Our nuclear engineering club is thrilled to announce that our magazine is seeking captivating articles that explore the fascinating world of nuclear engineering.

Chance with Polaris 2.0 magazine! All aspiring authors and scholars are invited!

Send in your essays on a variety of Nuclear Energy.

We are looking for articles for our magazine. Topics can be on :

1. Nuclear Power Generation

2. Nuclear Physics

3. Nuclear Fusion

4. Radiation Protection and Safety

5. Nuclear Fuel Cycle

6. Nuclear Materials

7. Nuclear Reactor Design and Operation

8. Nuclear Waste Management

9. Nuclear Medicine

10. Nuclear Non-Proliferation and Arms Control

11. Nuclear Reactor Dynamics and Kinetics

12. Advanced Nuclear Reactor Concepts

13. Nuclear Decay

14. Nuclear Rockets

15. Nuclear Submarine

16. Nuclear Weapons

Rules on How to Write Articles:

i. To succeed in the publishing industry, it is essential to write engaging and interesting articles that are relevant to the target audience. This involves researching the issue thoroughly, identifying perspectives that have not been explored before, and presenting your work in a manner that is both informative and engaging.

ii. Researching the writing style requirements of the magazines you want to submit your work is crucial, as each magazine has its own guidelines on topics, manner, and tone. Remember to be flexible, as you may discover new facts while writing a magazine article and change your approach to attract attention.

iii. Prepare an outline, which should contain important ideas, the content of the article body, and the summary points you will include in it. This will make it easier to fill the framework with your own content.

iv. Create a memorable title, which can occur at any point in the process of writing an article for a magazine. It is essential to wait until the article is finished before coming up with a title, as editors-in-chief love catchy titles.

v. To write, you must read everything that falls into your hands, whether it's articles on the front pages of major publications or small blog posts. Learn about the various issues that may be useful to your magazine writing skills.

vi. Add a strong ending, which should inform or elaborate on the theme of your piece and make the reader satisfied but also curious about the future progress of the issue.

vii. Articles have to be minimum 2 pages and maximum 6 pages.

viii. In conclusion, writing engaging and interesting magazine articles is essential for both freelance writers and seasoned professionals. Despite the digitalization of the market, the basic principles of journalistic integrity remain the same, making it an essential part of the publishing industry.

Guidelines of Formatting:

This handout guides paper formatting, including margins, indentations, font, alignment, page numbers, and paragraph spacing in Microsoft Word. (Note: The minimum number of page: 2 pages; maximum: 6 pages)

i.Document Margins

Final papers should have 1" margins on all sides. This can be changed by going to the "Layout" tab and changing the Top, Bottom, Left, and Right margins to 1", or by going to Format > Document in the menu bar and changing the margins there. Make sure the gutter is set to 0".

ii. Indentations

The first line of every new paragraph should automatically indent. If this is not the default setting, change the indentation format for a document by clicking Format > Paragraph in the menu bar. Look under the "Special" drop-down menu in the Indentation section, and select "First Line." This setting automatically indents the first line so that student writers don't have to do it manually.

iii. Font

Academic papers should be written in an academic font: either Times New Roman or Cambria. Normal text should be 12 points font and for title or headline, it should be 14 points font. (Note: Times New Roman and Cambria are the default fonts for Microsoft Word, and 12-point font is also the default setting for font size).

iv. Alignment

The text of your paper should be justified, the default in Word is left alignment so do change it. Add page number on the bottom of each page.

v. Line and paragraph Spacing

The line spacing should be 1.5 points for each line. For word, go to Home > Line and Paragraph Spacing. Choose the number of line spaces you want or select Line Spacing Options, and then select the options you want under Spacing.

vi.References

List of all sources cited in the research paper, following a specific citation style (e.g., APA, MLA)

Introduction (approx. 70 words):

In Bangladesh, the intersection of computer science and nuclear medicine holds immense promise for revolutionizing affordable healthcare. By leveraging advanced technologies and data-driven approaches, computer science can enhance diagnosis, treatment, and patient care. In this article, we explore the transformative potential of computer science in nuclear medicine for Bangladesh, highlighting its impact on affordability, accessibility, and improved healthcare outcomes.

Enhancing Diagnosis and Treatment (approx. 120 words):

Computer science plays a vital role in improving diagnostic accuracy and treatment effectiveness in nuclear medicine. Image reconstruction algorithms, powered by artificial intelligence (AI) and machine learning, enable precise analysis of nuclear imaging scans. This assists in early detection and characterization of diseases, leading to timely interventions. Computer-aided detection systems can identify subtle abnormalities, aiding physicians in accurate diagnoses.

