

Evolution of Pediatric Neurosurgery at National Institute of Neurosciences and Hospital (NINS&H), Bangladesh

Sudipta Kumar Mukherjee & D.M. Arman

Department of Pediatric Neurosurgery

National Institute of Neurosciences and Hospital, Dhaka, Bangladesh

Introduction: Pediatric neurosurgical disorders – congenital, neoplastic, traumatic, seizure, stroke and vascular – are common in all countries. Since about 36.5% of Bangladesh's population are children, the potential is great for pediatric neurosurgery to grow as a sub-specialty.¹ With increasing awareness and availability of diagnostic facilities more pediatric patients with neurosurgical disorders are being detected, creating additional workload challenges.

History: The evolution of neurosurgery and the advancement of pediatric neurosurgery occurred simultaneously. Franc D. Ingraham, Cushing's disciple, established the world's first pediatric neurosurgical unit at Boston Children's Hospital in 1929.² Renowned Professor Rashid Uddin Ahmed pioneered neurosurgery in Bangladesh in 1970.^{3,4} By 1978 approximately five sustaining pediatric neurosurgery fellowships had been created in the United States.⁵

The department of Pediatric Neurosurgery started its journey in 2012 with the establishment of National Institute of Neurosciences & Hospital (NINS&H). Neurosurgery for the first time in Bangladesh divided into five sub-specialities: Pediatric Neurosurgery, Neurospine, Neurotrauma, GammaKnife Surgery and Clinical Neurosurgery, with the leadership of Prof Sk Sader Hossain (then Head of The Dept, Dept of Neurosurgery, NINS&H). Prof. Dr. Sheikh Mohammad Ekramullah joined as Departmental Head of the Pediatric Neurosurgery. Two other Neurosurgeons staffed the newly built Pediatric Neurosurgery: Dr. Sudipta Kumer Mukherjee, now Head of the Department, and Dr. D.M. Arman; both have been working here since the beginning. Later Dr. Md Nafaur Rahman, Dr. Md Ziauddin, Dr. Abdullah Al Mahbub, Dr. Ansar Uddin Ahmed, Dr. Kazi Saiful Islam and four residents joined the department. Now a total of 11 doctors are working regularly in the Department of Pediatric Neurosurgery, NINS&H.

Our Perspective: Pediatric Neurosurgery in Bangladesh has improved considerably in the last two decades.⁶ Initially the department had a provision of 23 beds and operations were conducted two days a week. Later the number of beds increased to 37; operations are now being conducted three days a week. The number of patient beds and operations has increased every year although the number is insufficient compared to the demand. At least 150 patients a week are treated in the outpatient department; about 21,000 patients have been treated in the outpatient department in the last five years. The 538 routine operations performed in pediatric neurosurgery in 2023 included 20% CNS tumors, 60% congenital CNS abnormalities, and 8% vascular disease. Also in 2023, 261 emergency pediatric neurotrauma operations were performed. A few other major institutions in Bangladesh have established pediatric neurosurgery departments.

Data Management: Online cloud-based software called EMR – <https://emrbd.com/> - has been developed and is used for data management. The software includes services such as storing all patient information, printing discharge letters, research, online services etc.^{7,8}

Academic: CME is organized in some subjects along with joint case discussion once a week; pediatric neurology and intensive care units always assist.⁹ The International Society of Pediatric Neurosurgeon (ISPN) Education Course organized in collaboration with Bangladesh Society of Neurosurgeons (BSNS) has been conducted three times with the help of renowned Indian Prof. Sandeep Chatterjee, resulting in junior neurosurgeons expressing interest in pediatric neurosurgery.¹⁰ In our department two to four residents receive regular hands-on training. International residents are also welcome: we can provide housing and food assistance. We have a separate library facility for pediatric neurosurgery plus a cadaver lab with both dry and wet lab facilities.

