by creating an essential medications list to set priorities for policy, investments, and regulatory reviews. Enlightening the transparency of global supply chains, notably by providing better information on the source, cost, and drug quality. The intercity movement of individuals must be regulated through proper QR codes.
- Most epidemics and pandemics are considered to be originated from wildlife/animals to human populations. We should protect nature to prevent future outbreaks by reducing population displacement. Start one health campaign worldwide to reduce deforestation, intensive land forming, wildlife trading and hunting, and better surveillance of zoonotic pathogens that can help to prevent future pandemics. Can produce genetically modified crops that have more yield of cellulose that wouldn't be needing of deforestation.
- Take new initiatives for animal care to prevent or minimize contact between animals and humans to prevent zoonotic infections. Start identification of species that are most likely to act as reservoirs, vectors, or intermediate hosts for transmission of infectious diseases and restrict their contact with humans.
- We should adopt a One-Health approach to protect the health of all living beings by bringing experts across fields together to solve problems threatening humans, animals, and the environment. Promote one-health research in Pakistan.
- Pandemics and widespread epidemics have the power to destroy economies, upend nations, and claim millions of lives. The WHO's Health Emergencies Program (WHE) should collaborate with Member States to assist nations in being ready for widespread outbreaks and pandemics. A new WHO Global Health Board is required to support WHO decision-making, especially on controversial matters.
- There should be strong leadership and government involvement in PPA (Pandemic plans and preparedness activities). To carry out PPA, effective political leadership that can coordinate with the ministries of health and other pertinent departments is required.
- Strengthening and boosting the distribution and manufacture of cost-effective vaccines. Least and middle-income countries have no capacity to manufacture their vaccines although need to ensure that there is sufficient production capacity in developing countries that can be quickly scaled up.
- Promoting local manufacture of protective equipment. Encouragement of local production of diagnostic kits and other pharmaceuticals. Ensure fair allocation and distribution of vaccines, diagnostic kits, and other pharmaceuticals during epidemics. All diagnostic kits should be registered by the Drug Regulatory Authority of Pakistan (DRAP).
- Establishment of collaboration between biopharma companies, governments, and non-

governmental organizations that can share information and timely coordinate to maximize pandemic preparedness.

- Advancement of policies regarding the supply and procurement of vaccines should be constantly visited and improved for rapid supply and availability of vaccines in the region of the outbreak. The concept of herd immunity should be introduced.
- Global Health Fund should be established as a first line of action for any outbreak which is primarily focused on investments for pandemic preparedness and improvement of the public healthcare system. Collective funding should be initiated that can be directly utilized to help countries under serious threat. There should be proper funding for Research and Development (R&D) of therapeutics drugs and vaccines. Also, such funds can be used for the timely distribution of vaccines and therapeutics to the infected population. Proper strategies should be introduced for the effective implementation of pandemic measures that include the use of vaccines, transport during the pandemic, and essential protection measures.
- People's mental states should be considered as well so psychological counseling to avoid the panic of the pandemic. Should Avoid social stigma and promote a positive outlook during the pandemic.
- We should have to build trust in healthcare workers, National health agencies, and Health institutions about giving vaccines to people so that they stay healthy. we can help prevent future pandemics by building trust and making sure the guidance from these sources is evidence-based and respected. Raise awareness by mobilizing local religious scholars and the local community for increasing vaccine acceptance.
- Should improve the industry and academia linkages (Universities and Health Industries, hospitals) in which HEC can play a major role. Biomedical teaching labs in universities can be converted to diagnostic labs in emergencies. It's high time to invest in biomedical labs in Academia.

## 5. MEDIA COVERAGE

ANSO-PAS-MAAP Conference on Epidemic and Pandemic Preparedness got huge media coverage. Some of the links are as follows;

1. https://www.technologytimes.pk/2022/12/05/pas-plans-to-formulate-pandemic-control-related-strategies/
2. https://www.pakistantoday.com.pk/2022/12/07/science-minister-emphasizes-on-integrated-health-system-in-country-to-cope-with-future-epidemics/
3. https://www.radio.gov.pk/07-12-2022/agha-hasan-emphasizes-on-integrated-health-system-in-country
4. https://www.app.com.pk/national/science-minister-emphasizes-on-integrated-health-system-in-country-to-cope-with-future-epidemics/
5. https://leadpakistan.com.pk/news/pakistan-academy-of-sciences-plans-to-formulate-strategies-to-control-the-pandemic/
6. https://www.nation.com.pk/08-Dec-2022/science-minister-emphasises-on-integrated-health-system-to-cope-with-epidemics
7. https://www.brecorder.com/news/40213409/minister-calls-for-integrated-health-system-to-deal-with-epidemics
8. https://www.app.com.pk/photos-section/federal-minister-for-science-and-technology-agha-hassan-baloch-distributes-shield-to-position-holder-poster-presenter-during-a-conference-on-epidemic-pandemic-preparedness-organized-by-pakistan-acad/
9. https://www.technologytimes.pk/2022/12/08/epidemic-and-pandemic-preparedness-conference-held-by-anso-pas-maap/
10. https://hamariweb.com/enews/agha-hasan-emphasizes-on-integrated-health-system-in-country_nid3561730.aspx
11. https://www.urdupoint.com/en/pakistan/science-minister-emphasizes-on-integrated-hea-1606202.html