UNIVERSITY OF PORT HARCOURT

ACCIDENTS OF NATURE: SURVIVAL AND SEQUELAE

An Inaugural Lecture

by

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INAUGURAL LECTURE SERIES

NO. 171

THURSDAY, JULY 29, 2021

University of Port Harcourt Press Ltd.
University of Port Harcourt
Port Harcourt
Nigeria
E-mail: uniport.press@uniport.edu.ng

ISSN: 1119-9849
INAUGURAL LECTURE SERIES NO. 171
DELIVERED: JULY 29TH, 2021

Designed, Printed and Bound By UPPL

ORDER OF PROCEEDINGS

2.45 pm. Guests are seated

3.00pm. Academic Procession begins

The Procession shall enter the Ebitimi Banigo Auditorium, University Park, and the Congregation shall stand as the Procession enters the hall in the following order:

Academic Officer
Professors
Deans of Faculties/School
Dean, School of Graduate Studies
Provost, College of Health Sciences
Lecturer
Ag. Registrar
Deputy Vice Chancellor Academic
Deputy Vice Chancellor Administration
Vice Chancellor

After the Vice Chancellor has ascended the dais, the Congregation shall remain standing for the University of Port Harcourt Anthem.

The Congregation shall thereafter resume their seats.

THE VICE CHANCELLOR'S OPENING REMARKS.

The Ag. Registrar shall rise, cap, invite the Vice Chancellor to make his opening remarks and introduce the Lecturer.

The Lecturer shall remain standing during the Introduction.

THE INAUGURAL LECTURE

The Lecturer shall step on the rostrum, cap and deliver her Inaugural Lecture. After the lecture, she shall step towards the Vice Chancellor, cap and deliver a copy of the Inaugural Lecture to the Vice Chancellor and resume her seat. The Vice Chancellor shall present the document to the Registrar.

CLOSING

The Ag. Registrar shall rise, cap and invite the Vice Chancellor to make his Closing Remarks.

The Vice Chancellor's Closing Remarks.

The Vice Chancellor shall then rise, cap and make his Closing Remarks. The Congregation shall rise for the University of Port Harcourt Anthem and remain standing as the Academic [Honour] Procession retreats in the following order:

Vice Chancellor
Deputy Vice Chancellor Administration
Deputy Vice Chancellor Academic
Ag. Registrar
Lecturer
Provost, College of Health Sciences
Dean, School of Graduate Studies
Deans of Faculties/School
Professors
Academic Officer

PROTOCOL

- The Vice Chancellor
- Past Vice Chancellors
- Deputy Vice Chancellor, Administration
- Deputy Vice Chancellor, Academic
- Past Deputy Vice Chancellors
- Members of the Governing Council
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- Visiting Academics and Colleagues
- Esteemed Administrative Staff
- Captains of Industries
- Cherished Friends and Guests
- Unique Students of UNIPORT
- Members of the Press
- Distinguished Ladies and Gentlemen

DEDICATION

This Lecture Is Dedicated To:

- The **ALMIGHTY GOD**
- The most important people in my life- My darling husband and our children- Dr. Ibanibo Frank-Briggs, Soibifaa, Otokini and Tamunotonte.
- My late parents and foster parents: Late Chief Honest and Mrs. Mercy H.B. Dateme and Late Ambassador Dagogo and Lady Emma Obunge.

ACKNOWLEDGMENTS

I am most grateful to the Almighty God who has always guided, protected and provided for me. I give Him all glory, honor and praise.

I am deeply grateful to my wonderful parents Late Chief and Mrs. H.B. Dateme and Late Amb. D.D. Obunge and Lady Emma Obunge who taught me hard work, diligence, respect, honesty and industry and ingrained in me the value of education early in life.

I would like to express my deep gratitude to my darling husband, Pastor (Dr.) Ibanibo Frank-Briggs for his support, patience, guidance, and enthusiastic encouragement.

My heart is full of gratitude to my lovely children, Emi, Soibifaa, Otokini, Tonte and Joy for their love and understanding.

I would like to express my very great appreciation to my academic mentor, Prof. K.E.O. Nkanginieme who brought me into Residency training and has never ceased to protect my interest in Paediatrics. He has been my adviser and will remain my motivator.

My special gratitude goes to Prof. R.S. Oruamabo who made my employment possible as a Lecturer I. He has been a father indeed, always encouraging me. He has been a pillar of support for my family and me.

My special thanks go to Emeritus Professor Nimi D. Briggs, another father who employed me as the Vice Chancellor of

Unique Uniport in 2005. He will always stop when we meet and ask about my welfare and research work.

My gratitude to all the members of the Department of Paediatrics and Child Health who motivated me during my academic journey namely; Prof Alice Nte, Prof. Nwadiuto Akani, Prof. E.A.D. Alikor, Prof.Augusta Eneh, Prof. Barbara Otaigbe, Prof Ifeoma Anochie, Prof Rosemary Ugwu, Prof Peace Opara, Prof Preye Jaja, Dr. Balafama Alex-Hart, Dr. Paul Nsirim, Dr. Gracia Eke, Dr. Lucy Yaguo-Ide, Dr. Petronella Tabansi, Dr. Iroro Yarhere, Dr. Joyce Okagua and all other consultants in the Department. Other professional friends including Prof. Eno Ikpeme, Prof John Ikimalo and Dr. Franca Ikimalo, Dr. Chinelo Ozigbo, Dr. N. Inimgba, Prof. & Prof A.C. (Mrs) Onwuchekwa,, Prof Sotonye Fyneface-Ogan, Late Dr. Alagoma Iyagba, Prof & Prof. N. Eke, Dr. D. Altraide, Prof. Ngozi Orazulike, Dr & Prof P. Fiebai, Dr. James Omietimi, and Resident doctors, nurses and staff in the Department of Paediatrics. They all provided a conducive work environment for my academic growth.

Also, I thank all the staff of the Centre for Children Developmental and Communication Disorder (CCDCD) especially the pioneer Director Prof. Shirley Yul-Ifode who laid the foundation for all the good works in the centre and for taking me under her wings.

My special thanks also go to all the staff of the College of Health Sciences for all their support.

My sincere appreciation goes to Prof. Ndowa E.S. Lale, the immediate past Vice Chancellor of the Unique Uniport for appointing me Professor of Neurology and

Neurodevelopmental Paediatrics and Director of CCDC, the first in Nigeria.

I appreciate the past Chief Medical Directors (CMD), University Teaching Hospital, Dr. US Etawo and Prof. Aaron Ojule and the current CMD, Prof. Henry Ugboma and the members of Administration for creating a conducive environment for my research work.

I wish to appreciate past Provosts Prof. Christie Mato and Prof. Chris Akani, past Deans and Prof Patrick Eghwrudjakpor the current dean Faculty of Clinical Sciences for providing a calm working environment.

I am particularly grateful to my Provost Prof. Iyeopu Siminialayi for his valuable and constructive suggestions during the planning and development of this inaugural lecture, his willingness to give his time to proofread and edit my manuscript.

Special thanks to my senior colleague, and my mentor Prof Alice Nte for her support and encouragement throughout my career.

My special gratitude goes to Prof. D. Seleye-Fubara for his encouragement and proofreading this manuscript.

My special thanks also goes to Prof. Don M Baridam, former Vice-Chancellor, University of Port Harcourt and Pastor Iyke Orji who are always there to support and encourage me.

Special thanks to my dear colleague and brother, Prof. Innocent George for his support and encouragement throughout my career.

I appreciate my Neurology unit headed by Prof. E.A.D Alikor, and my younger colleague Dr. Nneka Gabriel-Job and all the Resident doctors who have passed through the unit. They have all added value to the field of neurology.

The greatest part of my gratefulness goes to my teachers in Bishop Crowder Memorial State School; Ireti Primary School, Lagos; Queens College, Yaba, Lagos, University of Jos and University of Port Harcourt.

I thank all members of Child Neurology Society of Nigeria, American Academy of Neurology and Paediatric Association of Nigeria for enabling my achievement in Paediatric Neurology.

I also acknowledge all my neurology patients; I specially appreciate the effort of all their parents and caregivers.

My heart is full of gratitude to my siblings, cousins, uncles, aunties, and my in-laws. They have stood by me at all times.

I thank my spiritual parents, Pastors and members of the Redeemed Christian Church of God, Rivers Family, especially Region 5 led by Pastor Soji Oni for their prayers and encouragement.

INAUGURAL LECTURE

Introduction

Vice Chancellor Sir, it is a great privilege and honour to stand before you and your Management team this day to give my inaugural lecture as a Professor of Paediatric Neurology and Neurodevelopmental Disorders in the Department of Paediatrics and Child Health, Faculty of Clinical Sciences, College of Health Sciences of this great and unique University of Port Harcourt. My journey as an academic in this great University started as Lecturer I in 2005 and in 2015, I was appointed a professor. I thank the Almighty God for today because as stated in the Book [1]of Ecclesiastes 3:1 and 7b "**To everything there is a season and a time to every purpose under the heaven. …a time to keep silence and a time to speak",** this is my appointed time to speak!

In the very first book of the Bible[1]where the creation of man was recorded, Genesis 1: 31, it is written, "and God saw everything that He had made, and, behold, it was VERY GOOD. Likewise**,** in Psalm 139:14**,** the Psalmist praised God saying**… "I am fearfully and wonderfully made, marvelous are your works,** and that my soul knows very well". From these expressions, you will agree with me that perfection was the original plan, purpose and mindset of our creator for mankind; however, things do not always happen as planned as **accidents sometimes interfere with nature and attempt to thwart God's plan for mankind.** Therefore, this lecture titled **"Accidents of Nature: Survival and Sequelae"** was chosen to highlight some of these accidents in the field of Paediatric Neurology and their sequelae and impact on survival. Because many questions concerning their causation, diagnosis and treatment cannot still be answered by present day research, they truly represent accidents of nature.

What Is An Accident?

An accident has been defined by the Thesaurus.com. Dictionary as "an undesirable or unfortunate happening that occurs unintentionally and usually results in harm, injury, damage or loss, casualty, mishap" **OR "**an event that happens unexpectedly without a deliberate cause". In my years of practice as a Paediatric Neurologist, I have often wondered why complications happen in some "apparently good" cases while some "apparently bad" cases recover completely. I have also seen some apparently "mysterious cases", for example out of a set of twins, one may have neurological problems such as microcephaly, hydrocephalous, etc while the other is normal. Sadly, in some twins, both may be neurologically abnormal with different types of abnormalities. Furthermore, there have been successive siblings with neurological problems following previously normal births in families. Many of these events make one to conclude that there are many questions about life that research has not answered and perhaps may not be able to answer.

Some of these abnormalities occur very early in pregnancy and for those occurring in the first three months of pregnancy natural abortion eliminates them (God's way), but sometimes for unknown reasons, the malformed babies thrive and develop beyond all odds. The causes of many malformations are usually tagged "idiopathic" or "unknown" when all the possible scientifically known factors have been eliminated. Furthermore, during the course of brain development, which may continue up to the age of 25 years, the brain can still be affected accidentally with negative impact on survival and devastating sequelae. These unexplained events, which man has no control over, are the cases I refer to as "**Accidents of Nature"** and the society has to accept and deal with their consequences accordingly. As a Paediatric Neurologist, the

"Accidents of Nature" that affect the nervous system, which is made up of the Central Nervous System (brain and spinal cord) (CNS) and Peripheral Nervous System (nerves) are my focus.

Who is a Paediatric or Child Neurologist?

A Paediatric or Child Neurologist is a doctor that diagnoses and manages diseases and disorders that affect the nervous system in children who are persons aged from birth to 18years as defined in the United Nations Convention[2a] on the Rights of the Child of 1989 and the Nigerian Child's Rights Act.[2b]

It is important to understand that being a Paediatric Neurologist is not just to prescribe medications and other management plans but also involves listening to patients and or their caregivers which is an important therapeutic process. Paediatric Neurologists discuss with patients and their caregivers thereby providing the avenue for them to share their innermost concerns without fear of reprisal or judgment, and their symptoms with someone who understands them. Additionally, the Paediatric Neurologist teaches and provides information and liaises with support groups for the optimal care of the affected child and family. The Paediatric Neurologist also coordinates multi-disciplinary teams for dealing with various issues involved in the care of the challenged child to provide the best treatment and care for his or her illness. They practise Rehabilitation Medicine which strives to ensure that the children are ambulating, mobile, working, and doing things that they care about thereby optimising their abilities in their disabilities. They also engage in various forms of research including clinical trials with a view to providing insights into these accidents of nature.

Dispelling some Myths about Neurology

Many myths (misconceptions) abound about Neurology which may impact on the care of affected children. Some of these myths are:

- **Neurology is "too complicated".** Remembering neurosciences (neuroanatomy, physiology, biochemistry, pathology, etc), localising the lesion, and prioritising differential diagnoses, can be challenging, as there is definitely much information to process. However, knowledge makes it easy to appreciate and recognise neurological disorders just like in any other specialty in Medicine.
- **Diagnose, then "adios".** The feeling is that "Neurologists are only interested in diagnoses and thereafter offer no definitive cure for the conditions. Hence they seem to say "adios" ("goodbye") to affected children and their caregivers after diagnoses. On the contrary, Neurologists successfully manage many neurological disorders with full recovery. This is buttressed by the fact that there are so many celebrities who have survived "Accidents of nature" . Prominent ones include:
  - **Nick Vujicic** is a painter, swimmer, skydiver, and motivational speaker(Phocomelia),
  - Alexander Graham Bell – Inventor (Asperger's)
  - Baruj Benacerraf – Physiologist (Dyslexia)
  - Richard Borcherds – Mathematician (Asperger's)
  - Louis Braille – Inventor (Visually Impaired)
  - Dr. Janice Brunstrom-Hernandez – Neurologist (Cerebral Palsy)
  - William P. Lear – Inventor (Dyslexia)
  - Dr. William Moon – Inventor (Visually Impaired)
  - Bernard Morin – Mathematician (Visually Impaired)
  - Abraham Nemeth – Inventor & Mathematician (Visually Impaired)

- **Caryn Elaine** (**Whoopi Goldberg)** actor, author, comedian, and television personality (Dyslexia)
- **Stevie Wonder**, original name Steveland Judkins singer, songwriter, and multi-instrumentalist, a child **prodigy** (Retinopathy of prematurity),
- **Thomas Cruise Mapother IV** actor and producer (dyslexia)
- **Willard Carroll Smith Jr (dyslexia)**

- **Neurology is "depressing"**. Yes, Neurology may seem "depressing" because some children with neurological diseases take time to recover and some have lifelong sequelae. There is no doubt that Neurology has its fair share of catastrophes, but this experience should not be construed as typical to all. Many affected children do remarkably well. One sees these patients in their darkest hours; when they are "comatose, paralysed and cannot speak" but for many, recovery can be remarkable, complete and total!.

