

NEUROLOGICAL HEALTH PROFILE IN PAKISTAN – A HEALTH SYSTEMS BASED NEEDS ASSESSMENT

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ABSTRACT

OBJECTIVES

The aims of our study were to develop a neurological health profile in Pakistan from a health systems perspective, ascertain the readiness of neurology with regards to Sustainable Development Goals, and proffer recommendations for policy advocacy and planning in neurology.

METHODS

The study design included a combination of desk research, in-depth/semi-structured interviews of key informants, and selected onsite visits. The study was conducted from June to August 2016. Quantitative data analysis was tabulated, while qualitative data was analysed for emergent themes.

RESULTS

Neurological care is tertiary based with almost no coverage at secondary level of health care. There is only 1 neurologist per million population. There is a serious gap between need for neurological care and availability of a trained health workforce for universal health coverage. Neurology, as a medical specialty, does not have an organised national or provincial structure, officially notified by the health authorities.

CONCLUSIONS

There is need for a strategic plan for neurological health in Pakistan with special emphasis on human resource development and establishing neurological services at district level.

MESH WORDS

Neurology, Health Systems, Health Workforce, Sustainable Development, Pakistan

INTRODUCTION

A World Health Organization (WHO) report¹ indicated that neurological diseases accounted for a little over 6% of total Disability Adjusted Life Years (DALYs) and was proportionately higher than tuberculosis, HIV/AIDS, malignant neoplasms, ischaemic heart disease, respiratory disease and digestive diseases.

While there is paucity of data on the burden of neurological diseases in Pakistan, a recent report from the Global Burden of Disease study² found that cerebrovascular disease was the seventh leading cause of DALYs in Pakistan in 2013 and increased by 35% between 1990-2013.

Wasay and Ali³ have suggested that the burden of neurological disorders in Pakistan is about 4-5%. They note that there is only 1 neurologist per 1 million population indicating a serious shortage of this specialist cadre.

The Sustainable Development Goals⁴ were adopted by member states of the United Nations in 2015 and constitute the global development agenda for the next 15 years. Goal 3 (Ensure healthy lives and promote well-being for all at all ages) is a specific health related goal and has three targets that are of relevance to neurological health. These are i) Target 3.4 - By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being;

ii) Target 3.8 - Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all; and iii) Target 3.c - Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing States.

The basic foundation of universal health coverage as propounded by the SDG goal on health is strengthening of health systems. WHO developed a health systems framework⁵ which now constitutes the basis for health care planning in member states. None of the provincial health sector strategies and plans in Pakistan (Balochistan health sector strategy is still in development) includes a mention of neurological diseases, but refer to the term 'non-communicable diseases'^{6, 7, 8}.

To the best of our knowledge, there has been no study on neurological health in Pakistan using the health systems framework of six building blocks of the WHO. The aim of this study was to establish a health systems profile of neurological health in Pakistan and to ascertain the readiness of the 'neurology specialty' with regards to the SDGs.

MATERIALS AND METHODS

The key objectives of the study were to establish a neurological health profile in Pakistan using a health systems framework, determine the most frequently encountered neurological diseases seen at health care facilities, determine the current status of training options and available health workforce for neurology, and proffer recommendations for policy advocacy and strategic planning in neurology.

The study was conducted from Islamabad but the study design incorporated information from all the four provinces through a combination of desk research, in-depth interviews (IDIs) of key informants, semi-structured interviews (SSIs), and, where feasible, onsite visits. The use of a combination of quantitative and qualitative data was to allow triangulation of findings, more objectivity and to limit bias.

The study was conducted between June 2016 to August 2016. Ethical approval was obtained from the Institutional Review Board and Ethics Committee, Shifa International Hospitals Ltd, Shifa Tameer-e-Millat

University, Islamabad.

The sample for the study comprised of the 24 tertiary teaching hospitals in the country recognised and accredited by the Pakistan Medical and Dental Council⁹ and the College of Physicians and Surgeons of Pakistan¹⁰ for training in neurology and paediatric neurology. Information on training programmes for allied health personnel was obtained from key informants and desk review¹¹.

Information regarding medicines for neurology was obtained from National Essential Drug List¹² developed by the Ministry of National Health Services, Regulations and Coordination, Government of Pakistan. Further information was also obtained from the essential medicines list developed by Government of Sindh¹³ and Government of Khyber Pakhtunkhwa¹⁴.