Moreover, computer-based simulations and modeling techniques optimize treatment planning in radiation therapy. By simulating dose delivery and predicting treatment outcomes, clinicians can personalize treatment regimens and minimize side effects, enhancing patient well-being. These advancements enable healthcare providers in Bangladesh to deliver more targeted, effective, and affordable treatments to a larger population.

Data-Driven Healthcare Management (approx. 120 words):

The integration of computer science in nuclear medicine enables efficient healthcare management through comprehensive data analysis. Electronic health records, combined with AI algorithms, provide valuable insights for optimizing patient care, resource allocation, and workflow management. By identifying patterns and trends in patient data, healthcare providers can make informed decisions, leading to better healthcare outcomes.

Additionally, computer science facilitates telemedicine initiatives, bridging the gap between rural areas and specialized healthcare facilities. Through secure networks and remote monitoring systems, patients can receive expert consultations, reducing the need for expensive travel and increasing accessibility to nuclear medicine services. This innovation ensures affordable healthcare reaches even the most remote regions of Bangladesh.

Addressing Affordability Challenges (approx. 100 words):

Computer science also offers cost-effective solutions to address affordability challenges in nuclear medicine. Virtual simulation and training platforms reduce the need for expensive equipment and minimize risks associated with practical training. By providing virtual environments for educational purposes, computer science lowers the barriers to training healthcare professionals in nuclear medicine, ultimately expanding the skilled workforce.

Furthermore, innovative imaging techniques, such as low-dose protocols and novel data processing algorithms, reduce radiation exposure without compromising diagnostic accuracy. This safeguards patient safety while minimizing associated costs. These advancements, driven by computer science, enable affordable access to high-quality nuclear medicine services for the population of Bangladesh.

Collaboration and Future Prospects (approx. 90 words):

Realizing the full potential of computer science in nuclear medicine requires collaboration among stakeholders. Academic institutions, healthcare providers, technology companies, and the government should foster partnerships to drive research, development, and implementation of computer science solutions. Investments in infrastructure, education, and training programs will further strengthen the integration of computer science in nuclear medicine and its affordability in Bangladesh.

Conclusion (approx. 100 words):

Computer science has the power to revolutionize nuclear medicine, making affordable healthcare a reality for Bangladesh. By leveraging advanced technologies, data-driven approaches, and collaborative efforts, the intersection of computer science and nuclear medicine can enhance diagnosis, treatment, and patient care. As Bangladesh progresses in embracing computer science, the nation will witness improved healthcare outcomes, increased accessibility, and affordability. By harnessing this transformative synergy, Bangladesh can pave the way for a brighter and healthier future for its citizens.

Nuclear medicine, an essential field for diagnosis and treatment, holds immense potential for affordable healthcare in Bangladesh. However, its widespread implementation faces limitations. By harnessing the power of computer science, we can address these challenges and pave the way for transformative advancements. In this article, we delve into the limitations and drawbacks of integrating computer science with nuclear medicine in Bangladesh, while exploring actionable steps to unlock its possibilities.

Limitations and Drawbacks (approx. 250 words):

Limited Infrastructure and Resources: The integration of computer science in nuclear medicine requires advanced infrastructure and resources, including high-performance computing systems and sophisticated imaging equipment. Unfortunately, many healthcare facilities in Bangladesh lack these essential components, hindering the seamless integration of computer science technologies.

Technical Expertise Gap: Developing and implementing computer science solutions in nuclear medicine demands a skilled workforce proficient in both domains. Currently, there is a shortage of experts with a strong background in computer science and nuclear medicine in Bangladesh. Bridging this expertise gap is crucial to effectively leverage computer science for affordable healthcare.

Cost and Affordability: While computer science technologies have the potential to enhance nuclear medicine practices, their initial implementation cost can be prohibitive. The high expenses associated with acquiring and maintaining computer systems, software, and specialized training pose significant financial challenges for healthcare institutions, especially in resource-constrained settings like Bangladesh.

Data Management and Security: Integrating computer science in nuclear medicine generates vast amounts of patient data, requiring robust systems for storage, management, and analysis. Ensuring data security and privacy becomes paramount in the face of increasing cyber threats. Implementing appropriate data management protocols and adhering to stringent security measures are critical aspects that need to be addressed.

Steps to Gain Possibility (approx. 250 words):

Strengthening Infrastructure: Investing in state-of-the-art imaging equipment and computing infrastructure is essential to unleash the power of computer science in nuclear medicine. Collaborative efforts between the government, private sector, and international organizations can help secure the necessary resources and funding.

Education and Training Programs: Establishing educational programs and training initiatives that combine computer science and nuclear medicine can bridge the expertise gap. Scholarships, grants, and professional development opportunities should be provided to nurture a skilled workforce capable of leveraging computer science in nuclear medicine.