Training a Paediatric Neurologist

Training a Paediatric Neurologist takes time. It starts from going through the medical school for 6 years to qualify as a doctor and a year for Housemanship. Thereafter the doctor goes through at least six years of Postgraduate Medical (Residency) training to gain Fellowship from any of the Postgraduate Medical Colleges which in Nigeria are National Postgraduate Medical College or West African College of Physicians. The Fellow undergoes a subspecialty training to become a Paediatric Neurologist with further sub-specialisation to become experts in Epilepsy, Movement Disorders, Sleep Disorders, Neurodevelopmental Disorders, Headaches in Children, CNS infections, etc. However, in Nigeria, for dearth of subspecialists, many Paediatric Neurologists offer services across board. The newly qualified Fellow having participated

in the training of medical students and postgraduate doctors is employed in the University as a Lecturer I. The journey as an academic then progresses with promotions, every three years, if possible, to the rank of a professor in a minimum of 9 years. Thus, the journey from medical school to the rank of professorship takes a minimum of 20 years!!!

Scope of Paediatric Neurologic Disorders

Child Neurologists manage a variety of neurologic conditions, which include: congenital abnormalities of the brain and spinal cord (e.g. congenital hydrocephalus and microcephalus, spina bifida, myelomeningoceles); seizure disorders including epilepsy and its mimickers; cerebral palsy; central nervous system infections; neuromuscular diseases; muscular dystrophies; headaches; brain cancers; sleep disorders; neurocutaneous syndromes; neurodevelopmental and behavioural disorders (e.g. Attention Deficit Hyperactivity Disorder (ADHD), Autism and its spectrum); speech and language impairments; hearing impairment; intellectual disabilities; etc. From these spectra of diseases that affect the brain, it is evident that the brain is by far the most complex and fascinating organ of the body, sometimes referred to as "black box" of the body. It has over one hundred billion (100 000 000 000) nerve cells each with up to 150, 000 connections. It is therefore not surprising that the study of the brain is intimidating and has also been the source of fascination for the world's greatest scientists, writers, and philosophers. Indeed, Physicist Emerson Pugh born on 1st May, 1929, a professor, research engineer and scientist and a highly esteemed worker with IBM, described it in his widely quoted speech as follows:

> "If the human brain were so simple
> That we could understand it,
> We would be so simple
> That we couldn't."

Consequently, as a prelude to this lecture I shall explain the development, structure and function of the nervous system.

The Development of the Nervous System

The study of the development of the nervous system in humans involves studies of embryology, developmental biology, and neuroscience to describe the cellular and molecular mechanisms by which the complex nervous system forms and develops prenatally and postnatally.[3]

The Central Nervous System (CNS): This is derived from the ectoderm, which is the outermost tissue layer of the embryo. Interestingly, the CNS is the first organ system to develop after fertilisation. In the third week of human embryonic development, the neuroectoderm appears and forms the neural plate along the dorsal side of the embryo. The neural plate is the source of a majority of neurons and glial cells of the CNS. A groove forms along the long axis of the neural plate and, by the fourth week of development, the neural plate wraps in on itself to give rise to the neural tube, which is filled with cerebrospinal fluid (CSF).As the embryo develops, the anterior part of the neural tube forms three primary brain vesicles, which become the primary anatomical regions of the brain: the forebrain (prosencephalon), the midbrain (mesencephalon), and hindbrain (rhombencephalon).[4,5]These simple, early vesicles enlarge and further divide into the five secondary brain vesicles which are the telencephalon (future cerebral cortex and basal ganglia), diencephalon(future thalamus and hypothalamus), mesencephalon (future midbrain), metencephalon (future pons and cerebellum),and myelencephalon (future med ulla) (Fig. 1)

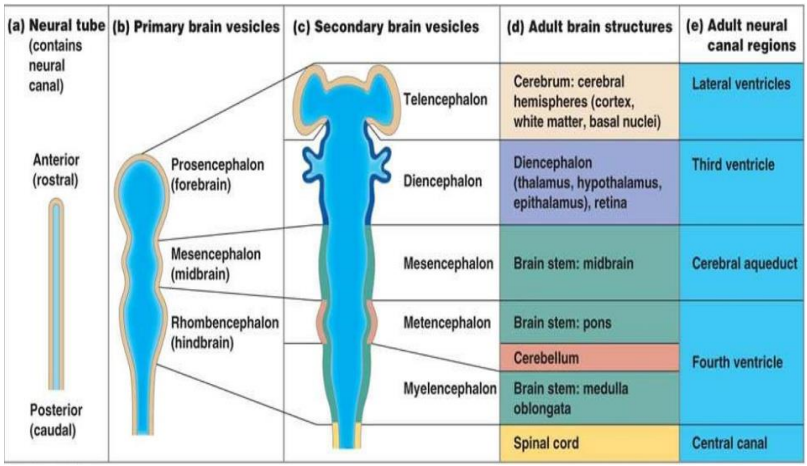
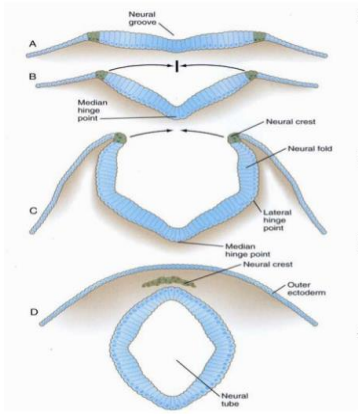


Fig.1: Stages of Central Nervous System development.

Neurulation: folding of the neural plate



1. Median hinge point forms (probably due to signaling from notochord) – columnar cells adopt triangular morphology (apical actin constriction, like a purse string)
2. Lateral hinge point forms by a similar mechanism (probably due to signaling from nearby mesoderm).
3. As neural folds close, neural crest delaminates and migrates away (more on that later…)
4. Closure happens first in middle of the tube and then zips rostrally and caudally.

Fig 2a. Folding of the Neural Plate [3,4]

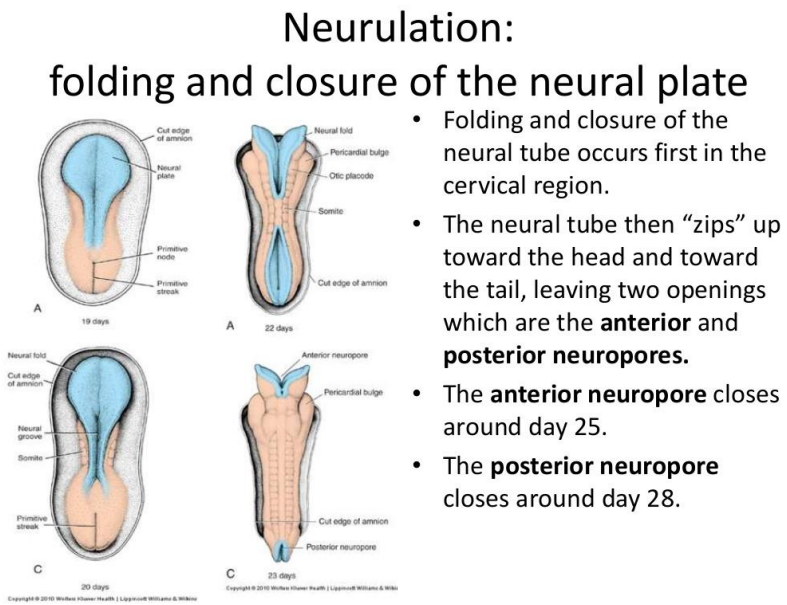


Fig. 2b: The stages of Brain formation from the Neural Plate [3,4]

In the fifth week, the alar plate of the prosencephalon expands to form the cerebral hemispheres (the telencephalon). The basal plate becomes the diencephalon. The diencephalon, mesencephalon and rhombencephalon constitute the brain stem of the embryo. It continues to flex at the mesencephalon. The rhombencephalon folds posteriorly, which causes its alar plate to flare and form the fourth ventricle of the brain. The pons and the cerebellum form in the upper part of the rhombencephalon, whilst the medulla oblongata forms in the lower part.[3-5]

The Cerebrospinal Fluid (CSF)-filled central chamber is continuous from the telencephalon to the spinal cord, and constitutes the developing ventricular system of the CNS. The ventricular system develops from the cephalic portion of the

neural tube. [19] Any abnormality occurring in the development of the ventricular system will lead to hydrocephalus.

Ventricular System

- The ventricular system is an elaboration of the lumen of cephalic portions of the neural tube, and its development parallels that of the brain.
- The cavities of the telencephalic vesicles become the **lateral ventricles** ;
- The diencephalic cavity becomes the **third ventricle** ;
- The rhombencephalic cavity becomes the **fourth ventricle** .

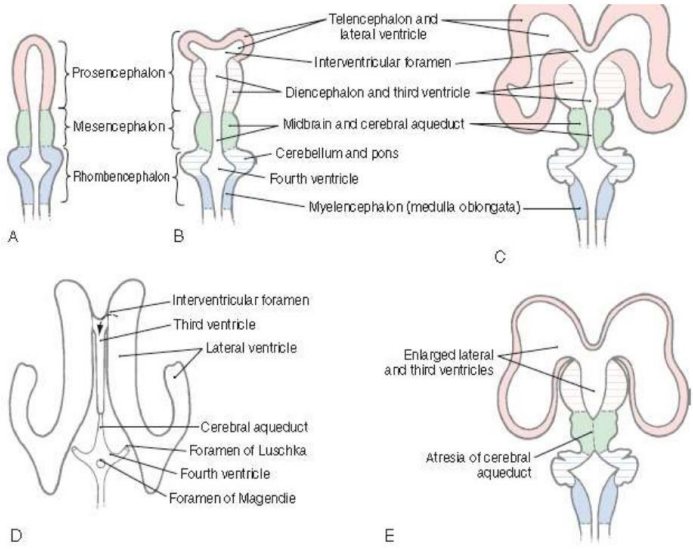
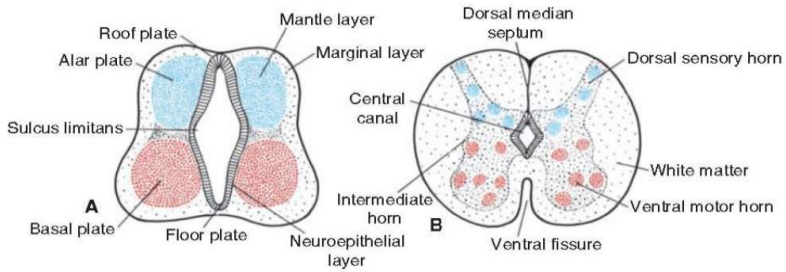
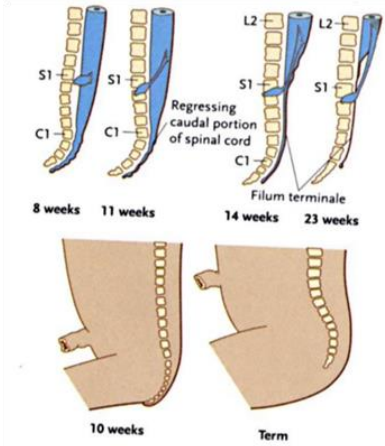


Fig 3: Development of the Ventricular system [4]

The Peripheral Nervous System: The neural tube gives rise to the brain and spinal cord and any disruption at this stage can lead to fatal deformities like anencephaly or lifelong disabilities like spina bifida. During this time, the walls of the neural tube contain neural stem cells, which drive brain growth as they divide many times. Gradually some of the cells stop dividing and differentiate into neurons and glial cells, which are the main cellular components of the CNS. The newly generated neurons migrate to different parts of the developing brain to self-organise into different brain structures. Once the neurons have reached their regional positions, they extend axons and dendrites, which allow them to communicate with other neurons via synapses. Synaptic communication between neurons leads to the establishment of functional neural circuits that mediate sensory and motor processing that underlies behaviour.

The spinal cord forms from the lower part of the neural tube. The wall of the neural tube consists of neuroepithelial cells, which differentiate into neuroblasts, forming the mantle layer (the gray matter). Nerve fibers emerge from these neuroblasts to form the marginal layer (the white matter). The ventral part of the mantle layer (the basal plates) forms the motor areas of the spinal cord, whilst the dorsal part (the alar plates) forms the sensory areas. Between the basal and alar plates is an intermediate layer that contains neurons of the autonomic nervous system.





The spinal cord and the vertebral column are the same length up until the 3rd month.

As each vertebral body grows thicker, the overall length of the vertebral column begins to exceed that of the spinal cord such that , in the adult the spinal cord terminates at L2 or 3 and the dural sac ends at about S2.

The tail end of the dural sac covering the spinal cord and nerve roots remains attached at the coccyx and becomes a long, thin strand called the filum terminale.