Health information regarding neurology related diseases and service delivery was obtained from the Pakistan Health Information System (PHIS), Ministry of National Health Services, Regulation and Coordination, Government of Pakistan, and the District Health Information System¹⁵ (DHIS).

Health financing data was obtained from the Poverty Reduction Strategy Paper annual expenditure reports¹⁶ produced by the Ministry of Finance, Government of Pakistan, and the provincial Public Sector and Annual Development Programmes for 2016-17^{17, 18, 19, 20}.

Information on leadership and governance was obtained through desk review and from the Pakistan Society of Neurology²¹.

Quantitative data was analysed and tabulated, while qualitative data was analysed for emergent themes.

The study faced limitations in onsite visits to all training centres owing to the logistic implications and costs of travel. Further, other than the DHIS reports, there was no standardised reporting system at the tertiary level. Limited time and resources did not permit interview of district physicians. In the absence of sound epidemiological data on the prevalence of neurological disorders in Pakistan, reliance had to be placed on the use of disease specific data where available.

RESULTS

SERVICE DELIVERY

The DHIS data revealed that 2.95% of all indoor

admissions in district hospitals in Pakistan were for neurological diseases. DHIS data reveals that head injuries, stroke and meningitis increased two-fold or more between 2012 and 2015 (Figure 1). This finding is elaborated further under discussion.

Both Punjab and Khyber Pakhtunkhwa have recently developed their Minimum Service Delivery Standards (MSDS) and Essential Package of Health Services (EPHS) respectively. Only the MSDS in Punjab indicate the need for a neurologist at district level.

Table 1 indicates the tertiary teaching hospitals providing neurological specialist services.

HEALTH WORKFORCE

There are at least 24 centres that have been accredited by PMDC and CPSP for training in neurology. Currently, there are 200 residents undergoing training in neurology, and the average annual intake of new residents is 2 per training centre.

Table 1 indicates the type of postgraduate training in neurology, while Table 2 shows the type of qualifications and number of centres for training allied health professionals related to neurology.

MEDICAL PRODUCTS AND TECHNOLOGY

Both the Governments of Sindh and Khyber Pakhtunkhwa have developed their essential medicines list which include the following levels of care – Basic Health Unit (BHU), Rural Health Centre (RHC), Tehsil Headquarter Hospital (THQ), and District Headquarter Hospital (DHQ). The National Essential Drug List has been revised and is due for release soon. The essential medicines list in Punjab is still under development for the secondary level of care. Table 3 illustrates the medicines included on the list that are relevant to neurology. However, certain medications which are considered a basic standard of care are not available in Pakistan e.g. tissue Plasminogen Activator (tPA) for management of acute ischaemic stroke.

HEALTH INFORMATION

The study found that tertiary level neurology departments were all using their own respective reporting formats of neurological disorders seen in the outpatient and in-patient categories. Further, no tertiary level data was being collated and synthesised by any coordinating structure.

However, at the district level, the DHIS collects

information on selected neurological disorders along with other health information using a standardised reporting template that is completed monthly by about 140 district headquarter hospitals and submitted to the respective provincial DHIS units. The provincial DHIS units are digitally linked with the Pakistan Health Information System currently operated by Health Planning System Strengthening and Information Analysis Unit in the Ministry of National Health Services, Regulation and Coordination in Islamabad.

The DHIS reporting form includes the following indicators for neurological diseases (however, this is not differentiated by age or gender):

- Outpatients – Epilepsy and Acute Flaccid Paralysis
- In-patients – Cerebrovascular Accident (CVA)/Stroke, Head Injury, Meningitis

HEALTH FINANCING

Analysis of available provincial financial data indicates that there is no differentiation by specialty. Poverty Reduction Strategy Paper (PRSP) pro-poor budgetary expenditures indicate that the major proportion of health spending by the provincial governments is in the area of general hospitals and clinics. Less than 10% is spent on health facilities and preventive measures. On review of the Provincial Annual Development Programmes for 2015-16, a few neurology related projects were found:

- The Government of Sindh has approved Rupees 847.168 million (US\$ 8 million) for establishment / construction of a new outpatient block that includes Neurosurgery, Neurology, Urology, Paediatric Surgery and other units at the Peoples Medical College Hospital, Benazirabad.
- The Government of Khyber Pakhtunkhwa has approved Rupees 706.809 million (US\$ 7 million) for establishment of the Khyber Institute of Neuro Sciences and Clinical Research (KINAR) in Mardan,
- The Government of Punjab has approved Rupees 2,354.241 million (US\$ 23.5 million) for establishment of the Punjab Institute of Neuro Sciences, Lahore (Phase-II), and allocated Rupees 711.000 million (US\$ 7 million) for Phase III

LEADERSHIP AND GOVERNANCE

Pakistan Society of Neurology took its birth from the Pakistan Academy of Neurological Sciences (PANS) and

now provides the main stewardship role for neurology. It has 193 members and serves as the main forum for clinical and continuing professional development of neurologists. There are several other societies, associations and foundations related to neurology that contribute to professional development. These include the following:

- Pakistan International Neuroscience Society (PINS)
- Epilepsy Association of Pakistan
- Pakistan Headache Society
- Pakistan Stroke Society
- Neurology Awareness and Research Foundation (NARF)
- Pakistan Society of Neuro Rehabilitation (PSNR)
- Movement Disorders Society of Pakistan
- Multiple Sclerosis Research and Welfare

The Pakistan Journal of Neurological Science is the main scientific journal of neurology in Pakistan. The journal is brought out quarterly by a joint collaboration of the Pakistan Society of Neurology, Pakistan Academy of Neurological Sciences, and Pakistan International Neuroscience Society. It is a recognised publication by the Eastern Mediterranean Regional Office of the World Health Organization (EMRO-WHO), Pakistan Medical and Dental Council (PMDC), and the Higher Education Commission (HEC).

The government has several national health programmes like the hepatitis control programme, tuberculosis control programme, malaria control programme, prevention of blindness programme etc., that have now been devolved to the provinces, but there is no programme or project for neurological health.

DISCUSSION

Although data on dementia in Pakistan is very limited, however, Ahmad et al²² in their hospital based study on consecutive patients with dementia found that 81.7% presented with memory loss as the chief complaint. About 20% had a prior history of stroke, 36.7% had parkinsonism, 41.7% had hypertension, 33.3 % had diabetes mellitus, while only 28.3% were smokers, and 35% had a family history of dementia.

Malik et al²³ studied the prevalence of childhood epilepsy in Pakistan using vaccinators as key informants. They found a prevalence for epilepsy of 7.0 per 1000 children.

Murtaza et al²⁴ studied the clinical features of

headaches and found that migraine was the most common disorder in 80.8%, followed by tension type headaches (TTH) in 22.7%, and medication-overuse headache in 2.4% of the studied population.

Multiple Sclerosis (MS), once thought to be rare in Pakistan, has begun to show an increasing trend²⁵. Javed et al²⁶ studied the spectrum of acquired demyelinating disorders in adults and found that the commonest presentation was that of clinically isolated syndrome (CIS) in 48%, followed by multiple sclerosis (MS) in 32% and neuromyelitis optica in 11.2%.

Rahman et al²⁷ studied Parkinson's disease and found that the commonest modes of presentation were tremor in 93.33%, bradykinesia in 86.67% and depression in 63.33%.

Kamal et al²⁸ studied stroke and transient ischaemic attacks (TIA) in persons aged 30 years and above in an urban slum community in Karachi and found an alarmingly high prevalence of stroke in 19.1% and TIA in 9.7%. Hashmi et al²⁹ have indicated the annual incidence of stroke in Pakistan to be 250/100,000, which is projected to an estimated 350,000 new cases every year.

Raja et al³⁰ conducted a multi-centre study on neurotrauma involving neurological units in Pakistan and found that road traffic accident was the commonest cause of head injury.

In order to address and provide clinical guidelines for some of the main neurological disorders in Pakistan, the Pakistan Society of Neurology has developed national guidelines for clinicians on dementia³¹, epilepsy^{32, 33}, ischaemic stroke care³⁴ and stroke manifesto³⁵, diagnosis and management of Parkinson's disease³⁶, and evaluation and management of neuropathic pain³⁷.

There is paucity of epidemiological data on neurological diseases in Pakistan. However, an epidemiological study conducted about 25 years ago in Karachi city determined crude prevalence of various neurological disorders³⁸.