Cost Optimization Strategies: Exploring cost optimization strategies, such as partnerships with technology providers, open-source software utilization, and sharing resources between healthcare institutions, can help mitigate the financial burden. Additionally, advocating for governmental support and policy reforms to allocate funds specifically for integrating computer science in nuclear medicine can be instrumental.

Collaborative Research and Development: Encouraging collaboration between computer science experts, nuclear medicine practitioners, and researchers can foster innovation. Joint research projects and interdisciplinary teams can address the unique challenges faced in the Bangladeshi context, leading to the development of tailored computer science solutions for affordable healthcare.

Conclusion (approx. 30 words):

By addressing the limitations and drawbacks associated with integrating computer science in nuclear medicine, Bangladesh can unlock the transformative potential of this synergy, revolutionizing affordable healthcare delivery for its population.

History and Perspectives of Nuclear Medicine in Bangladesh

Raihan Hussain*

Go to:

Abstract

Bangladesh is one of the smaller states in Asia. But it has a long and rich history of nuclear medicine for over sixty years. The progress in science and technology is always challenging in a developing country. In 1958, work for the first Nuclear Medicine facility was commenced in Dhaka in a tin-shed known as 'Radioisotope Centre' and was officially inaugurated in 1962. Since the late 50s of the last century nuclear medicine in Bangladesh has significantly progressed through the years in its course of development, but still the facilities are inadequate. At present there are 20 nuclear medicine establishments with 3 PET-CTs, 42 gamma camera/SPECTs with 95 physicians, 20 physicists, 10 radiochemists and 150 technologists. The Society of Nuclear Medicine, Bangladesh (SNMB) was formed in 1993 and publishing its official journal since 1997. Bangladesh also has close relationships with many international organizations like IAEA, ARCCNM, AOFNMB, ASNM, WFNMB and WARMTH. The history and the present scenario of the status of nuclear medicine in Bangladesh are being described here.

Keywords: Bangladesh, History, Nuclear Medicine

Go to:

Introduction

Bangladesh is a small country of only 147,570 sq km in the eastern part of the Indian sub-continent (Figure 1). It lies between India and Myanmar and geographically it is mainly a flat alluvial plain in the gangetic delta. Traditionally it is based on agricultural economy. It has the highest population density in the world (160 million, 1084/km2) with its expected challenges. Moreover the country is prone to natural calamities, like, flood, cyclones, tidal bore and droughts. Nevertheless the country is progressing fast with annual GDP growth of 6-7% for the last few years suggesting determination of the people. Similarly nuclear medicine has also been growing for the last decades and we will go back the timeline of the development and progress of Nuclear Medicine (NM) in this article.

