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**WHO IS GOING TO BE
PRIME POWER OF THE WORLD?**

AD NCA

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I would emphasise on Pakistan's national leadership to make the most of this diplomatic vacuum and focus our national technology plans on familiarization, development, induction and indigenization of emerging technologies in relevant areas of civil and military applications to serve the purposes of comprehensive national security. An appropriately focused national task force with clearly defined lead agency, mandate, objectives and reasonable resources at its disposal could be a good start point.



**EXPANSION
OF UNITED
NATIONS
SECURITY
COUNCIL**

Interaction

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TRANSFORMING HEALTHCARE THROUGH NUCLEAR MEDICINE

SABIHA MEHREEN, RESEARCH OFFICER (CISSS)

Pakistan's peaceful use of nuclear technology has been making significant contribution to the country's healthcare sector. As a developing nation with a large population, Pakistan faces numerous health challenges, including large segments of population deprived of adequate healthcare. The major reasons include limited resources allocated for healthcare in public sector and the increasing cost of treatment, especially chronic diseases and cancer. In this critical situation, Pakistan has strategically employed nuclear technology to address crucial medical needs of its population. This approach has enabled the country to improve diagnosis and provide access to advanced treatment of cancer to even remote areas. In this regard, the support of international organisations such as International Atomic Energy Agency (IAEA) in enhancing Pakistan's nuclear medicine capabilities is equally praiseworthy. The World Health Organization estimates (2021) that about 1.5 million cancer patients reside in Pakistan. This number is increased by approximately 178,000 new cases diagnosed every year, according to the data released by the International Agency for Research on Cancer in 2022. At national level, PAEC shares 80 percent burden of the cancer patients' diagnosis and treatment. It leads the way in the nuclear medicine setups in Pakistan with its 19 Atomic Energy Cancer Hospitals (AECHs). The AECHs are spread across the country ensuring that even remote regions have access to quality healthcare services. The nuclear medicine centres operating under PAEC have integrated state-of-the-art imaging techniques such as Single-Photon Emission Computed Tomography (SPECT) and Positron Emission Tomography (PET) scans. These non-invasive imaging technologies enable early detection and assessment of disease dispersal with an exceptional accuracy, allowing the healthcare professionals to formulate personalised treatment plans. This plays a pivotal role in ensuring appropriate timely intervention to improve the patients' survival rates across the country.

PAEC provides state-of-the-art facilities to patients at AECHs either free of charge or at subsidised rates. Through this, PAEC reaffirms its commitment to ensuring accessible and affordable healthcare for all. Over one million patients on

average receive radiation therapy for various types of cancer at AECHs every year.

The nuclear medicine services at these hospitals include crucial treatments for conditions such as thyrotoxicosis, benign and malignant thyroid diseases and palliative care for bone pains. Moreover, PAEC's integrated program in radiotherapy has received widespread acclaim from the public, solidifying its reputation as a reliable and trusted institution in cancer treatment.

PAEC also engages in research and training programs to enhance medical knowledge and expertise in the field of oncology. The AECHs play a central role in the national cancer awareness and prevention program, offering a range of diagnostic studies and therapeutic applications. For this purpose, various events such as workshops, seminars, conferences, and symposiums are being organised in collaboration with medical colleges, NGOs, universities and cancer patients' welfare societies.

Within PAEC, Pakistan Institute of Nuclear Science & Technology (PINSTECH) is a premier Research and Development (R&D) institute working in the domain of nuclear medicine. Among others, PINSTECH's wide-ranging research programme includes isotope production for diagnosis and treatment of cancer and thyroid diseases.

It is crucial to mention here Pakistan's mutually beneficial collaboration with the European Council for Nuclear Research (CERN) since 1994. CERN contributes to the medical innovation through its breakthrough technologies which are being used in areas related to medical diagnostics and imaging, therapy, dosimetry, as well as digital technologies for health applications.

CERN is also home to Isotope mass Separator On-Line Device (ISOLDE), an outstanding facility for nuclear research that has been producing more than 1300 radioisotopes from 73 elements over more than 50 years.

The CERN-MEDICIS (Medical Isotopes Collected from Isolde) facility supports R&D in nuclear medicine using non-conventional radionuclides. It also produces a wide range of high-purity radioisotopes specifically for medical research. Some of these isotopes can only be produced at CERN.

Pakistan's collaboration with CERN is based on the shared ideas of promoting world-class research in fundamental physics and pushing the frontiers of science and technology for the benefit of all.

More importantly, due to the efforts of PAEC scientists, researchers and technicians, Pakistan became the first country from Asia and the second overall to become an associate member of CERN in 2015. Based on such strong credentials, Pakistan now actively participates in international research activities in the nuclear field, accruing medical capacity building, besides expertise in other areas.

Regarding this, the joint effort of PINSTECH and the CERN-MEDICIS is noteworthy which focuses on the production and study of innovative radioisotopes. PINSTECH scientists and engineers have been seconded to the CERN-MEDICIS team for the development of radiochemical activities including a major contribution to the

MEDICIS radiochemistry set up for the purification of medical radioisotopes with both therapeutic and diagnostic properties, called “theranostic” combinations. The establishment of Pakistan's first theranostic laboratory at the Institute of Nuclear Medicine & Oncology (INMOL) hospital in Lahore is an extension of PAEC's pioneering efforts in the field. This laboratory focuses on the use of Gallium-68 and Lutetium-177 for metastatic neuroendocrine and prostate cancers. The integration of theranostics enhances the effectiveness of the treatment through a patient-centred and targeted approach.

Another notable milestone in Pakistan's nuclear technology-driven healthcare is the inauguration of the Cyber Knife facility at the Nuclear Medicine Oncology and Radiotherapy Institute (NORI) in Islamabad second such facility in Pakistan after Jinnah Hospital Karachi.

This pioneering treatment facility, inaugurated by Director General of the IAEA, Rafael Grossi on 15 February 2023, positions Pakistan as a regional centre for cancer care under the Rays of Hope initiative of IAEA that focuses on prioritising high-impact, cost-effective and sustainable interventions in line with national needs and commitment.

The IAEA's initiative aims to improve radiation medicine capacities and build the cancer care workforce, ultimately increasing access to the chronic disease treatment in low and middle-income countries. While nuclear technology has undoubtedly revolutionised healthcare in Pakistan, the emphasis on safety and stringent regulatory measures remains a top priority.

All medical setups using nuclear medicine are guided by the principles of the IAEA and Pakistan Nuclear Regulatory Authority (PNRA). PNRA is the national body that ensures compliance with international safety standards, oversees the safe use of nuclear technology in healthcare and conducts regular inspections to guarantee the well-being of patients and healthcare professionals.

The establishment of AECHs by PAEC demonstrates Pakistan's commitment to leveraging nuclear technology for peaceful purposes, particularly in the advancement of healthcare. These institutions stand as symbols of hope, offering comprehensive and affordable cancer care to the people of Pakistan and serving as models for the effective integration of nuclear technology in the field of medicine.

Moreover, implementing cost-effective interventions increases Pakistan's capacity in achieving health-related Sustainable Development Goals (SDGs). Sustainable development relies on a healthy population, as much as the healthy population depends on sustainable development.

In an era where nuclear technology is generally associated with defence and strategic applications, Pakistan's pursuit of a robust and cutting-edge nuclear programme through utilising the technology for peaceful healthcare purposes is commendable. As Pakistan continues to invest in this field, the future seems promising for the healthcare sector addressing the critical and life-threatening diseases for the well-being of its citizens.

The Op-ed was first carried by online platform Modern Diplomacy.