Sometimes, the spinal cord can become "tethered" or attached to the dural sac or filum terminale; this pulls on the cord and can obstruct flow of CSF thus causing swelling of the ventricles of the brain (hydrocephalus),

Fig. 4: Development of The Spinal Cord.

Table I: Timeline of the Growth and Development of the Nervous System in The Normal Foetus.[2,5]

AGE, DAYS	SIZE (CROWN–RUMP LENGTH), MM	NERVOUS SYSTEM DEVELOPMENT
18	1.5	Neural groove and tube
21	3.0	Optic vesicles
26	3.0	Closure of anterior neuropore
27	3.3	Closure of posterior neuropore; ventral horn cells appear
31	4.3	Anterior and posterior roots
35	5.0	Five cerebral vesicles
42	13.0	Primordium of cerebellum
56	25.0	Differentiation of cerebral cortex and meninges
150	225.0	Primary cerebral fissures appear
180	230.0	Secondary cerebral sulci and first myelination appear in brain
8–9 months	240.0	Further myelination and growth of brain

The Nervous System: its anatomy and functions

The nervous system is divided into areas responsible for different functions. These are discussed below (Fig. 5).

Cerebral cortex: The cerebral cortex (the cerebral hemisphere) controls thinking, voluntary movements, language, reasoning, and perception. In man and other mammals, the cortex looks like it has lots of wrinkles, grooves and bumps. The limbic system, often referred to as the "emotional brain", is found buried within the cerebrum. The cortex is divided into the following lobes:

- **Frontal lobe**: It is concerned with emotions, reasoning, planning, movement, and parts of speech. It is also involved in purposeful acts such as creativity, judgment, and problem solving, and planning.
- **Parietal lobe**: The parietal lobes are found behind the frontal lobes, above the temporal lobes, and at the top back of the brain. They are connected with the processing of nerve impulses related to the senses, such as touch, pain,

taste, pressure, and temperature. They also have language functions.

- **Temporal lobe**: The temporal lobes are found on either side of the brain and just above the ears. The temporal lobes are responsible for hearing, memory, meaning, and language. They also play a role in emotion and learning. The temporal lobes are concerned with interpreting and processing auditory stimuli.
- **Occipital lobe**: This is found in the back of the brain. The area is involved with the brain's ability to recognise objects. It is responsible for vision.

Some of the specific areas in the cortex are:

- **Pituitary gland**: it controls hormones which help with the optimal growth, development and functioning of the body, including turning food to energy. In deed without this gland one could eat but would not get any energy from the food!
- **Pineal gland**: This part controls growth and maturity. It is activated by light so if a child is born and lives all his/her life in a place without a trace of light (Anophthalmia leading to congenital blindness, an accident of nature) the pineal gland will never work.

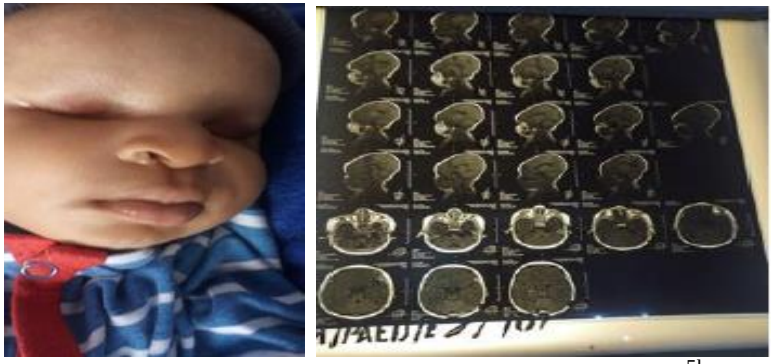


Fig. 5: An anophthalmic child (No eyeballs)![5b]

Corpus Callosum: The two hemispheres in the brain are connected by a thick bundle of nerve fibres called the corpus callosum that ensures both sides of the brain can communicate and send signals to each other.

Mid- brain: This section controls breathing and reflexes, e.g. swallowing reflexes. It includes the Thalamus, Hippocampus, and Amygdala:

- **Thalamus**: controls the sensory integration and motor integration and receives sensory information and relays it to the cerebral cortex. The cerebral cortex also sends information to the thalamus which then transmits it to other parts of the brain and the brain stem.
- **Hypothalamus**: controls the body temperature, emotions, hunger, thirst, appetite, digestion and sleep. The hypothalamus is composed of several different areas and is located at the base of the brain. It is only the size of a pea (about 1/300 of the total brain weight), but is responsible for some very important behaviours.
- **Amygdala**: The amygdala (there are two of them) control emotions such as regulating when one is happy or sad. The amygdala is very important because in its absence, the person will have feelings. You could win the lottery and feel nothing. You wouldn't be happy. Just a little thinking: Can terrorists, armed robbers, kidnappers and perpetrators of all forms of violence and human abuses be suffering from the dysfunction of their amygdala?

Pons: This is the part of the metencephalon in the hindbrain. It is involved in motor control and sensory analysis, for example, information from the ear first enters the brain in the pons. It is important in consciousness and sleep. Some structures within the pons are linked to the cerebellum, thus they are involved in movement and posture.

Cerebellum: controls movement, balance, posture, and coordination. New research has also linked it to thinking, novelty, and emotions.

Brainstem: acts as a relay centre connecting the cerebrum and cerebellum to the spinal cord. The **Medulla Oblongata** is the caudal-most part of the brain stem, between the pons and spinal cord. It is responsible for maintaining vital body functions, such as breathing, digestion and heartbeat. It performs many automatic functions such as breathing, heart rate, body temperature, wake and sleep cycles, digestion, sneezing, coughing, vomiting, and swallowing.

The **reticular formation** has projections to the thalamus and cerebral cortex that allow it to exert some control over which sensory signals reach the cerebrum and come to our conscious attention. It plays a central role in states of consciousness like alertness and sleep.

Spinal cord: The spinal cord is the highway for communication between the body and the brain. It extends from the medulla oblongata to the 2-5th vertebral column and functions primarily in the transmission of nerve signals from the motor cortex to the body, and from the afferent fibers of the sensory neurons to the sensory cortex. It is also a centre for coordinating many reflexes and contains reflex arcs that can independently control reflexes. When the spinal cord is injured, the exchange of information between the brain and other parts of the body is disrupted.

These parts of the brain and its parts are contained in the skull while the spinal is encased in the vertebral column.

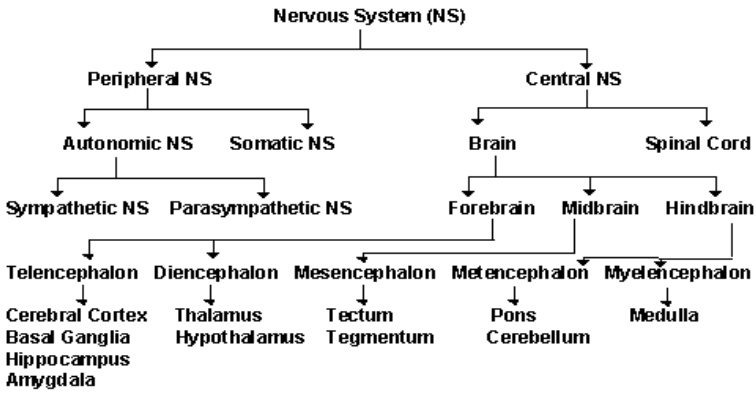


Fig. 6a: The Nervous system

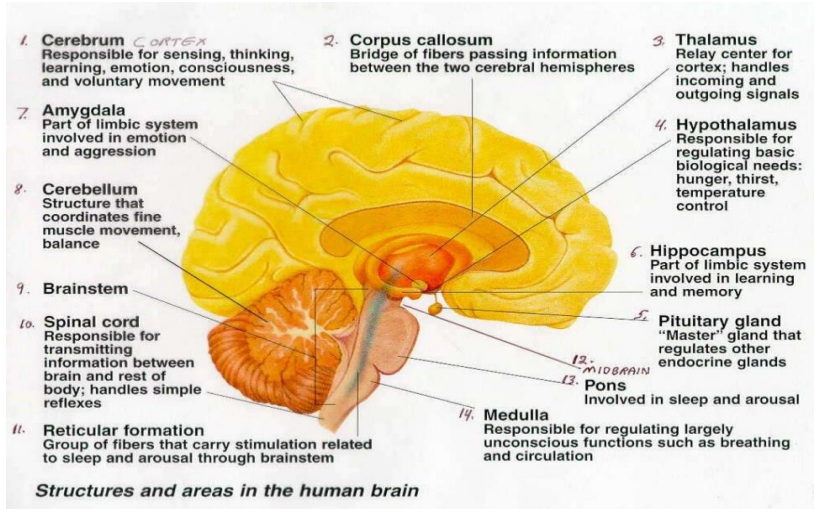


Fig. 6b: The parts of the brain and their functions [4]

Neurological Disorders in Children: Causes and Sequelae

The development of the nervous system is an orchestrated, tightly regulated, and genetically encoded process with clear influence from the environment. This suggests that any deviation from this process early in life can result in

neurodevelopmental disorders and, depending on specific timing, might lead to distinct pathology later in life. There are many causes of neurodevelopmental disorder, which range from infections, deprivation, genetic disorder, metabolic diseases, immune disorders, toxins, nutritional factors, physical trauma, and environmental factors.[5,6]

Some neurodevelopmental disorders- such as autism and other pervasive developmental disorders- are considered multifactorial syndromes with multiple factors being implicated but no specific known one. Furthermore, many of the disorders do not have any specific known cause but occur during the early phase of brain development, these are some of the disorders that will be discussed as "Accidents of Nature." To aid an understanding of the Accidents of nature, I shall discuss the causes further:

- **Genetic factors**: Each individual is made up of genes which are expressed in the Deoxyribonucleic Acid (DNA) and inherited from parents. The DNA molecule consists of two strands that wind around one another to form a shape known as a double helix. The DNA is organized to form chromosomes which are found in the nucleus of cells. Chromosomes exist in pairs and humans have 23 pairs of which 22 are autosomes (for the body) and a pair of sex chromosomes (XX for females and XY for males). A genetic disorder is a disease that is caused by a change, or mutation, in an individual's DNA sequence. A common example of a genetically determined neurodevelopmental disorder is Down Syndrome. This disorder usually results from the presence of an extra chromosome 21(giving a total of 47 instead of the normal 46 chromosomes) because of failure of chromosome 21 to separate during mitosis; although in uncommon instances it is related to other chromosomal abnormalities such as translocation of

the genetic material. Other examples of genetic disorders are Fragile X syndrome, Turner Syndrome, Klinefelter Syndrome. The mode of inheritance of a genetic disease is illustrated in Fig. 7.

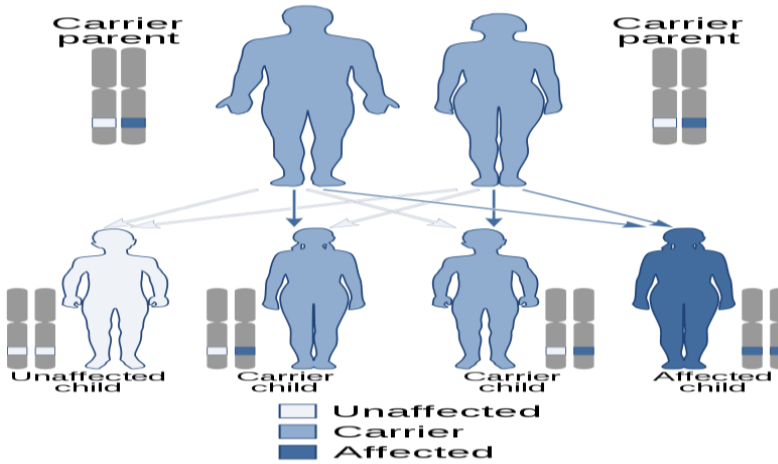


Fig. 7: The genetic inheritance of an autosomal recessive neurologic disease (e.g. Duchenne Muscular Dystrophy)

- **Immune dysfunction:** Immune reactions during pregnancy (in the mother or foetus), may produce neurodevelopmental disorders. One typical immune reaction in infants and children is or *Pediatric Autoimmune Neuropsychiatric Disorders Associated with Streptococcal infection*(PANDAS).Another disorder is Sydenham's chorea, which results in abnormal movements of the body and fewer psychological sequelae. Both are immune reactions against the brain that follow infection by *Streptococcus* bacterium. Susceptibility to this immune disease may be genetically determined; so several family members may suffer from one or both of them following an epidemic of Streptococcal infection.

- **Infections:** Systemic infections can result in neurodevelopmental sequelae. Infections of the brain such as meningitis, encephalitis or brain abscess have a high risk of causing neurodevelopmental disorders and problems. Some of the infectious diseases can be transmitted congenitally (either before or at birth), and cause serious neurodevelopmental problems. Examples of infectious diseases are (a) viruses such as poliomyelitis, Human Immunodeficiency virus, measles, rubella (congenital rubella syndrome), herpes simplex virus (HSV), cytomegalovirus infection (CMV), Zika virus; (b) bacteria- all bacterial organisms can infect the brain but the common ones are *Streptococcus pneumoniae, Haemophilus influenzae, Staphylococcus aureus, Mycobacterium tuberculosis, and Treponema pallidum* in congenital syphilis which may progress to neurosyphilis. (c) Protozoa are also implicated e.g. *Toxoplasma* causes congenital toxoplasmosis with multiple cysts in the brain and other organs, leading to a variety of neurological deficits. *Plasmodium falciparum* causes celebral malaria, an important cause of morbidity and mortality in children resident in malaria endemic areas. It is important to note that in immunocompromised children, including the preterms, low birth weight babies, neonates, the malnourished, those on immunosuppressive treatments, almost any organism can cause severe infections of the central nervous systems with serious impact on survival and sequelae... the "Accidents of Nature" which can be prevented with prompt and optimal treatment. Additionally, infections during pregnancy can result in autoimmune disorders as discussed above.
- **Metabolic and Endocrine disorders[7]:** Metabolic disorders in either the mother or the child can cause neurodevelopmental disorders. Examples are diabetes

mellitus (a multifactorial disorder), neonatal jaundice and phenylketonuria (an inborn error of metabolism). Many such inherited diseases may directly affect the child's metabolism and neural development.