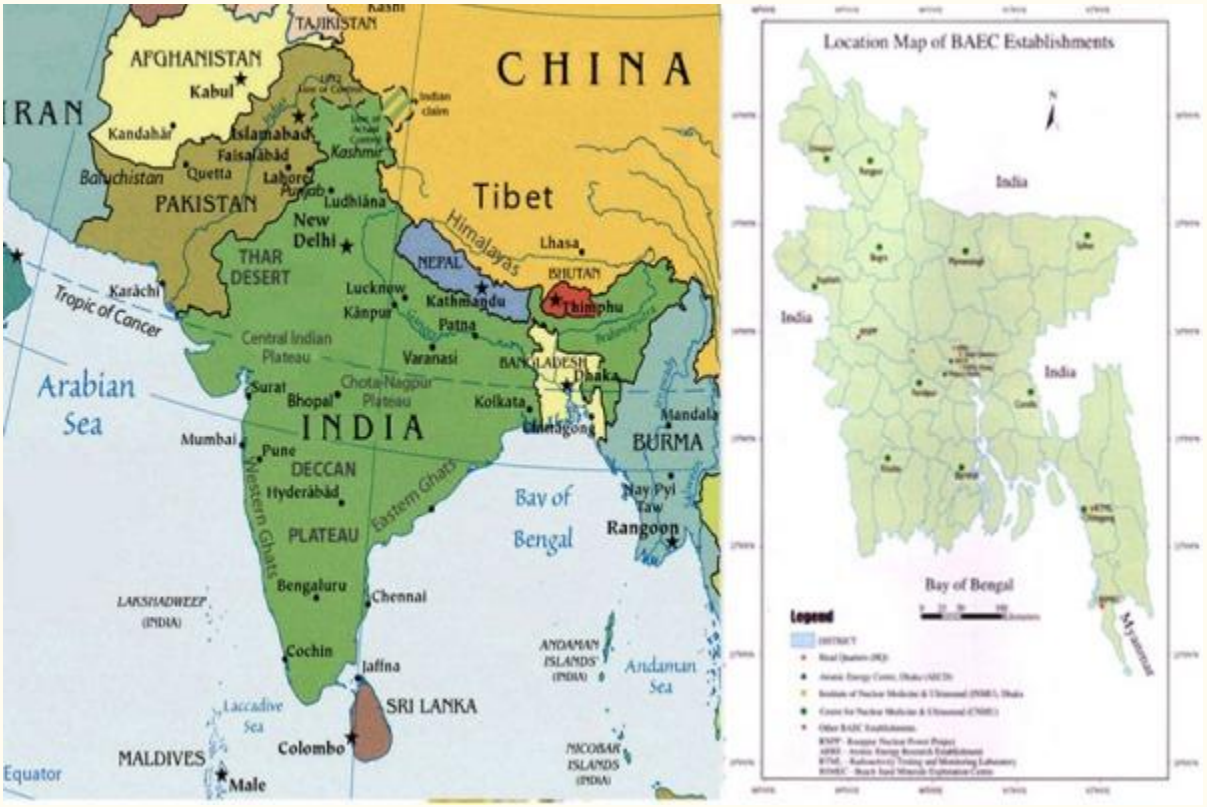

Figure 1

a. Location of Bangladesh in map of Asia, b. Locations of major Nuclear Medicine establishments in Bangladesh

Go to:

History

The history of NM in Bangladesh is quite old. More than 50 years have passed since the first NM centre started its journey (1). Plans were made in late 1950s under the Pakistan Atomic Energy Commission (PAEC) for establishment of the first NM department in the Dhaka Medical College, the only medical college in the then East Pakistan. The construction started in 1958 in a tin-shed known as 'Radioisotope Centre' and Dr. Mazharul Islam joined there as a medical officer (Figure 2). It was officially inaugurated in 1962 by Gen. Barki, the then Health Minister of Pakistan. But the department lacked regular supply of isotopes and had a rectilinear scan, two probe renograms and a radioactive iodine uptake system. It faced some administrative problems due to dual administration (both by Ministry of Health as well PAEC). So no significant up-gradation was done. In early 1960's PAEC took initiative to develop NM in the region. At that time Dr. Kamaluddin Ahmed joined PAEC. He went to West Pakistan in Karachi to work and later went to UK for higher studies in 1962 and achieved Masters of Sciences (MSc.). He returned back to East Pakistan in 1966 and contributed immensely in development of NM. Actually his determination and hard work lead to the growth of NM in the then East Pakistan and later on in Bangladesh. So he is considered as the Father of NM in the country.

Figure 2

The first Nuclear Medicine establishment of the country "Radioisotope Centre" in Dhaka

In 1960's, two more centres were constructed, one in the south-east part in Chittagong and another in the west in Rajshahi by PAEC. In the mid 60's Dr. Shawkat Jahan and Dr. Kamaruddin Pramanik also joined NM in Dhaka and Lahore respectively. Dr. Kamaluddin Ahmed on his return from UK joined in Dhaka NM centre in 1966. He could motivate the authorities for improvement of the facilities and moved to a newly established centre in Chittagong. Dr. Kamaruddin Pramanik joined in Rajshahi from Lahore in 1970. By this time there were three NM facilities in the

country. Dr. Pramanik is known to have revolutionary ideas with new techniques, as for example introduction of radioisotopic gold needle per rectum for rectal cancer.

In 1971 war of independence took place. In a war ravaged country NM suffered difficulties as in any other sectors. After the independence Bangladesh Atomic Energy Commission (BAEC) was founded in February 1973 and steps were taken for promotion of NM (2). Two new centres, one in the north-west in Dinajpur and another in the north-east in Sylhet were established in 1980. It may be mentioned that the northern part of the country was known for endemic iodine deficiency zone. By creating these centres awareness about NM among the medical community started to grow. For the general public, these centres proved to be essential as these catered for thyroid diseases. In 1980 the Radioisotope Centre in Dhaka was handed over to BAEC by the ministry of health for better management. By 1983, another four centres in Mymensingh, Rangpur, Barisal and Khulna were constructed. In 1997, 4 new centres were constructed at Faridpur, Comilla, Bogra and Mitford Hospital, Dhaka under BAEC (Figure 3). In the recent years private sectors joined in expansion of Nuclear Medicine and 5 centres were setup. BAEC has very recently established another centre at Cox' Bazar. Apart from BAEC, different governmental bodies have also established 3 more centres.

Figure 3

A Nuclear Medicine Institute in a peripheral region of the country

Go to:

Education

In early 1980s a centralised institute to look after the human resources development and NM education was felt. The Institute of Nuclear Medicine (INM) was established in the Institute of Postgraduate Medicine and Research (IPGMR) campus located in central Dhaka city in 1980. It started functioning in 1981 and marked as a milestone in the development of NM in the country. First ultrasound machine and computerised gamma camera of the country was established in 1981 and 1983 respectively.