The burden of cerebrovascular disorders in Pakistan² is close to the comparison group average of 2,567.1 Years of Life Lost per 100,000 (YLL) age standardised. A comparison group of countries was used to compare YLLs across locations relative to the group average. Comparison groups were chosen based on the GBD regional classifications, known trade partnerships, and

income classifications. Interestingly, data analysis for 2015 shows that Bangladesh had a high YLL of 3,277.0 compared to 1,082.8 in Sri Lanka and 1,854.3 in India. The highest YLL rate was found in Afghanistan with 7,020.2. Wasay and Ali³ suggested that 4 out of every 100 individuals in Pakistan may have some form of neurological disorder. Aziz et al³⁹ in their study estimated the prevalence of epilepsy in Pakistan to be 9.99 per 1000 population. They found the highest prevalence in people younger than 30 years of age, especially those in the childhood group, and in the rural population. Herekar et al⁴⁰ studied the prevalence of headache disorders, in which the initial survey was done by non-medical personnel on a nationally based random sample and validation done by a neurologist. They found a prevalence of about 3.48%.

There is limited data on paediatric neurology in Pakistan. Zaheer et al⁴¹ in their study on all paediatric admissions to a major tertiary hospital found that 6.7% of children were admitted because of neurological disease, which included congenital / perinatal /developmental neurological disorders (20%), central nervous system (CNS) infections (13%), neoplastic disorders of CNS (16.9%), febrile fits (15%), seizure disorders (10.7%), and cerebral palsy (9.8%). The overall mortality of children admitted due to neurological diseases was 17.6%.

The specialty of neurology continues as a tertiary level service in Pakistan at present with little or no neurological specialist care at district hospitals. This means that there is a serious coverage and access gap for the population in need. Further, there is paucity of data on the neurological services provided in the private sector and further study is required to elucidate the status of neurological services in this sector.

Our study estimates that there is 1 neurologist per million population. This situation contrasts markedly with Ireland⁴² that is aiming for 1 per 70,000 population, while the average ratio in South East Asia⁴³ is 1:288,920 population. It is unlikely that Pakistan will be able to achieve a ten-fold increase in neurologists in the next 15 years. However, there is a pressing need for the Pakistan Society of Neurology in collaboration with the human resources for health directorates of provincial health departments and leading training institutes for neurology to formulate a human resource development plan that aims to reduce the ratio from 1:1,000,000 to 1:500,000.

The findings from DHIS indicate that a basic reporting

system for neurological disorders exists at least at district level. However, the findings from 2012 and 2015 suggest that there is need to study why there was a decrease in acute flaccid paralysis (AFP) and epilepsy in 3 years and more than doubling of stroke and meningitis in 3 years, as there may be factors related to the quality of reporting. There is need for orientation of hospital administrators, data entry operators, physicians and neurologists at district hospitals to ensure that neurological data is reflected as per the DHIS form and that provincial and federal level data analysis includes neurology. This may require collaboration and joint periodic review by neurology leaders in respective provinces with provincial DHIS units. The review may also be extended to district level analysis to determine which districts have the highest frequency of neurological disorders, and provide the basis for further study and intervention.

In the absence of a national coordinating and planning structure for neurological services, the professional society can take a lead to hold a consultative process in collaboration with provincial DHIS units and WHO Pakistan to develop a standardised tertiary level neurological reporting system that is collated periodically and synthesised into an official annual report. Further, there is a need to develop a national database and registries for neurological diseases. The Pakistan Society of Neurology has initiated a process of developing a database for neurology.

The provincial essential medicines list provides a minimum standard for medicines used for neurological disorders. However, our study found that these medicines were not always available in stock. The professional society would need to create awareness amongst neurologist professionals about the standard list and lobby hospital and provincial health administration to ensure that the medicines are made available at the levels of care indicated. However, the list is inadequate at present as there is need for the Pakistan Society of Neurology to advocate to the provincial health departments to include medications related to headache prophylaxis, acute stroke management, stroke secondary prophylaxis, dementia, demyelinating diseases as well as medicines for neuro-inflammatory diseases (e.g. intravenous, oral steroids and immune-suppressive therapy).