- Maternal diabetes causes excessive birth size, making it harder for the infant to pass through the birth canal without injury or it can directly produce early neurodevelopmental deficits.
- Phenylketonuria (PKU) induces severe brain damage resulting in epilepsy, delayed growth and development. These children require a strict diet to prevent mental retardation and other problems.
- **Nutrition:** Nutrition disorders and nutritional deficits may cause neurodevelopmental disorders, such as spina bifida, and anencephaly, both of which are neural tube defects with malformation and dysfunction of the nervous system and its supporting structures, leading to serious physical disability and emotional sequelae. Some of the nutrients include the following;
- *Folic acid deformity*: The most common nutritional cause of neural tube defects is folic acid deficiency in the mother. Folic acid is a B vitamin (Vitamin B9) found in fruits, vegetables, whole grains, and milk products.
- *Iodine:* Iodine deficiency produces a spectrum of neurodevelopmental disorders ranging from mild emotional disturbance to severe mental retardation.
- Substance abuse: *Alcohol:* Excesses of this in maternal and infant diets may cause disorders. In 1973 K.L. Jones and D.W. Smith of the University of Washington Medical School in Seattle found a pattern of "craniofacial, limb, and cardiovascular defects associated with prenatal onset growth deficiency and developmental delay" in children of alcoholic mothers, now called fetal alcohol syndrome.

- **Trauma[8]:** Trauma to the developing human brain is a common cause of neurodevelopmental disorders. It may be due to congenital injury (including injury resulting from otherwise uncomplicated premature birth) and injury occurring in infancy or childhood. Common causes of congenital injury are asphyxia and hypoxia (lack of oxygen to the brain) and the mechanical trauma of the birth process itself.
- **Deprivation**: Deprivation from social and emotional care cause severe delay in brain and cognitive development. Early Child Development Studies with children growing up in Romanian orphanages during Nicolae Ceauşescu's regime revealed profound effects on social and language deprivation on the developing brain. These effects are time dependent. The longer children stayed in negligent institutional care or situations, the greater the consequences.

MANAGEMENT OF NEUROLOGICAL DISEASES/ DISORDERS

This presentation will not be complete without talking about the management of these accidents of nature in order to enhance the survival of the affected children with minimal or no sequelae.

A. Diagnosis of Neurological Disorders in Children.

The diagnosis of neurological disorders is critical to the institution of appropriate management to mitigate the development of long-term sequelae. It involves the following steps:

1. History taking: In-depth interviews with the parents, caregivers, child and teachers where applicable is needed. This includes obtaining the socio-demographic data of the child, duration, nature and symptoms of the disorder. It also

involves taking the developmental and family histories especially in genetically determined disorders.

2. Detailed Nervous System Examination including the central and peripheral nervous systems. It allows the neurologist to check the nervous system in action and assess the mental status (level of awareness and interaction with the environment),cranial nerves, motor and sensory skills, balance, coordination, pupillary response, reflexes and vital signs.
3. Administration of Child Behavioural Check Lists (CBCL) or standardised questionnaires to determine the presence and extent of any behavioural disorder. The CBCL's questions are categorised into 8 groups based on different syndromes: anxious/depressed, withdrawn/depressed, somatic complaints, social problems, thought problems, attention problems, rule-breaking behaviour, and aggressive behaviour.
4. Neurologic Diagnostic Investigations / Tests and Procedures: Diagnostic tests and procedures are vital tools that help the neurologist confirm or exclude the presence of a neurological disorder or other medical condition. They include the following:

4.1. Biochemical Investigations

1. Laboratory screening tests: these include blood, urine, or other substances used to diagnose diseases, better understand the disease process, and monitor levels of therapeutic medicines. For example, blood and blood products are used to detect brain and/or spinal cord infections, and toxins that affect the nervous system. Blood tests are also used to monitor levels of therapeutic medicine used to treat epilepsy and other neurological disorders.
2. Genetic testing of DNA can diagnose congenital diseases. It helps parents who have a family history of a neurological

disease to determine if they are carriers of known genes that cause the disorder or find out if their child is affected. It also identifies spina bifida in utero (while the child is inside the mother's womb). Genetic tests include the following:

- Amniocentesis, done at 14-16 weeks of pregnancy.
- Chorionic villus sampling, performed by testing a sample of the placenta in early pregnancy.
- Uterine ultrasound: This is a noninvasive test.

3. Cerebrospinal fluid analysis involves the removal of a small amount of the fluid that protects the brain and spinal cord. The fluid is tested to detect infection to the brain and/or spinal cord, and other neurological conditions, including cytology for the diagnosis of intracranial tumours.

4.2. Neuroimaging

1. X-rays of the patient's skull and spine are often taken as part of a neurological work-up.
2. Angiography is used to detect blockages of the arteries or veins. A cerebral angiogram detects the degree of narrowing or obstruction of an artery or blood vessel in the brain, head, and neck. It is used to diagnose stroke and to determine the location and size of a brain tumor, aneurysm, or vascular malformation.
3. Biopsy involves the removal and examination of a small piece of tissue from the body. Muscle or nerve biopsies are used to diagnose neuromuscular disorders.
4. Brain scans are imaging techniques used to diagnose tumours, blood vessel malformations, or haemorrhage in the brain.

    a. Ultrasound imaging**,** also called sonography, uses high-frequency sound waves to obtain images inside the body. Neurosonography (ultrasound of the brain and

spinal column) analyses blood flow in the brain and used to diagnose stroke, brain tumors, hydrocephalus and vascular problems. Transcranial Doppler ultrasound is used to view arteries and blood vessels in the neck and determine blood flow and risk of stroke.

b. Computed Tomography, also known as a CT scan, is a noninvasive, painless procedure used to produce rapid, clear two-dimensional images of organs, bones, and tissues. Neurological CT scans are used to view the brain and spine. An intra-thecal contrast-enhanced CT scan (cisternography) is used to detect diseases of the spine and spinal nerve roots.

c. Magnetic Resonance Imaging (MRI) uses computer-generated radio waves and a powerful magnetic field to produce detailed images of body structures including tissues, organs, bones, and nerves.

d. Functional MRI (fMRI). A fMRI pinpoints areas of the brain that are active. This imaging process is used to assess brain damage from head injury or degenerative disorders and to identify and monitor other neurological disorders, including stroke, and brain tumors.

5. Myelography is used to diagnose spinal nerve injury, herniated discs, fractures, back or leg pain, and spinal tumours.
6. Positron Emission Tomography (PET) scans provide two- and three-dimensional pictures of brain activity by measuring radioactive isotopes that are injected into the bloodstream.

7. Electroencephalography (EEG), monitors brain activity through the skull. EEG is used to diagnose seizure disorders, brain tumors, brain damage, inflammation of the brain and/or spinal cord, metabolic and degenerative

disorders of the brain. It is also used to evaluate sleep disorders, monitor brain activity and confirm brain death.

8. Electromyography, or EMG, is used to diagnose nerve and muscle dysfunction and spinal cord diseases.
9. Evoked potentials (also called evoked response) measure the electrical signals to the brain generated by hearing, touch, or sight. Evoked potentials are also used to test sight and hearing (especially in infants and young children), monitor brain activity among coma patients, and confirm brain death.
    - Auditory evoked potentials (also called brain stem auditory evoked response) are used to assess high-frequency hearing loss, diagnose any damage to the acoustic nerve and auditory pathways in the brainstem.
    - Visual evoked potentials detect loss of vision from optic nerve.
    - Somatosensory evoked potentials measure response from stimuli to the peripheral nerves and detect nerve or spinal cord damage or nerve degeneration.
10. Polysomnogram: It measures brain and body activity during sleep. It is used to identify sleep disorders, restless legs syndrome, breathing disorders like obstructive sleep apnoea.
11. Single photon emission computed tomography (SPECT**)**, a nuclear imaging test involving blood flow to tissues, is used to evaluate certain brain functions.

B. Management of Neurologic disorders

Generally, early intervention in form of treatment or therapy, results in better outcome. The management of the different disease conditions are discussed under my experiences as a paediatric neurologist.

Epidemiology of "Accidents of Nature"

Ascertaining the global epidemiology of neurodevelopmental disorders is a difficult task, given the significant paucity of data for many geographical regions as well as the cultural variations in presentation and measurement.

BURDEN OF CHILDHOOD NEURODEVELOPMENTAL DISORDERS

Vice Chancellor Sir, it is noteworthy that having a child with a disability caused by **'Accidents of Nature',** survival and everyday living can have profound effects on the entire family, which include parents, siblings, extended family members and the society at large. The time and financial costs, the physical and emotional demands and logistical complexities associated with raising a disabled child can have far-reaching effects. The impacts will depend on the type of condition and severity, as well as the physical, emotional, and financial wherewithal of the family and the resources that are available to manage the situation. Neurological diseases are viewed differently by different people based on their cultural beliefs and socio-economic positions especially those associated with adverse sequelae. In Africa, disability is viewed as spiritual attack or a curse despite medical explanations proffered unlike in the developed world, where it is accepted as a natural phenomenon that is explained by medical theories and research. These different perceptions therefore attract different interventions. Some of their impacts are as follows:

1. **Impact on the Family:** For parents, having a challenged child may increase stress, take a toll on mental and physical health, make it difficult to find appropriate and affordable child care; it may also affects decisions about work, education/training, having additional children, and relying on public support. It may be associated with **guilt, blame,**

or reduced self-esteem. It may divert attention from other aspects of family functioning.

Vice Chancellor Sir, I must tell you that the ripple effects of child disability, which are sequelae of these accidents of nature on the family, are enormous. Existing studies indicate that having an infant with a serious health condition or health risk increases the likelihood that parents divorce or live apart; and many affected mothers may not work outside the home. It also leads to a reduction in the father's work hours.

Studies in the psychology literature indicate that a number of specific child health conditions are associated with poor mental health outcomes of parents and siblings. A meta-analysis of studies on affected families indicates that peer activities and cognitive development scores are lower for siblings of children with a chronic illness compared to controls. Furthermore, the well being of grandparents and other extended family members is affected.

2. **Emotional Impact:** Physically and sexual abuse are common in these children.

3. **Financial Impact:** Out-of-pocket costs of medical care and other services are enormous. Having a challenged child affect parents' allocation of financial resources to the upkeep of their healthy children, their short- and long-term contributions to the household, and other siblings' health and development. This is because treatment/ therapy maybe lifelong; new medications and investigations are not cheap either.

4. **Impact on Health care:** Children living with disability require not only high quality primary health care, but often require high-level multidisciplinary specialised care on a

long-term basis. Ideally, children with complicated cases will have a team of specialists who work together in a coordinated fashion. This requires extra cost. Cost of medical care is enormous. Finance is needed for therapy, purchase of medications, payment for consultations, transportation to health facility etc. Most times, these are out of pocket expenses. The government does not have any special funds for these children. This has negative implications for the health and well being of these children.

5. **Challenges with Time**: Having a disabled child in the family affects the distribution of time for care on the part of the child's grandparents or other extended family members. Quality care is time consuming.

6. **Access to Infrastructure and Socio-Economic Challenges**

   The architectural inaccessibility of school buildings including staircases, narrow corridors, inaccessible desks and equipment, inaccessible bathrooms are often a major barrier for children with motor disability like patients with cerebral palsy, spinal bifida, muscular dystrophy**.** The high cost of many technologies limits access for these children, particularly in low income and middle-income countries like ours. In particular, **intermediate and assistive technologies** are often unaffordable or unavailable. Many of my patients' mothers carry these children on their back or with someone assisting them to the clinic for follow up. Assistive devices like computerised typewriters, walking frames, braille writing machine, hearing aids or audio-visual aids, prosthesis, and motorized wheelchairs are not available and not affordable. Thus to actualize the concept of the Universal Health Coverage which seeks to leave no

one behind, efforts must be put in place to address these gaps in the care of these children with "accidents of nature".

7. **Educational Challenges**: Many of these children historically have been excluded from mainstream education opportunities. The school-aged ones are kept in the confines of their homes rather than brought to schools (UNESCO, 2012). Some of these children never enter school, others start but make poor progress eventually dropping out. Specialised childcare is often needed, as are appropriate recreational and social activities for them. These are lacking in Nigeria. The common gaps in Education Policy include a lack of financial and other targeted incentives for them to attend school as well as a lack of social protection and support services for them. Barriers include: inaccessible school buildings; schools being located too far away from where they live; lack of appropriate facilities at school; lack of teacher training in inclusive education methodologies; lack of appropriate teaching and learning materials; lack of extra support in the classroom for children with disabilities; social stigma and negative parental attitudes and poverty (Croft, 2010: 11). Those with physical disabilities are likely to face difficulties in travelling to school if, for example, the roads and bridges are unsuitable for wheelchair use and the distances are too far. Even if it is possible to reach the school, there may be problems of stairs, narrow doorways, inappropriate seating, or inaccessible toilet facilities. The attitudes of teachers, school administrators, other children, and even family members affect the inclusion of children with disabilities in mainstream schools. It is therefore important for the government to ensure the effective implementation of the Disability Act.