The then INM became an affiliated institute of Dhaka University and course curriculum for one year diploma course was approved in 1987. In 1988 the first batch of Diploma in Nuclear Medicine (DNM) were enrolled in Dhaka University. This was another great leap forward. This created an opportunity for the local young professionals for higher education. Gradually candidates from regional countries like Nepal also got enrolled and completed the course. Eventually after ten years, the one year course was extended to two years masters program (Master of Philosophy) which is still continuing. Now the course is being planned and to be extended for four years (Residency program).

Go to:

Current situation

Steps are taken to establish more centres in near future (4 under BAEC, 2 under ministry of health, 4 under private sectors). So it can be easily understood that NM is an expanding arena in the country. Regarding the equipment, the first single headed SPECT was installed in 1994, first double headed SPECT in 2003, First SPECT-CT in 2008 and first PET-CT in 2010. At present there are 20 NM centres with 3 PET-CTs, 42 gamma camera/SPECTs having 95 NM physicians, 20 physicists, 10 radiochemists and 150 technologists (3). The National Institute of Nuclear medicine and Allied Sciences (NINMAS) in Dhaka is by far the largest NM facility in the country. It covers an area of 60,000 sq. ft. and has seven working divisions, namely, Scintigraphy, Nuclear Cardiology, Nuclear Nephrology, In-vitro, Thyroid, Ultrasound and Colour Doppler and R & D divisions. According to the departmental statistics, the number of patients catered at NINMAS was 54678, 60569, 62192 and 63377 in the fiscal years of 2010-11, 2011-12, 2012-13 and 2013-14 respectively (4). Bangladesh also organizes various NM training programs and workshops, in which both local and foreign participants take part. International Atomic Energy Agency (IAEA) is also providing placement of foreign trainees to Bangladesh for Fellowship training.

Go to:

Society of Nuclear Medicine, Bangladesh (SNMB)

The Society of Nuclear Medicine, Bangladesh (SNMB) was formed in 1993 with Dr. Kamaluddin Ahmed as the founder president and Dr. M A Karim as the founder general secretary. The first national conference was held in 1994 at the Atomic Energy Centre (AEC) Auditorium in Dhaka. SNMB was established for promotion and development of activities of Nuclear Medicine and allied sciences in Bangladesh.

SNMB functions actively for the promotion and consolidation of the subject. Annually it holds conferences and seminars to enrich the discipline among the members. It is also publishing “The Bangladesh Journal of Nuclear Medicine (BJNM)” regularly for the last 18 years (http://banglajol.info/index.php/BJNM). SNMB has also successfully organised international NM events like Asian Regional Cooperative Council for Nuclear Medicine (ARCCNM) conferences in 2003 and 2010 (Figure 4). The society has now more than 100 members and considered one of the vibrant and active medical societies in the country (Figure 5). It is also known to be one of the most active NM societies in the south-east Asian region. Two of our senior members Prof. MA Karim and Prof. Shahana Afroz

have attained the post of Chairman of BAEC, a very important position being from NM background as anywhere in the world.

Figure 4

A group of Nuclear Medicine personalities of Asian region at the ARCCNM meeting in Dhaka, Bangladesh, 2010

Figure 5

Some of the senior members of Society of Nuclear Medicine (SNMB)

SNMB held its 20th national conference very recently on 20-22 March, 2015. It was a grand occasion of Nuclear Medicine (NM) in Bangladesh and was attended by more than 150 participants from all over the country as well as very prominent international leaders like Prof. Henry Bom, President AOFNMB and Prof. Jun Hatazawa, Chairman ARCCNM. At present SNMB stands on a solid foundation with one hundred members.

Go to:

International Activities

SNMB actively cooperates with Asia-Oceania Federation of Nuclear Medicine and Biology (AOFNMB), ARCCNM and Asian School of Nuclear Medicine (ASNM), who are working together for the excellence of NM scenario in all aspects of scientific and academic activities, human resources development and promotion of newer technologies in the region (5). SNMB also has close relationship with global bodies like World Federation of Nuclear Medicine and Biology (WFNMB) and World Association of Radiopharmaceutical & Molecular Therapy (WARMTH). The members of the society also actively participate in various NM conferences throughout the world and also take active roles in different organisational posts. At present I am serving as Secretary General of AOFNMB and Treasurer of ARCCNM. I was also an elected Member of the Governing Body of WARMTH in 2012 - 2015. Dr. Mizanul Hasan is the Vice Dean of ASNM. Dr. Kamaluddin Ahmed and Dr. M A Karim have worked as IAEA

experts in promoting NM in African and Asian countries. These are some examples of our member's international collaborations.