Collaboration: The need for foreign training was felt after the creation of the Pediatric Neurosurgery Department. Moya Moya disease surgery began in 2013 after training in Seoul National University Hospital (SNUH), South Korea. Further training at Asan Medical Center improved our surgery for Moya Moya disease. Prof. BK Misra, Hinduja Hospital, Mumbai, has gone one step further by training through a WFNS Fellowship. We also greatly benefitted from training with Prof. LN Shekhar, University of Washington, USA, through the International Visiting Surgeons Fellowship (IVSF) of the American Association of Neurological Surgeons (AANS). Prof. Kenji Ohata at Osaka City University Hospital, Japan, also trained us in skull base surgery. Pediatric neurosurgeon Prof. CE Deopujari visited us several times from Mumbai; he trained us by conducting academic sessions and by performing operations here. Prof. Philip Aldana organized training for two doctors at the AAACPN in Singapore. Pediatric Neurologists of NINS & H and other hospitals refer patients to the Pediatric Neurosurgery Department. Neuroanaethetists and Neuroradiologists play their role in complex patient management.

Reputed teachers from international institutes have enriched us through regular webinars after the Covid period. We regularly participate in case discussions at the Johns Hopkins Pediatric Neurosurgery Monthly Meeting (JIAM). Like other pediatric neurosurgical centers, our caseload includes about 50% congenital neurosurgical problems including hydrocephalus and neural tube defects (NTDs). CURE Children's Hospital, Uganda, assisted us by arranging training under the supervision of Prof. Benjamin C Warf, MD, in 2015 and gifting two flexible endoscopes after the training. Prof. John Mugamba and Dr. Peter Ssenyonga trained us with the highest endeavor. Mr. Charles Howard was the main collaborator behind all these works. Later Dr. Femi Bankole from Nigeria, Dr. Brandon Roque from Alabama, USA, Dr. Michael Dewan from Vanderbilt, USA came to Dhaka thanks to Charles Howard and helped us in development.

Some diseases require a multidisciplinary approach to treatment; art is “diversity and integration”. For example, a pediatric orthopedist, a physiotherapist, a pediatric urologist, a social worker, a plastic surgeon and a pediatric surgeon treat spina bifida. We collaborate with pediatric cardiology since many patients with congenital heart disease, especially cardiogenic brain abscess patients, require collaboration. We collaborate with maxillofacial surgeons for craniofacial reconstruction. Many pediatric tumors behave differently from adult tumors; hence we coordinate decision-making with oncologists through the online Pediatric CNS Tumor Board.

Research: Pediatric Neurosurgery Research Committee (PNRC) is a non-profit research organization - <http://pnrc16.org> - established in 2016 at the suggestion of Honorable Director Prof. (Dr.) Quazi Deen Mohammad. Now we are doing research in collaboration with Harvard University. Another study was completed with the same institute. Prof. Dr. Md. Joynul Islam,

Head, Department of Neurosurgery, NINS&H and Dr. Maitreyi Majumder, MD, MPH, neurologist at Boston Children's Hospital, USA contributed greatly in our research. Research results have been published in prestigious national and international journals. The results highlight the importance of pregnant women eating more green vegetables, taking folic acid tablets three months before conception, and creating public awareness for folic acid fortification of food to prevent NTDs. After the research findings, concerned government officials have immediately given necessary instructions to the implementers. We dream of eliminating NTDs from this country and through this research PNRC will be a part of that great work.

Social Activities and Publications: As doctors we have a social responsibility, so we work with GAIN and Award NGOs to support patient families and mobilize folic acid fortification. We write in daily newspapers, join talk shows, and share positive news on social media to create public awareness of pediatric disorders and treatments. A booklet written in Bengali on NTDs, hydrocephalus, and craniosynostosis is being distributed free to the parents of affected patients.

Future of Pediatric Neurosurgery: Pediatric neurosurgery warrants great expansion due to insufficient services compared to the needs. We are assisted in epilepsy surgery by renowned neurosurgeon Prof. Manas Panigrahi, epileptologist Dr. Sita Jayalakshmi, and their team. High-quality teaching programs, symposia, seminars, practical workshops, etc, are essential to attract and train residents in pediatric neurosurgery. A versatile use of software, apps, and digital technology can reduce the gap between rural and urban patients seeking treatment. Our Prime Minister's dream of "Digital Bangladesh" has turned "division into unity".^{11, 12} Our dream is to create a "Pediatric Neuroscience Foundation" through which such education, knowledge and skills can be spread to every part of the country. NINS&H Joint Director Prof. Dr. Badrul Alam said the Department of Pediatric Neurosurgery has finished preparing for flight; it is time to fly. As a newly emerging field, pediatric neurosurgery has taken off and is expected to continue to grow in the future.