8. **Career and Employment challenges**: Lower rates of labour market participation are one of the important pathways through which disability may lead to poverty (WB and WHO, 2011:11). Persons with disability have lower employment rates and lower educational attainment than persons without disability. In terms of economic inclusion of the disabled people, these persons have limited access to the formal employment sector because organisations don't want to include them in their formal employment process. Reasons for unemployment include employer discrimination, architectural barriers within the workplace, pervasive negative attitudes regarding skill, and the adverse reactions of customers. This however, contrary to the recommendations of the Nigerian Disability
9. **Issues of Adaptability in Society**: Societal beliefs about people with disabilities have a strong impact on inclusion. Furthermore, it is regarded as a bad omen in the family to have a child with neurological disorder. Tradition and cultural beliefs support this ideology that persons living with disability have committed abominable sins.. These children and their parents are often stigmatised, this is known as "**disability related stigma".** Social exclusion means lack of belongingness, acceptance and recognition. This social exclusion prevents them from participating fully in the economic, social, and political sphere. They are denied access to vocational training, employment, transportation and housing, making it difficult or impossible to achieve economic self- sufficiency and contribute to their communities in their adult lives.

MY CONTRIBUTIONS TO THE PRACTICE OF PAEDIATRIC NEUROLOGY

Vice Chancellor Sir, since my employment into the University, I have been involved in training undergraduates and postgraduate medical personnel in Paediatric Neurology. Over a period of about 15 years, more than two thousand medical students have passed through my unit from local and international institutions. I have also supervised postgraduate dissertations in Paediatric Neurology. Some of the younger colleagues are senior lecturers in Paediatrics and Child Health specialising in various areas. They are also engaged in teaching medical students. Others are in various institutions and are doing excellently well. I have also provided service to the teeming number of children who have survived various accidents of nature with long- term sequelae which require the neurologist's attention.

In research I have contributed to knowledge with the presentation of over 50 papers in local and international conferences, some of which have won international awards. I have published 10 chapters in books and 50 peer reviewed journals articles. Relating with my patients and caregivers of those with neurological sequelae gives them hope and improves their quality of life. I wish to discuss and share some of my research work as contribution to knowledge.

In this section, I will use my contributions from research and clinical services to highlight different types of neurological disorders that I have managed.

1. Neural Tube Defects.

Neural tube defects (NTDs) are birth **defects** of the brain, spine, or spinal cord. They happen in the first month of pregnancy, often before a woman even knows that she is pregnant. Neural tube defects are a heterogeneous and complex

group of congenital central nervous system (CNS) anomalies[10,11]. Anencephaly, spina bifida, and encephalocele are the commonest types. Inadequate neurulation, lack of separation of the skin and neural ectoderm after neurulation is completed and problems occurring during the process that constitutes filum terminale all cause open or closed spinal dysraphism. Encephalocele forms after the neural tube is closed[12].

Neural tube malformations and malformations of the other organ systems frequently accompany NTDs. In patients with lumbosacral spina bifida, the problems include motor and sensory dysfunctions in the lower extremities, anal and urethral sphincter failure, and neurogenic bladder. Notably, most patients with thoracic and lumbosacral spina bifida have an increased probability of hydrocephaly and Arnold–Chiari type 2 (hydrocephaly in association with meningomyelocele) malformation. The NTDs occur in about 3,000 pregnancies each year in the United States. In Nigeria the number is similar. Associated problems include physical problems (such as **paralysis** and urinary and **bowel control problems**), **blindness**, **deafness**, **intellectual disability**, lack of consciousness, and, in some cases, death[12,13.]The chance of having a child with a neural tube defect for those without a family history are approximately 1/500- 1/1,000 (0.1-0.2%), although this varies with race and region.

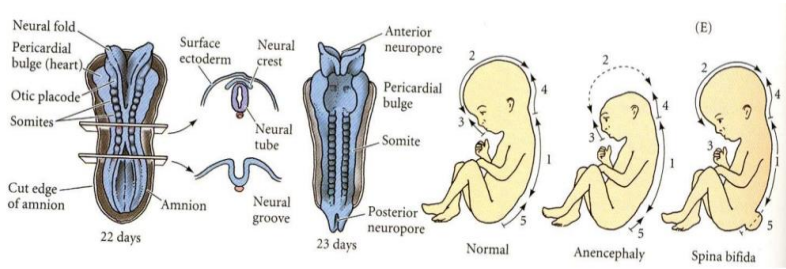


Fig. 8: Stages of failure of the neuropore[4]

In 2011, a retrospective study by **A I. Frank-Briggs** and E.A.D Alikor on the Pattern of Neurological Disorders in Port Harcourt over a 5- year period (January 2004 to December 2009)[14]identified 78patients with NTD. The clinical characteristics of the subjects are summarized in Table II. In these patients, the median time of making a diagnosis of NTD by ultrasonography in the prenatal period for eleven of them was 16–24 weeks. The types of defects diagnosed were meningomyelocele 44(61.1%), meningocele 20 (27.8%) and encephalocele 4 (5.6%) and three families had a positive family history of NTD.

Table II: Characteristics of the Study Group [14]

Characteristics of the Study Group	
Maternal Age (years)	27 (22-33)
Gestational Age (weeks), median (25%-75%)	38 (37-39)
Birth Weight (in grams)	3150 (2640-3450)
Gender *n* (%) Male Female	 44 (61.1) 28 (38.9)
Mode of Delivery: *n* (%) Vaginal Caesarean section	 69 (95.8) 13 (4.2)
Place of Delivery Home	 10

Church	13
Hospital	28
Others	21
Folic acid use(Preconception) *n* (%)	
Yes	13 (18.1)
No	40 (55.6)
Use in Pregnancy	39 (54.2)
Vitamin B complex use	
Yes	33
No	39
Prenatal Diagnosis	
Yes	11
No	61
Type of Defect	
Meningomyelocele	48
Meningocele	20
Encephalocele	4
Other complications	42

Source: International Journal of Biomedical Sciences 2011;7(2): 145-149.

Spina bifida affects one in 2,000 babies and leads to lifelong and severe physical disabilities, including paraplegia. Lack of folic acid (Vitamin B9) and Vitamin B12 have been implicated [15,16,17.] In many cases of spina bifida the nerves of the spinal cord are exposed, and become damaged because they are not protected by bone and skin.

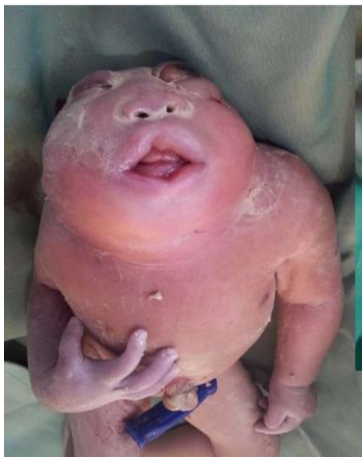
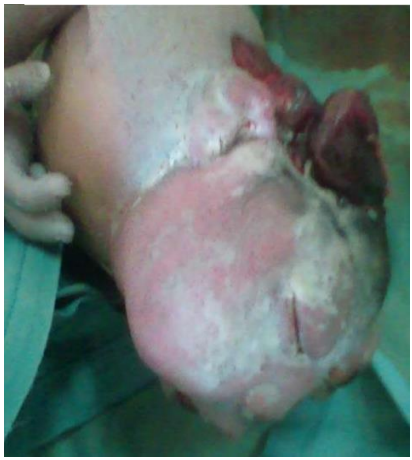



Fig. 9: A Child with Anencephaly

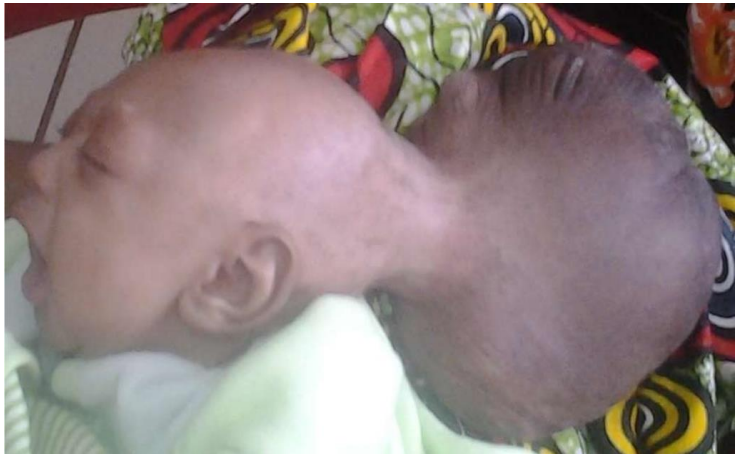
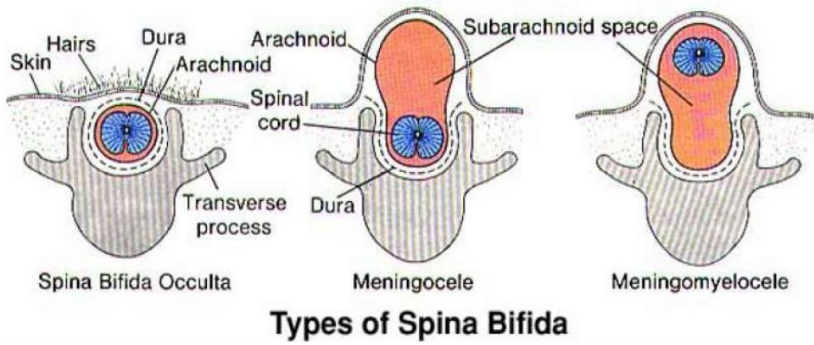


Figure 9b: A Child with occipital encephalocoele



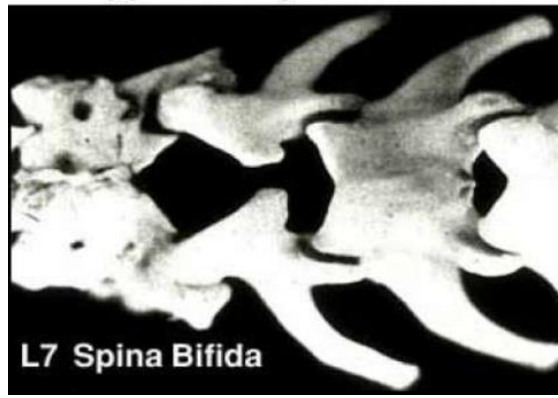


Fig.10: Spina Bifida (Defect on lumbar vertebrae)

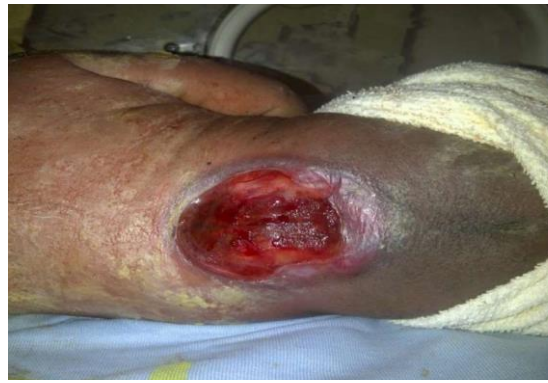


Fig. 11: Patient with Meningoencephalocele

The management of these patients is very challenging and tasking. The patients present late and because of infections, poverty and unavailability of well-equipped intensive care unit, most patients do not have early surgical repair of their defects. In many instances, caregivers abandon these critically ill children and leave them at the mercy of hospital staff. Their reasons for this worrisome behaviour range from financial constraints, shame and feelings of guilt and hopelessness. Others do not present to the hospital because they are too embarrassed to be associated with such 'accident of nature', while others express their religious or cultural beliefs; feeling that these children are born as a result of nemesis for evil deeds and as such punishment from gods. All these sociocultural factors and more make it difficult to manage these children. Due to lack of up to date surgical equipment and technology in our facility, prenatal management especially treatment in-utero is not achievable for now in Port Harcourt or elsewhere in Nigeria. Contrary to the situation in Nigeria, about twenty years ago, British Broadcasting Corporation (BBC) News reported that Surgeons had successfully treated very severe spina bifida by operating on a baby while it was still in its mother's womb (Fig. 13). **Baby Noah Kipfmiller's** mother Mellissa was just 23 weeks pregnant when the procedure was carried out. The leg movement was saved by the operation, and surgeons are confident he has also avoided the mental impairment usually associated with severe forms of the disease. Dr Scott Adzick and colleagues reported in Lancet Medical Journal that they successfully undertook such a procedure on baby Noah who was found to have spina bifida on ultrasound scan done at 20 weeks of pregnancy. Noah was born seven weeks after the operation when the mother went into early labour. Surgery also prevented the formation of fluid around the brain that usually accompanies spina bifida in newborns to correct life-threatening conditions such as giant lung masses,

and congenital diaphragmatic hernia. Dr Adzick and his team have extensive experience of operating on foetuses. In spite of these deficiencies, the Neurosurgery Team in the University of Port Harcourt Teaching Hospital has undertaken repairs on…. many of whom are being followed in the Neurology Clinic with series sequelae such quadriplegia, urinary and faecal incontinence and intellectual disability.

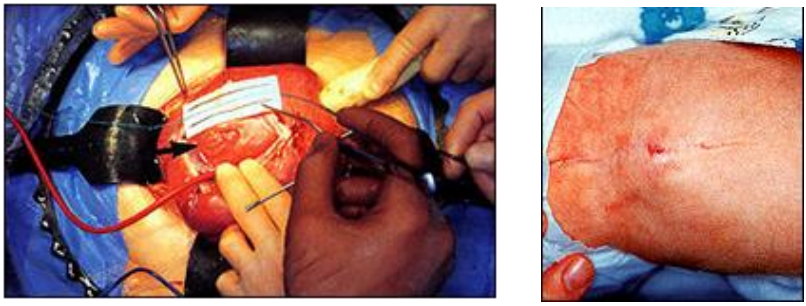


Fig. 13: Surgery worked well on severe spina bifida.