Go to:

Conclusion

NM in Bangladesh has significantly progressed through the years in its course of development by the government initiatives as well as cooperation from IAEA and above all by the dedication and efforts of the NM personals. The country has also maintained international relationship with ARCCNM, AOFNMB, ASNM, WFNMB and WARMTH for coordinated approach of development. The facilities are still inadequate as being a developing country and a long way to go especially in a land of 160 million people.

Go to:

References

1. Hasan M. Present, past and future of nuclear medicine in Bangladesh. *Bangladesh J Nucl Med.* 2014;17(1):8–9. [Google Scholar]

2. Saha DK. Bangladesh Atomic Energy Commission. *Annual Report.* 2013;1 [Google Scholar]

3. Sabih D. The Asian Nuclear Medicine Board (ANMB);why do we need it? *Asia J Nucl Med Biol.* 2013;1(2):1–3. [PMC free article] [PubMed] [Google Scholar]

4. Office Records Documents. *National Institute of Nuclear medicine and Allied Sciences (NINMAS)* 2015. Available at: http://www.drdo.gov.in/drdo/labs/INMAS/English/index.jsp?pg=homebody.jsp. ;

5. Hussain R. Nuclear medicine in the region – Asia-oceania organisational perspective. *Bangladesh J Nucl Med.* 2014;17(1):11–2. [Google Scholar]

https://www.iaea.org/newscenter/news/how-bangladesh-is-breaking-down-barriers-to-nuclear-medicine

How Bangladesh is Breaking Down Barriers to Nuclear Medicine

02 Nov 2016
Nicole Jawerth, IAEA Office of Public Information and Communication

Bangladesh is building a nuclear medicine system with well-trained medical staff, advanced imaging tools and a cost-effective source of essential radiopharmaceuticals. (Photo: N. Jawerth/IAEA)

Dhaka, Bangladesh — The number of people who can affordably access diagnostic medical care in Bangladesh has increased three times over the last ten years, as the country has expanded and strengthened its nuclear medical services. Health officials have worked steadily, with the support of the IAEA, to build a nuclear medicine system with well-trained medical staff, advanced imaging tools and a cost-effective source of essential radiopharmaceuticals.

“I came today because this is a very nice facility, but also because it is the most affordable option,” said A. Chowdhury, following a medical scan of her kidneys at the National Institute for Nuclear Medicine and Allied Sciences (NINMAS) in Dhaka one sunny afternoon last month. “Without this kind of public hospital, I don’t know how I would have been able to get this help.”

Cost is extremely important for people in Bangladesh. If we didn’t provide subsidized care like we do here at NINMAS, many people would not be able to get the care they need. Raihan Hussain, Head, National Institute for Nuclear Medicine and Allied Sciences, Bangladesh

NINMAS, recently renovated, is one of the 15 publicly-funded nuclear medicine centres established in the last twenty years around Bangladesh. It carries out more than 60 000 nuclear medicine procedures (see The Science box) each year in the areas of oncology, cardiology, nephrology and cerebral studies. It also provides therapeutic services for thyroid conditions such as cancer, thyrotoxicosis and eye diseases, like pterygium and cancer.

Publicly-funded centres like NINMAS play an important role for Bangladesh's 170 million people, particularly for the quarter of the population who live below the poverty line.

"Cost is extremely important for people in Bangladesh. If we didn't provide subsidized care like we do here at NINMAS, many people would not be able to get the care they need," said Raihan Hussain, Head of the Nuclear Cardiology and positron emission tomography (PET)/computed tomography (CT) Division at NINMAS.

A renal scan, like the one Chowdhury received, is a simple procedure in nuclear medicine that allows doctors to evaluate the condition and function of a patient's kidneys, explained Hussain. "In a private practice this type of procedure costs at least five times as much as at NINMAS."

Since its establishment, NINMAS has worked with IAEA experts to procure equipment, receive training and pursue research to further enhance and refine patient care. Its doctors now also teach medical students.

A. Chowdhury came to the National Institute for Nuclear Medicine and Allied Sciences (NINMAS) in Dhaka for a diagnostic scan of her kidneys. (Photo: N. Jawerth/IAEA)

Future plans for NINMAS include the installation of another PET/CT machine and the establishment of a cyclotron facility for producing key radiopharmaceuticals — specialized drugs containing small amounts of radioactive material used to create medical scan images. This will allow them to expand patient care and continue to meet growing demands associated with the increasing number of cases of cardiovascular diseases, cancer, tuberculosis and diabetes, among others. These health conditions account for around 75% of nuclear medicine procedures in the country.

"With the new PET/CT machine, we expect to nearly double the number of patients we can service with our machines each week. This is very important because the population continues to grow, which means more people will need care," said Nasreen Sultana, Associate Professor at NINMAS. "The in-house cyclotron will help us to cost-effectively produce radiopharmaceuticals used for PET scans. This will help complement what we are already getting from the research reactor nearby."