At present, there are no clearly defined minimum service delivery standards (MSDS) for neurological services at primary, secondary and tertiary level (although the MSDS in Punjab has attempted to

provide some guidance in this). There is need for the Pakistan Society of Neurology to establish an expert group/task force to liaise with the provincial health administration to review existing facilities, services and human resources and develop minimum service delivery standards for neurology.

Further, Atif et al⁴⁴ observed irrational use of drugs in outpatient departments of two tertiary care hospitals. Some of the key issues included polypharmacy, brand prescribing, over-prescribing of antibiotics, short consultation and dispensing times, lack of patients' knowledge about prescribed medicines and unavailability of all key drugs in stock. Atif et al⁴⁵ in their study on rational use of drugs at primary health care centres also indicated that irrational utilisation of medicines can also cause an increase in morbidity and mortality associated with chronic conditions such as diabetes, hypertension, epilepsy and neurological disorders. This requires urgent attention by the Pakistan Society of Neurology for improvement in clinical standards.

While there are a few examples of specific neurology projects by the provincial governments, the overall funding for the specialty remains very limited and part of overall general hospital allocation and expenditure.

All of the other national health programmes alluded to earlier receive funding from international development partners and non-governmental organisations. Such support has usually been preceded by a pilot phase in which pilot projects are undertaken in selected districts to test a service delivery approach. After review, this is extended to a demonstration phase in a few more districts. Once the success of the approach is proven to be scalable, it is usually taken to scale by the provincial government. Neurology may benefit from learning the process undertaken by other specialties to garner international support, raise the profile of the specialty and mobilise additional financing from the government.

Advocacy by provincial leadership in neurology has mobilised government resources for establishment of four specialist neurological centres. This suggests an increasing awareness at policy and planning level. However, the findings indicate that while neurology has a strong professional base, it does not have an organised national or provincial structure, officially notified by the federal and provincial health authorities, like national or provincial committees on neurology. The main role of such committees is to act as the technical arm of the provincial health department to formulate a national plan on neurological health, plan for service

development, develop scale-up plans of human resources for neurology, standardise reporting systems, pilot intervention projects at district level for scalability, and act as the forum for policy advocacy. The work of the committees complements the important role of professional societies whose main function is to establish professional standards, guidelines and benchmarks, play a national and international representational role, foster research, and ensure continuing medical education. The lack of such committees is impeding development of the specialty, especially at district (secondary) level, as it does not have the advocacy platform to enhance the profile or attract dedicated funding achieved by some of the other specialties. The Pakistan Society of Neurology needs to engage with the Ministry of National Health Services, Regulations and Coordination and provincial health departments to establish a National Committee for Neurological Health with similar provincial level coordination structures respectively. This process will facilitate the planning and development of neurological services while the professional society focusses on quality and clinical standards for the specialty.

Since the launch of the SDGs in 2015, we were unable to find any scale or matrix to assess the readiness of neurological services with respect to SDGs. We developed a 10-points SDGs readiness scale for neurological health based on our study's findings (Table 4). The readiness scale shows that the baseline for neurological health has a low score of 1 indicating areas where strategic emphasis needs to be placed. We have also suggested some targets to be achieved by 2030. We envisage that this scale could also be used both as a planning guide for development of a national/provincial programme and a performance measurement framework for neurological health.

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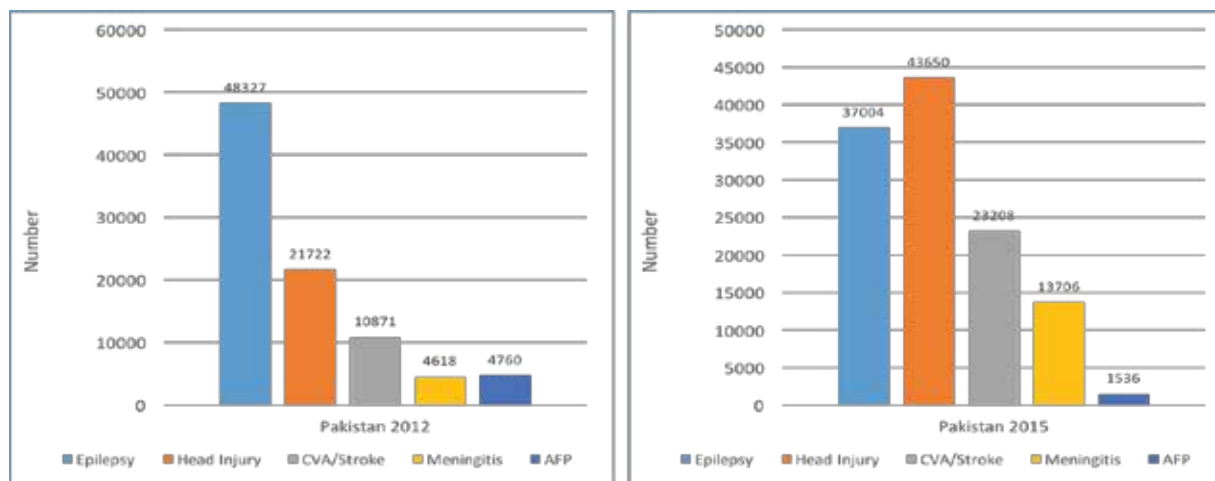
DISCLAIMER