The findings in my research and publication have contributed to the field of study of NTD in Port Harcourt metropolis and its environs. We established that as many as 7.1% of our children suffer from this disorder.

The Published articles has highlighted challenges and how best to treat them in our resource poor settings.

Enlightenment of parents and caregivers in outpatient clinics and on admission in the neurology unit and enlightenment of the public in print and electronic media has affected their treatment and management positively.

Increase in awareness- more patients are turning out- our records show an increased number of children presenting for

intervention. Most of them are from environmental polluted regions.

Cultural practices in intervention of NTD have reduced remarkably as parents and caregivers no longer burst the "boil" along the spine of the affected children.

Belief systems- this has been addressed (witch craft, infidelity on the part of the wife while pregnant are frequent beliefs).

As the aphorism says, prevention is better than cure so we encouraged young girls and women of child bearing age to take Folic acid supplements and made recommendation that folic acid could be added in commonly consumed foods such as bread (as is suggested in other climes).

2. Hydrocephalus

Hydrocephalus is another common paediatric neurological disorder with grave sequelae. It occurs in one to two per 1,000 live births. It is a clinical condition where there is buildup of fluid in the brain, precisely, cerebrospinal fluid in the ventricular system. It can be congenital or secondary to accidents of nature occurring after birth, such as infections. In hydrocephalus, the build-up of CSF can raise pressure inside the skull, which squashes the surrounding brain tissue. In some cases, it causes the head to steadily grow in size until it becomes out of proportion with the rest of the body, resulting in convulsions, and brain damage. This can be fatal if left untreated.[20,21] Hydrocephalus is a lifelong condition because of the severe brain damage. However, with early diagnosis and proper treatment, children with hydrocephalus live near normal lives with sequelae including intellectual disability, visual impairment, impaired memory or dementia and seizure disorders.[22-,24] In most cases, the implantation of a shunt will

control the accumulation of fluid but shunts do not cure the disorder.

Between 2004-2009(**A.I. Frank-Briggs et al)** [14] carried out a research to assess the prevalence of congenital hydrocephalus amongst children with neurological disorders. There were 128 patients, 84 males (65.6%) and 44 females (34.4%) with a male: female ratio of 1.9: 1.The patients were aged between 7 days to 12 weeks of age.

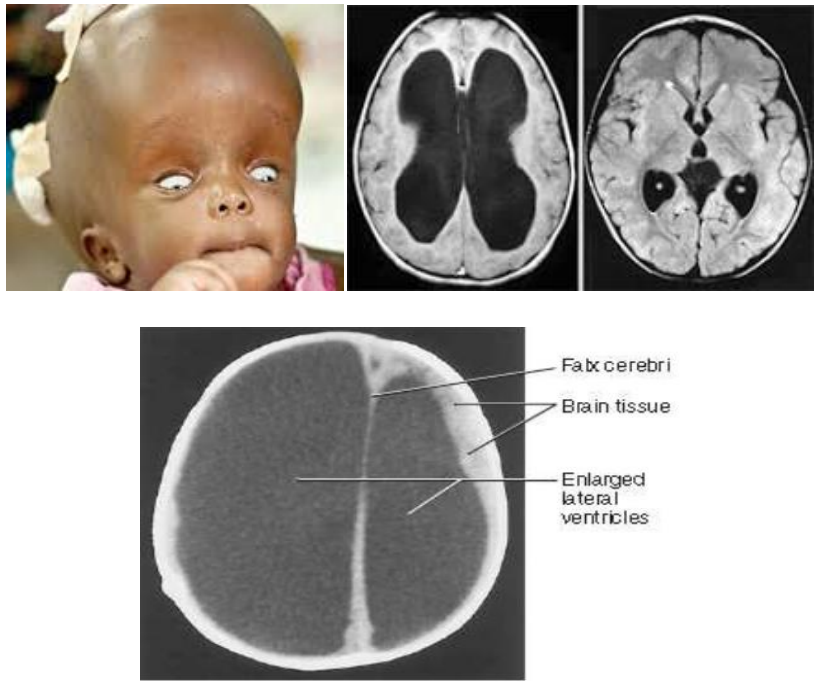


Fig.14: Congenital hydrocephalus showing the findings on Brain MRI and CT scan

The main features in the children are increasing head size, 'small eyes', progressive vomiting, lethargy, difficulty feeding, increasingly being irritable, excessive sleepiness, fever, high-

pitched uncontrollable cry and weakness and excessive widening of the fontanels. An examination will show the following big sized head with changes in facial appearance (craniofacial disproportion), prominent scalp veins, tensed and bulging anterior fontanels, sutural diasthesis, muscle spasticity, slow movement and failure to thrive. Associated complications included 93(72.7%) meningitis, 88(68.6%)raised intracranial pressure, 32(25%)SIADH secretion while 9(7.03%% had ocular complications- strabismus, and abducens nerve palsy. Some of the infants had more than one abnormality. Other malformations noted were talipes equinovarus 44(34.4%), myelomeningocele 29(22.66%), congenital heart diseases 18(14.06%), myelocele 15(11.72%), Arnold Chiari malformations 14(10.9%), Down syndrome 6(4.69%), Holoprosencephaly 4(3.1%).

The hospital stay for patients ranged from two weeks to three months. The costs of investigations, surgery, drugs and other consumables, hospital admission and bed fees, feeding and upkeep for stay in hospital ranged from N158,000 to N300,000. A ventriculo-peritoneal shunt procedure was performed in 88(68.8%)and external venticulostomy was done for 5 (%)infants. We noted that having a child with hydrocephalus was very devastating with high mortality rate due to recurrent infections namely meningitis, ventriculitis and shunt infections.

The high cost of management and long stay in the hospital had unpleasant and traumatic effects on the caregivers: **From lack of specialised wards, to buying surgical devices, having a child with hydrocephalus is challenging- parents pay for beds space, shunt materials, medications and had to feed themselves in hospital. The unpleasant experience is quiet disturbing to them.**

Ventriculoperitoneal (VP) shunt: This is the mainstay of treatment for hydrocephalus. The shunt is placed between the lateral ventricle and the peritoneal cavity, which is preferred because the peritoneum can accommodate a greater catheter length and obviate the need for shunt replacement as the child grows[25,26]. Shunts allow unidirectional flow of cerebrospinal fluid (CSF) due to a valve system with a preset pressure requirement for flow. Mortality rates and developmental outcomes of congenital hydrocephalus vary greatly and are dependent upon the underlying etiology. The sequelae and associated morbidity as seen amongst our patients in University of Port Harcourt include, cognitive impairment, motor impairment with delay in achieving milestones, epilepsy, , endocrine disorders, loss of vision, urinary and faecal incontinence, and breathing problems. In addition, the vast majority of patients with VP shunts required at least one shunt revision. Patients should be followed up throughout their lifetimes with careful attention paid to psychosocial, educational, and vocational needs. However most of our patients are lost to follow up because of problems with transportation, finances, and work/child care responsibilities, stigmata associated with the condition and cultural beliefs.

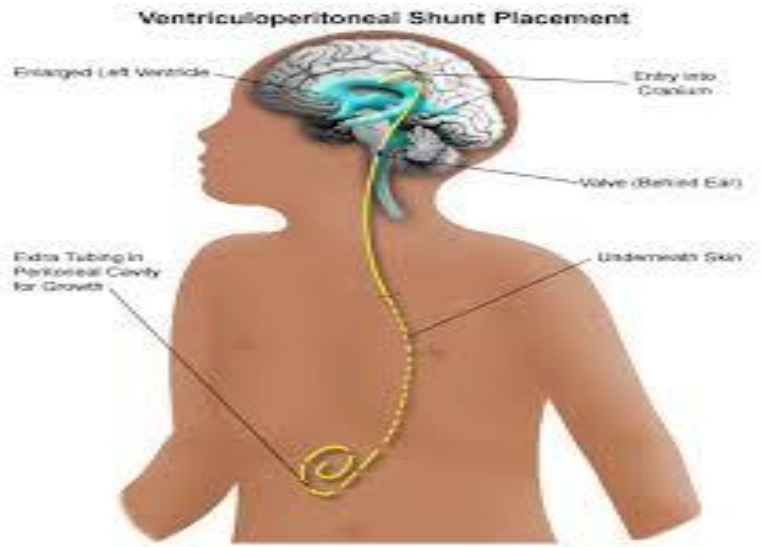


Fig. 16: Ventriculoperitoneal shunt insitu

The Research Findings has done the following in our setting including the following:

- Enlightenment of Parents and caregivers in outpatient clinics and on admission; this has made parents to be more empathetic and sympathetic about their children's illness
- Improved patient's turnout in the past two years
- Increase in awareness in treatment options
- Improved knowledge on how best to intervene
- Commitment and interest to the child's outcome
- Follow up clinic for the patients are very busy as most of them with sequelae turn out for continuous care.

3. MUSCULAR DYSTROPHY

Muscular dystrophy, a genetic disease of young boys that presents with muscle weakness is caused by mutations of the X chromosome.[27, 28]It has many variants all attributed to a failure of production of dystrophin, an essential protein for building

and repairing muscles whose absence or deformity results in disruptions of the outer membrane of muscle cells with associated weakening of the muscles and active muscle damage. The two main types are Duchenne muscular dystrophy(with almost total absence of dystrophin) and Becker muscular dystrophy (with a reduction in the amount or size of the dystrophin protein). Usually diagnosed between ages 3 and 6 years, its early signs include delayed walking, difficulty in rising from a sitting or lying position, frequent falls and weakness typically affecting the pelvic and shoulder muscles which progressively worsen till the child becomes wheelchair bound and eventually dies early.

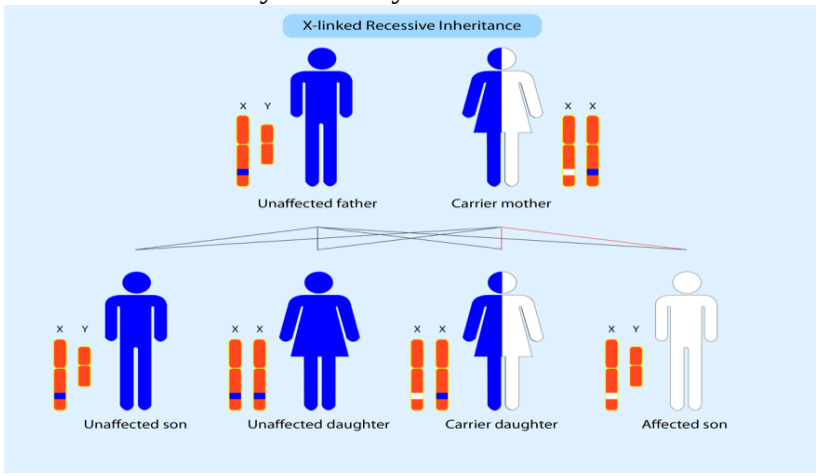


Fig. 17:X- linked Recessive inheritance Pattern of Muscular Dystrophy[28]

In 2005, **A.I Frank-Briggs** et al [29] in a prospective study of children with Muscular Dystrophy at the Paediatric Neurology Clinic of the University of Port Harcourt Teaching Hospital showed the commonest features in all affected children being recurrent falls and inability/ difficulty to stand up from a sitting position, difficulty in climbing staircase, contracture of the limbs, waddling gait and positive Gower's sign,

pseudohypertrophy of the gastrocnemius (calf) muscles and depression. The creatine kinase levels were markedly raised in all of them[30].Life-threatening complications, like breathing difficulties, pneumonia, respiratory failure and heart problems - cardiomyopathies and heart failure occur frequently. In the past, people with this condition did not usually survive beyond their 20s, but progress in technology and research is improving the outlook. Currently, the average life expectancy for people with Duchenne is 27 years, and this is likely to improve in time. In spite of the devastating effect of muscular dystrophies on affected persons, there is currently no cure for affected patients, and treatment involves physical therapy, breathing assistance, and the use of mobility aids (canes, wheelchairs, and walkers to help the affected person to stay mobile.)

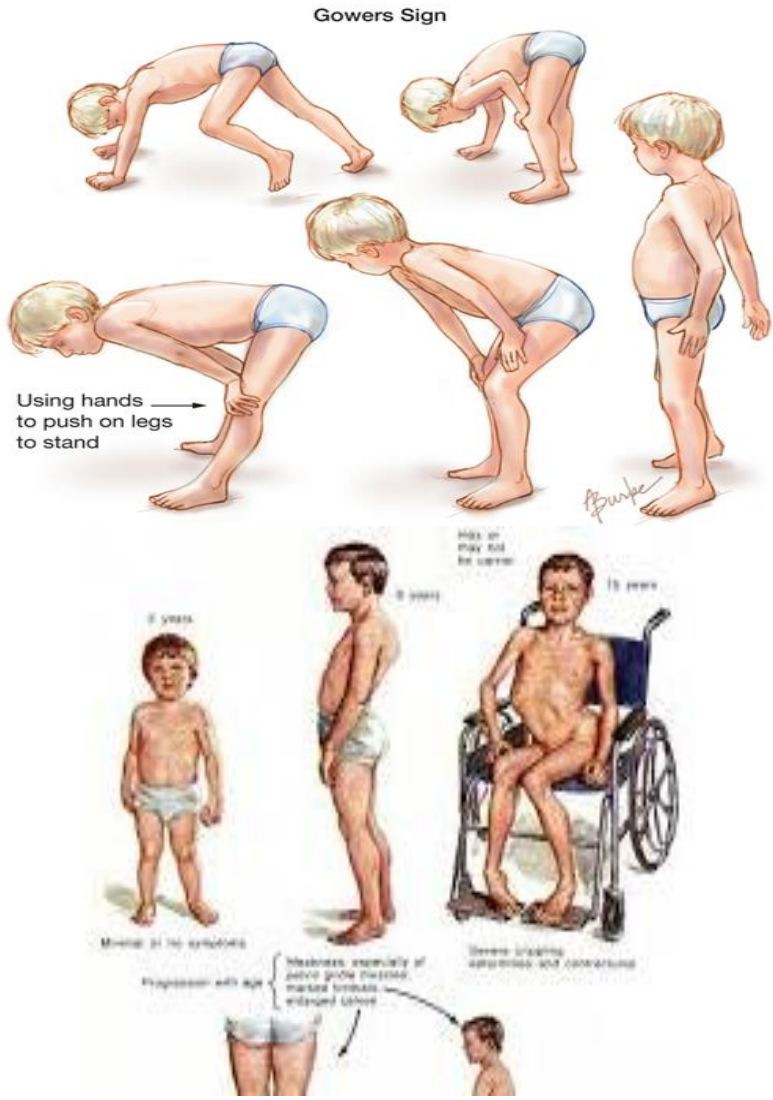


Fig.18: Demonstration of Gower's sign and stages of severity in a child affected with Muscular Dystrophy

Contribution to knowledge

- Publication has shown that this disorder is not alien to us in this part of the world.
- It is rare in Nigeria but we have been able to publish our research findings to add to the global statistics
- No cure for the disorder but we do counseling for these children and parents giving them hope.