As the population of Bangladesh grows, more people will need nuclear medicine services like the ones provided at NINMAS. (Photo: N. Jawerth/IAEA)

Producing radiopharmaceuticals

The majority of the radiopharmaceuticals used in Bangladesh's nuclear medicine centres now come from the radioisotope production laboratory housed in the Bangladesh Atomic Energy Commission's Institute of Nuclear Science and Technology in Savar, just outside of Dhaka. The laboratory relies on a 3-megawatt (MW) research reactor to develop and supply radiopharmaceuticals used in the over 500 000 procedures performed at NINMAS and the other publicly-funded and private nuclear medicine centres every year.

"We used to only produce very small amounts of radiopharmaceuticals and could only supply Dhaka. Now we have been able to cut imports and sustainably meet the growing demand of the whole country without interruption," said M. Azizul Haque, Head of the Radioisotope Production Division of the BAEC's Institute of Nuclear Science and Technology.

In addition to iodine-131, which is a radioisotope primarily used to diagnose and treat thyroid conditions, the laboratory produces generators of molybdenum-99 (Mo-99)/technetium-99m (Tc-99m). Tc-99m is a radioisotope used in over 80% of nuclear medicine procedures. Each week between 18 to 20 generators — a device used to extract Tc-99m from Mo-99 for use in medicine — are produced at the laboratory at significantly lower costs than importing the already completed generators. The facilities were established through IAEA technical cooperation projects.

Through its collaboration with the IAEA, the laboratory has also established an ISO-certified clean room facility for producing Tc-99m cold kits, which are used for preparing Tc-99m radiopharmaceuticals for use in diagnostic procedures.

Now the laboratory is working with the IAEA to setup a new facility to produce lutetium-177 (Lu-177), another radioisotope used for palliation of bones for terminal cancer patients. The facility is a few months away from completion.

“We also have a plan for a new 20 to 30 MW reactor within the next 10 years. Then we can produce the isotopes locally, and then we may be able to supply it to other countries,” said Azizul Haque.

Technicians at NINMAS use a dedicated laboratory area for preparing radiopharmaceuticals for use in patients. (N. Jawerth/IAEA)

What is nuclear medicine?

Nuclear medicine techniques are most often used to evaluate the function of any organ or structure in the body. They provide unique information and offer the potential to identify diseases in early stages.

The majority of nuclear medicine procedures take place inside the body through specialized drugs called radiopharmaceuticals, which contain radionuclides. When these drugs are taken into the body, they interact with certain tissues or organs. A special detector, such as a gamma camera, outside the body can detect the small amounts of radiation emitted from the organ or tissue. The camera is then able to translate the information into images of the specific tissue or organ. By using radiopharmaceuticals, doctors can get accurate information about the organ or tissue as well as the functioning of organs such as heart, kidneys, liver, among others.

Nuclear medicine is also used for treatment of some diseases and health conditions. Doctors choose small quantities of radiopharmaceuticals that certain body parts absorb more significantly and more effectively than other body parts. This allows them to target specific areas during treatment. The small amounts of radiation in the radiopharmaceuticals then kills off the cells causing the health condition, with minimal effect on other cells in the surrounding area and the rest of the body.

How many nuclear medicine centers are there in Bangladesh?

At present there are 20 NM centres with 3 PET-CTs, 42 gamma camera/SPECTs having 95 NM physicians, 20 physicists, 10 radiochemists and 150 technologists (3). The National Institute of Nuclear medicine and Allied Sciences (NINMAS) in Dhaka is by far the largest NM facility in the country.

History and Perspectives of Nuclear Medicine in Bangladesh

What are the 2 types of nuclear medicine?

Single Photon Emission Computed Tomography or SPECT and Positron Emission Tomography or PET scans are the two most common imaging modalities in nuclear medicine.

Nuclear Medicine

https://www.nuclearasia.com/feature/bangladesh-riding-high-affordable-healthcare-nuclear-medicine-brief-account/822/

- Feature

Nuclear medicine for affordable health care in Bangladesh

In Bangladesh, nowadays, atoms are not only providing healing touch to the patients suffering from diseases like Cancer to Thyroid malfunction but are aiding in diagnosis too.

August 20, 2017

1234

Atoms are well known for their destructive power, but many strides are being taken in the field of harnessing its power for the health sector to save lives.

In Bangladesh, nowadays, a large number of people are diagnosed with diseases like Cancer and Thyroid malfunction and many are treated through the use of atoms. Nuclear medical technologies have revolutionized the diagnostic services owing to its accuracy.