We, the authors, confirm that the abstract has not been presented or published in a conference, or published in an abstract book or any other relevant information.

Figure 1 – Neurological disorders reported in the District Health Information System

Figure 1

Figure 1 compares the status of neurological disorders reported in the DHIS in 2012 and 2015. It highlights changes in disease patterns with doubling of head injuries and stroke and an almost three-fold increase in meningitis.



CVA – Cerebrovascular Accident; AFP – Acute Flaccid Paralysis;

Table1 – Specialist centres in neurology and type of postgraduate training in neurology

TABLES

	City	Name of Centre accredited for training	Training programmes in Paediatric Neurology
1	Karachi	The Aga Khan University Hospital	FCPS
2	Lahore	The Children's Hospital & The Institute of Child Health	FCPS
3	Multan	The Children's Hospital & The Institute of Child Health	FCPS
	City	Name of Centre accredited for training	Training programmes in Neurology
1	Islamabad	Pakistan Institute of Medical Sciences (PIMS)	FCPS AND MD
2	Islamabad	Shifa International Hospital	FCPS
3	Islamabad	Institute Of Health & Management Sciences	PGD
4	Quetta	Bolan Medical College, BMC Hospital Complex	FCPS
5	Peshawar	PGMI/Lady Reading Hospital	FCPS
6	Peshawar	Northwest General Hospital & Research Centre	FCPS
7	Lahore	King Edward Medical University, Mayo Hospital	FCPS MD
8	Lahore	Services Hospital & Services Institute of Medical Sciences (SIMS)	FCPS
9	Lahore	Sheikh Zayed PGMI Hospital	FCPS
10	Lahore	Post Graduate Medical Institute (PGMI)	MD
11	Lahore	Fatima Jinnah Medical University, Sir Ganga Ram Hospital	FCPS
12	Multan	Nishtar Medical College & Hospital Multan	FCPS
13	Rawalpindi	Military Hospital	FCPS
14	Jamshoro	Liaquat University of Medical & Health Sciences	FCPS
15	Karachi	The Aga Khan University Hospital	FCPS

16	Karachi	Dow University of Health Sciences, Civil Hospital	FCPS MD
17	Karachi	Jinnah Postgraduate Medical Centre (JPMC)	FCPS MD PGD
18	Karachi	Liaquat National Postgraduate Medical Centre	FCPS MD
19	Karachi	Ziauddin University	FCPS MD
20	Karachi	Karachi Medical Dental College, Abbasi Shaheed Hospital	FCPS MD
21	Larkana	Shaheed Mohtarma Benazir Bhutto Medical University	FCPS DCN

FCPS – Fellow of the College of Physicians and Surgeons of Pakistan; MD – Doctor of Medicine; PGD – Postgraduate Diploma; DCN – Diploma in Clinical Neurology

Table 2 – Type and number of neurology related training programmes for Allied Health Personnel

Qualification	Islamabad	Balochistan	Khyber Pakhtunkhwa	Punjab	Sindh
Certificate in Neuro Spinal Imaging (6 months)					1
Certificate in Non-Interventional Radiology (6 months)					1
Diploma Imaging Technician (1 year in Islamabad, 2 years in Lahore)	1			2	
Postgraduate Diploma in Neuro-muscular Physical Therapy (1 year)	1				1
FSc Medical Image Technology (2 years)	1				
Diploma in Medical Technology (1 year)					1
Diploma in Neuro Sciences (1 year)				1	
BSc Hons Imaging Technician (4 years)				1	
BS/BSc Hons/MD Medical Image Technology (4 years)	2		1	17	
BS Neuro Sciences (4 years)					1
BS/BSc/BSc Hons Medical Technology (2 to 4 years)	3			2	5
BS Rehabilitation Sciences (4 years)				1	