4. CEREBRAL PALSY (CP)

Cerebral palsy is defined as "a group of permanent disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain.[33] It is characterized by abnormal muscle tone, reflexes, or motor development and coordination.

The neurological lesion is primary and permanent while orthopedic manifestations are secondary and progressive. [34,35]While movement problems are the central feature of CP, difficulties with feeding communication, hearing and behavior often co-occur as well as epilepsy, visual impairment, and learning disabilities. In cerebral palsy unequal growth between muscle-tendon units and bone eventually leads to bone and joint deformities. Often, symptoms include poor coordination, stiff muscles, weak muscles, and tremors. Often, babies with cerebral palsy do not roll over, sit, crawl or walk as early as other children of their age. Most often, the problems occur during pregnancy; however, they may also occur during childbirth or shortly after birth and early childhood. It is remarkable to note that symptoms and severity vary from case to case.

In babies that are born at term risk factors [36,37]include problems with the placenta, birth defects, low birth weight, a delivery

requiring either the use of instruments or an emergency Caesarean section, birth asphyxia, seizures just after birth, respiratory distress syndrome, low blood sugar, and infections in the baby. After birth, other causes include severe jaundice, physical brain injury, abusive head trauma, incidents involving hypoxia to the bran and encephalitis or meningitis.

In Nigeria and in our facility in particular, birth asphyxia, high bilirubin levels, and infections in newborns of the central nervous system are main cause. Many cases of CP in Africa could be prevented with better resources available. [38,39]

CP is partly preventable through immunization of the mother and efforts to prevent the risk factors will reduce CP. There is no known cure for CP; however, supportive treatments, medications and surgery may help many individuals.[40-42] This may include physical therapy, occupational therapy and speech therapy.[1] Medications such as diazepam, baclofen and botulinum toxin may help relax stiff muscles. Surgery may include lengthening muscles and cutting overly active nerves. Often, external braces and other assistive technology are helpful. Some affected children can achieve near normal adult lives with appropriate treatment. While alternative medicines are frequently used, there is no evidence to support their use.

Classification of Cerebral Palsy

It is classified by the types of motor impairment of the limbs or organs, and by restrictions to the activities an affected person may perform. It's classifications by motor impairment include:spastic, ataxic, and athetoid/dyskinetic and mixed pattern[44]. Additionally, there is classifications based on topography (geography) which reflect the areas of the body that is paralysed.

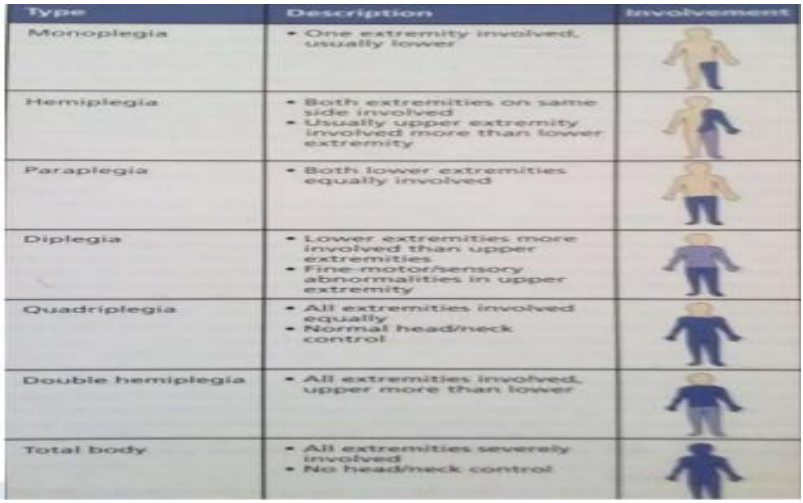


Fig.19: Geographic classification of Cerebral palsy

In a study of Sociocultural issues and causes of cerebral palsy in Port Harcourt, Nigeria[43,]Frank-Briggs A.I et al showed that of 2,288 patients with neurological disorders managed at the Paediatric Neurology Clinic between June 2008 and June 2010, 834(36.45%)had cerebral palsy The children were aged 5 months to 13 years(mean age of 8 years) with the main social issues being family disharmony, psychological problems, low self-esteem, financial and emotional stress. Socio-economically, CP was commoner in the low socio-economic class and the main types were spastic CP 668 (80.09%), hypotonic 87(10.43%), extrapyramidal types 57 (6.83%), and the mixed type 22 (2.64%). The main causes were birth asphyxia (27.94%), kernicterus (26.26%) and Central Nerves System infections (15.95%) and unknown (12.2%). The co-morbidities were recurrent seizures, microcephaly, speech and auditory deficits.

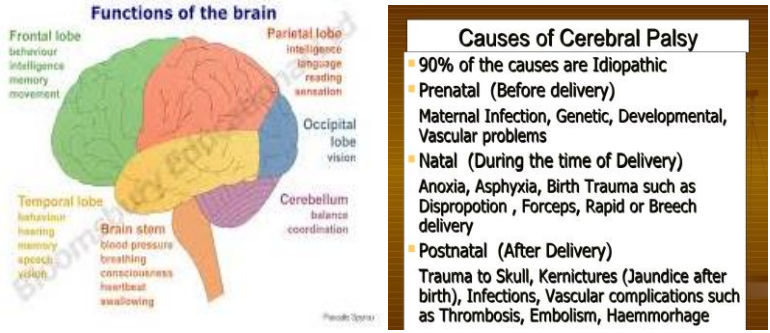


Fig. 20: The areas of the brain that can be affected in a child with CP

Some of the survival issues noted in our experience with cerebral palsy are

1. **Financial problems:** In Nigeria, particularly in our facility, the parents and caregivers bear the cost of taking care of these children. The cost of care ranges from thousands to millions of naira for the low and middle socioeconomic class families. The cost implication makes it difficult for the children to have optimal care resulting in being lost to follow up. In other climes, the government plays a significant role in providing for the medical and social amenities needed by these children. For example, Access Economics released a report on the economic impact of cerebral palsy in Australia. The report found that, the financial cost of caring for children with cerebral palsy in Australia annually was as much was $AUS 1.47 billion or 0.14% of GDP. Money is needed for welfare payments and other indirect costs such as direct programme services, aides and home modifications as well as direct health system expenditure.
2. **Family disharmony:** Children diagnosed with this condition and their families have a lot of social problems, which compromise their quality of life. Disagreement about

the child's illness, care practices, and the huge financial implications involved in managing these children often result in arguments and disharmony in the family. This leads to divorce, guilt feeling and low self-esteem. The resultant effect is that the patient is often lost to follow up.

3. **Cultural beliefs:** Many of our parents belief that CP is caused by factors such as influences of past lives, mystical interventions or past actions of parents or perceived enemies**.** This beliefs influence the level of medical care given to these children. More often than not, the parents source for alternative care; some children are abandoned, denied their rights, neglected and face "grandmother syndrome" (being a situation where these children are left with elderly women in the family, they become malnourished and finally die from neglect or euthanasia.
4. **Stigmatisation**: This is common for most neurologic problems including cerebral palsy. Parents of CP children are discriminated in their community, this causes low self-esteem, they may be denied some job opportunities. Affected children are not admitted to regular school. Their peers may bully them and so they do not go to school.
5. **Self-care issues:**. Self-care activities, such as bathing, dressing, grooming, are difficult for children with CP as self-care depends primarily on use of the upper limbs. Compared to other disabilities, children with cerebral palsy need help in performing daily tasks. The involvement of parents in caring for their sick children takes a great toll on their time, family life, career and employment opportunities. As a result, most of the mothers are not able to take up gainful employment in secular jobs.
5. **Co-morbidities:** Our patients with CP have varying degrees of cognitive impairment, epilepsy, hearing and visual impairment, feeding problems and recurrent infections especially pneumonia. These children have

significantly reduced life expectancy. Studies show that about 5-10% of children with CP die in childhood, particularly those with epilepsy and swallowing difficulty[45,46].

4. CHILDHOOD NEURODEVELOPMENTAL / BEHAVIOURAL DISORDERS

Neurodevelopmental disorders are in associated with varying degrees of challenges[48]. They pose different levels of mental, emotional, psychological, physical, social and economic consequences for individuals, families, and the society. The disorders directly or indirectly affect the quality of life of the affected individual, their families and the society.

Types of neurodevelopmental disorders include the following:-

1. Intellectual disability (ID) or intellectual and developmental disability (IDD), previously called mental retardation
2. Autism spectrum disorders, such as Asperger's syndrome or Kanner syndrome
3. Behavioural disorders including Conduct disorder, Attention deficit hyperactivity disorder, Anxiety disorders, Oppositional Deviant Disorder, Bipolar disorders etc.
4. Motor disorders including developmental coordination disorder and stereotypic movement disorder.
5. Tic disorders including Tourette's syndrome
6. Communication, speech and language disorders
7. Hearing impairments: e.g. anotia, sensorineural hearing loss.
8. Genetic disorders, such as Fragile-X syndrome, Down syndrome and schizophrenia, hypogonadotrophic-hypogonadal syndromes etc.

9. Disorders due to neurotoxicity like foetal alcohol spectrum disorder and other heavy metals, such lead, chromium, platinum, hydrocarbons like dioxin, Polybrominated Diphenyl Ethers (PBDEs) and Polychlorinated biphenyls (PCBs), medications and illegal drugs, like cocaine and others.

Causes and Risk factors

1. **Gender** – boys are more likely than girls to suffer from behavioural disorders. It is unclear if the cause is genetic or linked to socialisation experiences.
2. **Gestation and birth** – difficult pregnancies, premature birth and low birth weight may have poor brain development and contribute in some cases to the child's behaviour later in life.
3. **Temperament** – children who are temperamental, aggressive and 'difficult to manage' from an early age are more likely to develop behavioural disorders later in life.
4. **Learning difficulties** –problems with reading and writing are often associated with behaviour problems.
5. **Intellectual disabilities** – children with intellectual disabilities are twice as likely to have behavioural disorders.
6. **Brain development** – studies have shown that genetic factors, chromosomal abnormalities, and structural abnormalities in various areas of the brain contribute to these abnormalities.
7. **Family life** – behavioural disorders are more likely in dysfunctional families. For example, a child is at increased risk in families where domestic violence, poverty, poor parenting skills or substance abuse occur.

5a. CONDUCT DISORDER

Conduct disorder is common but 'hidden' and characterised by a wide range of antisocial and aggressive behaviors, which impair the quality of life of these children. Early identification and appropriate intervention will improve the course of these behavioural disorders. Children with conduct disorder (CD) are often judged as 'bad kids' because of their delinquent behaviours and refusal to accept rules. It affects 1 in 20 children and teenagers[53]. Children with CD exhibit cruelty, from early life more than normal teasing and bullying, hurting animals, picking fights, theft, vandalism, arson and even more severe vices. Some of the typical behaviours of a child with CD may include:

- Frequent refusal to obey parents or other authority figures
- Tendency to use drugs, including cigarettes and alcohol, at a very early age
- Lack of empathy for others
- showing sadistic behaviours including bullying and physical or sexual abuse
- Using weapons in physical fights
- Criminal behaviour such as stealing, deliberately lighting fires, breaking into houses and vandalism
- Suicidal tendencies.

Over the years research is still on going to determine the cause of this disorder. The exact cause of conduct disorder is thought to be an interaction between genetic and environmental factors are not well understood. However, scientists found that there are distinctive **differences in white matter pathways** (the brain's structural wiring) among young people who have the condition[54, 55]. Beyond difficulties in executive function, neurological research on children with conduct disorder demonstrates differences in **brain anatomy** and **function** that reflect the behaviours and mental anomalies associated with

conduct disorder. Compared to normal controls, children with early and adolescent onset conduct disorder displayed reduced responses in brain regions associated with social behavior (**i.e., amygdala, ventromedial prefrontal cortex, insula, and orbitofrontal cortex)**. In addition, they also demonstrate less responsiveness in the orbitofrontal regions of the brain during a stimulus-reinforcement and reward task. This provides neural explanations why children with conduct disorder may likely repeat classes and have poor decision-making patterns. These children also display a reduction in grey matter volume in the amygdala, which may account for fear conditioning deficits. This reduction has been linked to difficulty processing social emotional stimuli, regardless of the age of onset.