The National Institute for Nuclear Medicine and Allied Sciences (NINMAS), through a number of centers, is providing various nuclear medicine services throughout the country. The institute is an establishment of Bangladesh Atomic

Energy Commission (BAEC) under the Ministry of Science & Technology of the government. Out of these different centers, Bangabandhu Sheikh Mujib Medical University (BSMMU) has the best state-of-the-art facilities in nuclear technology. NINMAS and BSMMU offer diagnosis, treatment; and concurrently conducts research and development activities.

NINMAS Director Dr. Nurun Nahar said that the doctors usually refer patients here after collecting their basic health data. “We diagnose the referred patients using various nuclear technologies and here at NINMAS the health care fees are affordable enough,” she told Nuclear Asia.

With the modern single and dual head SPECT cameras, the institute is now capable of performing most modern scanning in the oncology, cardiology, nephrology and cerebral studies. Keeping with an ever increasing importance of Positron Emission Tomography (PET), Institute has a project to establish a PET center. This gives a new dimension to the endeavor to represent the Institute as a “Centre of Excellence” in the field of nuclear medicine services in Bangladesh.

NINMAS has different divisions including Scintigraphy, Thyroid, Nuclear Cardiology, PET-CT, Nuclear Nephrology, In-Vitro, Ultrasound and Color Doppler, Research and Development. Scintigraphy division has modern gamma cameras which give accurate information about the organ or tissue as well as the functioning of different organs such as brain, bone, heart, breast, lung heart, kidneys and liver using radio isotopes. Patients are no more needed to go abroad to detect certain cancers as PET-CT division is already offering this service at BSMMU. Thyroid division offers detection of thyroid cancer and various other treatments. NINMAS offers MPhil and MD courses for the students. Post Graduate students from different backgrounds gather here for training as part of their academic activities.

The peaceful use of atom in medical science was actually initiated much before its use for bombing Hiroshima and Nagasaki. However, the use of nuclear medicine flourished only in the twenty-first century. Radioactive atoms and radio isotopes are mostly used in the field of nuclear medicine technology to diagnose, treat and prevent different diseases. However, there are several well-known side-effects to the use of radioactive atoms in the human body.

Fortunately, in most of the cases, the side-effects are negligible.

While asking about the side effects Dr. Nahar remarked that, the side-effects are real but one needs to compare the benefits with the side-effects. If the benefits are found to be dominant over side-effects than the nuclear medicine

service is applied, she added. Moreover, NINMAS uses modern technologies and maintains highest possible standards in Bangladesh which minimize the risk factors and side effects, she said. “Our only problem is the lack of manpower; we cannot utilize the facility to its full capacity due to the scarcity of enough manpower,” she rued.

The Project Director and Chief Scientific officer of NINMAS Dr. Md Nurul Islam said that the state-of-the-art services offered at the institute are unique in the South-Asian region and more development is expected. Besides, the costs of the services here is relatively lower than the neighboring countries. “The majority of the radiopharmaceuticals used in Bangladesh’s nuclear medicine centers now come from the radioisotope production laboratory housed in the BAEC’s Institute of Nuclear Science and Technology in Savar. Initiatives are being taken to produce more of the isotopes at home,” he said.

The very first use of nuclear medicine started at Dhaka in the name of ‘Radio isotope’ center set up in 1962. Society of Nuclear Medicine was formed in 1993 and NINMAS was first established in 1980 with a small extent in Block-A of the former Institute of Post Graduate Medicine & Research (IPGMR). It is now located in the newly constructed 18-storied Block- D of Bangabandhu Sheikh Mujib Medical University (former IPGMR). Country’s first computerized ultrasonography and gamma camera were installed at Institute in 1981 and 1983 respectively. The institute started offering diploma courses from 1987.

In Dhaka, there are three different publicly-funded facilities that offer nuclear medicine services including BSMMU, Dhaka Medical College and Sir Salimullah Medical College. Private owned United Hospital of Dhaka also offers some services with limited capacity. The services of nuclear medicine are also available out of Dhaka. Chittagong Medical College and the medical colleges of Mymensingh, Rajshahi, Sylhet, Rangpur, Khulna, Barisal, Faridpur, Bogra, Comilla also offers some services.

Professor Dr. Morshed Ali, the director of the nuclear medicine of Rangpur Medical College said that the medical college offers almost all the services like Dhaka including thyroid cancers. Every day 50 to 60 patients get health care at the nuclear medicine department. Dr. Ali pointed as the scarcity of skilled manpower as the main hindrance in the full utilisation of nuclear technology in the health sector. “We offer academic courses here as well. However, we have scarcity of skilled man power here which will be solved once all the medical colleges start academic courses on nuclear medicine,” he remarked. He informed that, International Atomic Energy Agency (IAEA) provides assistance in developing skilled manpower and using new technologies.