FSc – Faculty of Science; BS – Bachelor of Science; BSc – Bachelor of Science; BSc Hons – Bachelor of Science with Honours; MD – Doctor of Medicine

Table 3 – Essential Medicines List

	Khyber Pakhtunkhwa	Sindh
BHU		
RHC	<p>Anti -Epileptics/Anti -Convulsants</p> <ul style="list-style-type: none"> ▪ Carbamazepine ▪ Phenobarbital (sodium) ▪ Phenytoin (sodium) ▪ Valproic acid (sodium valproate) ▪ Magnesium sulphate (for eclampsia only) <p>Anxiolytics</p> <ul style="list-style-type: none"> ▪ Alprazolam ▪ Diazepam 	<p>Anti -Epileptics/Anti -Convulsants</p> <ul style="list-style-type: none"> ▪ Carbamazepine ▪ Phenobarbital (sodium) ▪ Phenytoin (sodium) ▪ Magnesium sulphate (for eclampsia only) <p>Anxiolytics</p> <ul style="list-style-type: none"> ▪ Alprazolam ▪ Diazepam
THQ	<p>Muscle relaxants</p> <ul style="list-style-type: none"> ▪ Neostigmine (metilsulphate/bromide) ▪ Suxamethonium (chloride) <p>Anti -Epileptics/Anti -Convulsants</p> <ul style="list-style-type: none"> ▪ Carbamazepine ▪ Phenobarbital (sodium) ▪ Phenytoin (sodium) ▪ Magnesium sulphate (for eclampsia only) <p>Anti -Parkinson's</p> <ul style="list-style-type: none"> ▪ Biperiden ▪ Levodopa + Carbidopa <p>Medicine for Mental and Behavioural Disorders/ Tranquilisers</p> <ul style="list-style-type: none"> ▪ Chlorpromazine (hydrochloride) ▪ Alprazolam ▪ Diazepam 	<p>Muscle relaxants</p> <ul style="list-style-type: none"> ▪ Neostigmine (metilsulphate/bromide) ▪ Suxamethonium (chloride) <p>Anti -Epileptics/Anti -Convulsants</p> <ul style="list-style-type: none"> ▪ Carbamazepine ▪ Phenobarbital (sodium) ▪ Phenytoin (sodium) ▪ Magnesium sulphate (for eclampsia only) <p>Medicine for Mental and Behavioural Disorders/ Tranquilisers</p> <ul style="list-style-type: none"> ▪ Chlorpromazine (hydrochloride) ▪ Haloperidol ▪ Alprazolam ▪ Diazepam
DHQ	<p>Muscle relaxants</p> <ul style="list-style-type: none"> ▪ Neostigmine (metilsulphate/bromide) ▪ Suxamethonium (chloride) ▪ Atracurium (besylate) <p>Anti -Epileptics/Anti -Convulsants</p> <ul style="list-style-type: none"> ▪ Carbamazepine ▪ Phenobarbital (sodium) ▪ Phenytoin (sodium) ▪ Magnesium sulphate (for eclampsia only) <p>Medicine for Mental and Behavioural Disorders/ Tranquilisers</p> <ul style="list-style-type: none"> ▪ Chlorpromazine (hydrochloride) ▪ Fluphenazine (decanoate or enanthate) ▪ Fluoxetine (hydrochloride) ▪ Amitryptiline (hydrochloride) ▪ Carbamazepine ▪ Chlomipramine (hydrochloride) ▪ Olanzapine ▪ Alprazolam ▪ Diazepam ▪ Bromazepam <p>Anti -Parkinson's</p> <ul style="list-style-type: none"> ▪ Biperiden ▪ Levodopa + Carbidopa 	<p>Muscle relaxants</p> <ul style="list-style-type: none"> ▪ Neostigmine (metilsulphate/bromide) ▪ Suxamethonium (chloride) ▪ Atracurium (besylate) <p>Anti -Epileptics/Anti -Convulsants</p> <ul style="list-style-type: none"> ▪ Carbamazepine ▪ Phenobarbital (sodium) ▪ Phenytoin (sodium) ▪ Valproic acid (sodium valproate) ▪ Magnesium sulphate (for eclampsia only) <p>Medicine for Mental and Behavioural Disorders/ Tranquilisers</p> <ul style="list-style-type: none"> ▪ Chlorpromazine (hydrochloride) ▪ Fluphenazine (decanoate or enanthate) ▪ Fluoxetine (hydrochloride) ▪ Amitryptiline (hydrochloride) ▪ Carbamazepine ▪ Chlomipramine (hydrochloride) ▪ Olanzapine ▪ Alprazolam ▪ Diazepam ▪ Bromazepam ▪ Risperidone <p>Anti -Parkinson's</p> <ul style="list-style-type: none"> ▪ Biperiden ▪ Levodopa + Carbidopa