Covid-19 has taken many of us: we have lost pediatric neurosurgeon colleague Prof. James T. Goodrich. This article is dedicated to Prof. Goodrich.

References:

1. How many children are there in Bangladesh? [Internet]. 2023. Available from: <https://data.unicef.org/how-many/how-many-children-under-18-are-there-in-bangladesh/>.
2. Lohani S, Cohen AR, Franc D, Ingraham and the genesis of pediatric neurosurgery. *J Neurosurg Pediatr.* 2013;11(6):727-33.
3. Hossain M. Evolution of Neurosurgery in Bangladesh. *Bangladesh J Neurosurg.* 2023;12:1-2.
4. Khan A, Hossain ATM, Shalike N, Kanti Barua K. Evolution of Neurosurgery in Bangladesh. *Bangladesh J Neurosurg.* 2019;8:57-62.
5. Albright AL, Pollack IF, Adelson PD. *Principles & Practice of Pediatric Neurosurgery*: Thieme; 2011.
6. Hossain S. Neurosurgery in Bangladesh: Past, Present and Future. *J NINS Bangladesh.* 2017;2:46.
7. Mukherjee SK, Olivieri DJ, Madhani SI, Bonfield CM, Mbabazi E, Arman DM, et al. EMR adoption in Dhaka, Bangladesh: a template to index pediatric central nervous system tumor care and a review of preliminary neuro-oncologic observations. *Childs Nerv Syst.* 2022;38(8):1497-504.
8. Mukherjee SK. Electronic Medical Record – Bangladesh (EMR-BD) 2023 <https://wfns.org/newsletter/348>.
9. NINS. 2023 [Available from: <https://www.nins.gov.bd/nins/index.php/departments/2017-03-22-04-56-59/paediatric-neurology-department>].
10. ISPN. Past Education Course 2024 [Available from: <https://www.ispneurosurgery.org/past-courses/>].

11. Habib A, Baizid A. Achievements and expectations of digital Bangladesh: e-governance initiatives in Bangladesh 2010. 393-4 p.

12. Islam MS, Grönlund Å. Digital Bangladesh – A Change We Can Believe in? 2011. 107-21 p.

Figures:

Fig 1: First education course jointly organized by BSNS and ISPN. Sitting from left to right: Prof. ATM Mosharef Hossain, Prof. Seow Wan Tew, Prof. Dr. Willian Harkness, Prof Sandeep Chatterjee, Prof. Dr. Kanak Kanti Barua, Prof. Dr. C.E Deopujari, Prof. Dr. Md. Raziul Haque and Prof SM Ekramullah.



Fig 2: Left to Right: Dr. Anasr Uddin Ahmed, Dr. Abdullah Al Mahbub, Dr. Kazi Saiful Islam, Dr. D. M. Arman, Prof. Dr. Sheikh Muhammad Ekramullah, Prof. Dr. Md. Badrul Alam (Joint Director, NINS&H), Prof. Dr. Sk Sader Hossain, Prof. Dr. Md. Joynul Islam, Dr. Sudipta Kumer Mukherjee, Dr. Md. Nafaur Rahman and Dr. Md. Ziauddin.



Fig 3: Program organized by Pediatric Neurosurgery on the occasion of Father of the Nation Bangabandhu Sheikh Mujibur Rahman's 103rd Birth Anniversary & National Children's Day. Left to Right: Prof. Dr. Narayan Saha, Prof. Dr. Seikh Azimul Hoque, Dr. Sudipta Kumer Mukherjee, Prof. Dr. Md. Badrul Alam (Joint Director, NINS&H), Prof. Dr. Quazi Deen Mohammad (Director, NINS&H) and Dr. Md. Ziauddin.