BHU – Basic Health Unit; RHC – Rural Health Centre; THQ – Tehsil Headquarter Hospital; DHQ – District Headquarter Hospital

Table 4 - SDGs readiness scale for Neurological Health in Pakistan (2016-2030)

Scale	1	2	3	4	5
Achievement of target	Up to 20%	>20% - 40%	>40% - 60%	>60% - 80%	>80% -100%
Theme	Year 2016	Year 2019	Year 2023	Year 2027	Year 2030
1. Mortality reduction by 33%	Baseline – 15-20% mortality in neurology admissions				Target - 12% mortality in neurology admissions
2. Service Delivery (UHC)	Baseline - <10% district hospitals with neurological services				Target - 100% district hospitals provide neurological services
3. Medical Products	Baseline - essential list of neurological medicines available, but not always in stock				Target – 100% district hospitals have essential medicines for neurology
4. Technology (Essential package of diagnostic technology - CT -Scan, EEG, EMG, NCS)	Baseline - CT scans used by neurologists at <10% district hospitals. No MRI, EEG, EMG or NCS at district hospitals				Target – 100% district hospitals have essential package of diagnostic technology
5.1 Health Workforce deployment	Baseline - <10% district hospitals with neurologists				Target - 100% district hospitals with neurologists
5.2 Health Workforce development	Baseline – 1 neurologist per million population				Target – 1 neurologist per 500,000 population
6. Health Information	Baseline – <10% of districts with neurologists reporting on DHIS, but no tertiary reporting				Target - 100% districts reporting neurology on DHIS; 100% tertiary neurology departments reporting
7. Health Financing	Baseline - <1% health development budget for development of neurology services				Target - 2% of health development budget allocated for neurology services
8. Leadership and Governance	Baseline – professional societies active but no national or provincial programme				Target – all provinces have neurological health programmes
9. Quality	Baseline - best practice national guidelines developed and MSDS/EPHS available for district hospitals				Target - 100% district hospitals implement quality guidelines and meet MSDS/EPHS benchmarks for neurology
10. Research	Baseline – limited disease specific epidemiological data; no provincial or national data				Target - rapid assessment of neurological health conducted for 100% districts

SDGs – Sustainable Development Goals; UHC – Universal Health Coverage; CT – Computed Tomography; MRI – Medical Resonance Imaging; EEG – Electroencephalogram; EMG – Electromyogram; NCS – Nerve Conduction Studies; DHIS – District Health Information System; MSDS – Minimum Service Delivery Standards; EPHS – Essential Package of Health Services. Note: Immunology, serology, and genetic testing is now becoming essential in neurological diagnosis and would need to be provided at tertiary level initially.

LEGENDS

Table 1

Table 1 indicates that there are 24 specialist centres for neurology that also provide postgraduate training. These include three centres for paediatric neurology. Most of the training is either FCPS or MD.

Table 2

Table 2 highlights the type of training courses related to neurology already being run for allied health personnel. They provide a useful framework to plan human resource development of a neurological health team.

Table 3

Table 3 indicates the approved essential medicines list in two provinces for use at primary, secondary and tertiary levels of health care.

Table 4

Table 4 presents a proposed SDG readiness scale/matrix to assess the status of neurological services and could possibly be used as a baseline to develop a strategic plan for development of neurological health services in Pakistan.

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