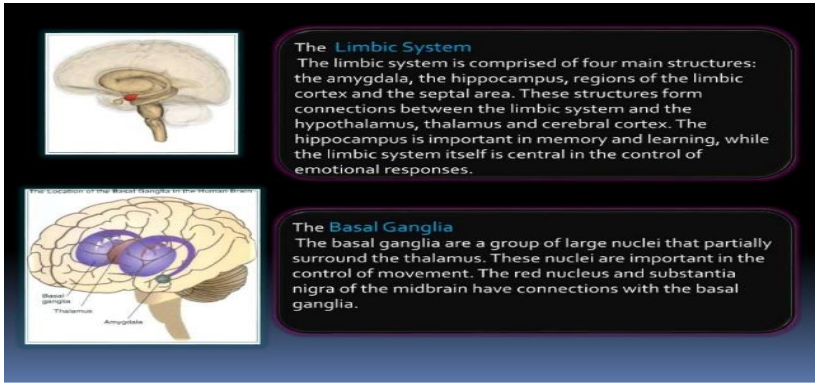


Fig. 21: Demonstrating the limbic system and basal ganglia of the brain

Aside from the differences in neuroanatomy and activation patterns between children with conduct disorder and controls, neurochemical profiles also vary between them. They are characterised as having reduced serotonin and cortisol levels (e.g., reduced hypothalamic-pituitary-adrenal (HPA) axis), as well as reduced autonomic nervous system (ANS) functioning. These reductions are associated with the inability to regulate

mood and impulsive behaviours, weakened signals of anxiety and fear, and decreased self-esteem. Taken together, these findings may account for some of the variance in the psychological and behavioural patterns of children with conduct disorder.

Fig. 22: Brain's structural wiring - reason for Conduct disorder in children

Abnormal ‘wiring’ of the nerves in the brain in different individuals possibly is a reason for antisocial behaviours among young people. The details of these recent findings were published in the Journal of American Academy of Child and Adolescent Psychiatry. The researchers investigated differences in the brain's structure between children with conduct disorder and a comparison group of typically developing children without severe antisocial behaviour. The study included nearly 300 children aged between 9 and 18, with equal numbers of boys and girls."The differences that we see in the brains of young people with conduct disorder are unique in so much as they are different from the white matter changes that have been reported in other childhood conditions such as autism or ADHD," says Dr Jack Rogers, co-lead author on the study."Additionally we found that callous traits, such as

reduced empathy and guilt, explained some of the white matter differences seen in youths with conduct disorder suggesting that these traits are important factors to consider when exploring differences in the brains of young people with conduct disorder."

This challenge with the early diagnosis of conduct disorder is exemplified by the story of the first case I saw. In September 2007, AO, a 10 year old girl who resumed in a boarding facility in a secondary school in Nigeria set a hostel on fire, some of the students died, while others has lifelong neurological sequaelae. Further investigation revealed that the student who set the hostel on fire had **Conduct Disorder,** a type of neurodevelopmental disorder. This awakened my interest to research on this very interesting subject.

Therefore, in 2008 **Frank-Briggs A.I. et al**[51] in a secondary school-based study of 885 students showed that 140 (15.82%), 112 males and 28 females (male: female ratio of 4:1) had conduct disorder. Their ages ranged from 9-18(modal age 13) years. The behaviours exhibited included bullying and or threatening of classmates and other students**,** poor school attendance, lying, stealing, poor academic performance, vandalism, use of hard drugs (heroin, alcohol, morphine), weapon use and harm to others.

This paper, published in December 2008 in the Nigerian Health Journal and has attracted many citations and comments from researchers all over the world and commendations from the ResearchGate (a professional and most attractive academic social networking site for scientific community with over 170 million members from all over the world). As a result, there is increased awareness; school dropout rates have reduced tremendously.

5b. Autism Spectrum Disorders

Autism is a neurodevelopmental disorder characterised by severe impairment in reciprocal social interactions, communication skills, and the presence of restricted stereotypical behaviours[58-60].It prevalence has been increasing in all races with 1: 54 children in the USA said to be affected in the USA in March 2020 by CDC. The symptoms, which begin in early childhood and can impact function, range from mild to severe.[62]The Challenges in Social skills manifest as **d**eficits in social skills may lead to problems with friendships, daily living, and vocational success. The symptoms of social reciprocity include; lack of mutual sharing of interests with preference not to play or interact with others and lack awareness or understanding of other people's thoughts or feelings. Additionally, the Challenges in Communication skills are atypical nonverbal behaviours which include:

- Poor or no eye contact with an observer when called by name
- Facial expressions: they often don't know how to recognise emotions from others' facial expressions, or they may not respond with the appropriate facial expressions.
- Unusual speech: children with autism speak in a flat, monotonic voice or they may not recognize the need to control the volume of their voice in different social settings.
- They exhibit a condition called echolalia in which they respond to a question by repeating the inquiry instead of answering.

The third manifestation of Autism, the Challenges in Behaviour include:

- Stereotyped behaviours– they perform repetitive behaviours such as rocking, hand flapping, finger flicking, head banging, or repeating phrases or sounds.

- Resistance to change–they tend to have routines and rituals that they must follow, like eating certain foods in a specific order, or taking the same path to school every day. The child may have a meltdown if there is any change or disruption to his routine.
- Restricted interests– Children may become excessively interested in a particular thing or topic and devote all their attention to it.
- Oversensitivity– they are overly sensitive to loud sounds, bright lights, strong smells, or being touched.

Pathophysiology of Autism: Neuroanatomical studies support the concept that autism may involve a combination of brain enlargement in some areas and reduction in others. Studies suggest abnormal neuronal growth and pruning during the early stages of prenatal and postnatal brain development, leaving some areas of the brain with too many neurons and other areas with too few neurons. Some research has reported an overall brain enlargement in autism, while others suggest abnormalities in several areas of the brain, including the frontal lobe, the mirror neuron system, the limbic system, the temporal lobe, and the corpus callosum.

The Risk factors for autism include: having an older parent, a family history of autism, and certain genetic conditions[63,64,] like fragile X syndrome, prenatal and perinatal risk factors including maternal gestational diabetes, Low vitamin D levels in early development etc. Although vaccination[65] with mumps-measles-rubella (MMR) vaccine was alleged to be a risk factor for autism, recent research have demonstrated no convincing scientific evidence to support the claims, and further evidence continues to refute them, including the observation that the rate of autism continues to climb despite its elimination from routine childhood vaccines.

Sadly, **Autism has No cure**. Consequently, creating awareness, improving skills in its diagnosis and optimal management will promote better outcome in affected children. Those in the mild range may function independently, while those with severe symptoms may require substantial support in their daily lives. However, **e**arly intervention for affected children is advocated and efforts are generally individualised and include cognitive behavioural therapy and teaching of coping skills.

Having understood this increasingly prevalent behavioural disorder, I wish to share the experiences in this centre at this juncture.

In 2012 Frank-Briggs A. I [61]in the paper, "**Autism in Children: Features, Management and Challenges in Nigeria"** highlighted the clinical features and management of autism as it affects the Nigerian child and discussed the challenges faced by caregivers and the society at large. The study revealed that Nigerian children with autism just like their counterparts in the developed climes had problems with verbal and nonverbal communication (89-98%), impaired social interaction in >92%, unusual repetitive or severely limited activities and interests 85-92% with similar impact of these behaviours ranging from mild to disabling. Management was multidisciplinary including cognitive behavioural therapy and psychotherapy; and there is no cure for it. The study concluded that "the combined problems of malaria, malnutrition, pneumonia, HIV/AIDS and other infectious illnesses might be masking emphasis on this very important neurodevelopmental condition."

This study has contributed positively in enlightenment of the disorders. Consequently more children with autism are turning out for early diagnosis and care. The Child Neurology Society of Nigeria (CNSN) in collaboration with Paediatric Association

of Nigeria (PAN) has embanked on developing guidelines for management of Behavioural Disorder in Nigeria.

5c. Attention Deficit Hyperactivity Disorder

Another very challenging and common neurodevelopmental disorder is Attention Deficit Hyperactivity Disorder (ADHD). Two to five per cent of children are thought to have the disorder with boys outnumbering girls by the ratio 3M: 1F. Other characteristics of ADHD include: inattention, hyperactivity / Overactivity and impulsivity.

Over the last 30 years, research into ADHD has greatly increased. There is no single, unified theory that explains the cause of ADHD. Genetic factors are presumed important, and it has been suggested that environmental factors may affect how symptoms manifest. It is believed that individuals with ADHD have difficulty with "executive functioning". These functions are thought to reside in the **frontal lobes**. This area of the brain enables recall of tasks that need accomplishing, organisation, prioritisation of thoughts and actions, keeping track of time, awareness of interactions with surroundings, the ability to focus despite competing stimuli, and adaptation to changing situations. With derangement in this frontal lobe, these functions and activities are compromised.

Also, several lines of research based on structural and/or functional imaging techniques, stimulant drugs, psychological interventions have identified alterations in the dopaminergic and the adrenergic pathways of individuals with ADHD. In particular, areas of the prefrontal cortex appear to be mostly affected. Dopamine and norepinephrine are neurotransmitters playing an important role in brain function. The uptake transporters for dopamine and norepinephrine are overly active and clear these neurotransmitters from the synapse a lot faster

than in normal individuals. This is thought to increase processing latency and salience, and diminished working memory. The major symptoms of these children with ADHD who are categorised two are summarised below.

Table III: Symptoms of Attention Deficit Hyperactivity Disorder

Inattentive-type (ADHD-PI)	**Hyperactive/impulsive-type (ADHD-PH)**
• Forgetful during daily activities • Easily distracted by extraneous stimuli • Losing important items (e.g. pencils, homework, toys, etc.) • Always asking for attention, but • Not listening and not responding to name being called out • Unable to focus on tasks at hand, cannot sustain attention in activities • Avoids or dislikes tasks requiring sustained mental effort • Makes careless mistakes by failing to pay attention to details • Difficulty organizing tasks and activities • Fails to follow-through on complex instructions and tasks (e.g. homework, chores, etc.)	• Squirms and fidgets (with hands and/or feet) • Cannot sit still • Cannot play quietly or engage in leisurely activities • Talks excessively • Runs and climbs excessively • Always on the go, as if "driven by a motor" • Cannot wait for their turn • Blurts out answers • Intrudes on others and interrupts conversations

Sadly, although it is not associated with mortality, the morbidity is grave as there is **No cure for ADHD**. Some of the complications and challenges include school drop out, low self esteem, poor interpersonal relationship, as adults they are prone to having marital disharmony, inability to keep a job, alcoholism and illicit drug abuse, and accident prone.

As part of the efforts to unravel the problem of ADHD, in 2011, **Frank-Briggs A.I.**[68]in a review study showed that, the disorder affects about 3 to 5% of children globally, with symptoms starting before 7 years of age; and in about 50% of cases continuing into adulthood. The study also highlighted that these children with ADHD had other comorbidities particularly conduct disorder (40-50%),learning disabilities (30-45%), anxiety (20-35%), depression (10-30%), and epilepsy (20-30%). This is a source of concern to clinicians. This paper also revealed that very little data was available in in developing countries like Nigeria, awareness of the general populace; skills in the diagnosis and optimal management are currently low. I concluded that there is dearth of information about ADHD in our environment but the disorder is not uncommon and thus there is need for improvement in these areas.

Thus, in 2015, E.A.DAlikor, **Frank-Briggs A. I et al**, [69] in a study of **Attention Deficit Hyperactivity Disorder among school children in Port Harcourt, Nigeria, published in** American Journal of Psychiatry and Neuroscience showed that Attention Deficit Hyperactivity Disorder (ADHD) showed that out of 452 (51.1%) males and 432 (48.9%) females primary school children showed that 7(0.8%) had ADHD, out of which 6 (85.7%) had predominantly inattentive, 2 (28.6%) had predominantly hyperactive-impulsive and 1 (14.3%) had the combined subtype. The study showed that although ADHD was not common in children in Southern Nigeria it is associated with other psychiatric co-morbidities as in other parts of the world.

5d Anxiety Disorders

Everyone feels anxious now and then which is a normal emotion.[73,74] Anxiety disorders are different in that they are a group of neurodevelopmental illnesses, characterised by

excessive or inappropriate fear, with behavioural disturbances that impair normal functioning. Children with anxiety disorders have clinical symptoms, such as excessive fear, behavioural disturbances, avoidance of feared objects; and associated distress.[75,76] Anxiety is a source of concern to the clinicians as it is co morbid with other mental disorders, particularly depression and learning disabilities, and it causes low self-esteem. The types of Anxiety Disorders[78] are:

- **Panic disorder**. This involves feeling of terror that strikes at random.
- **Social anxiety disorder**. Also called social phobia, one feels overwhelmingly worried and self-conscious about everyday social situations.
- **Specific** phobias. Intense fear of a specific object or situation, such as height or flying.
- **Generalised anxiety disorder**: excessive, unrealistic worry and tension for no reason.

The symptoms of Anxiety Disorder include: panic, fear, and uneasiness, sleep problems, restlessness, cold sweaty numb or tingling hands or feet, shortness of breath, heart palpitations, dry mouth, nausea, tense muscles, and dizziness.

Although researchers do not know exactly what brings on anxiety disorders[79,80], suggested causes stem from a combination of factors, including unexplainable changes in the brain function; other possible contributory factors include environmental stress and genetic abnormalities. The disorder runs in families and could be linked to faulty neurons in the brain.

It is important to note that treatment is challenging and because there is no cure for affected children, early intervention is

important as without therapy, affected children usually develop severe depression which may lead to suicide.[81,82]

Bringing it home, **Frank-Briggs A.I**[77]et albetween2018 and2010**, in their study on Anxiety Disorder amongst Secondary School Children in an Urban City in Nigeria aimed at** evaluating its prevalence showed that 91(10.28%,)of 885 students aged 9-18 years, met the criteria for the diagnosis of anxiety/ depression disorder . There were 37 males and 54 females with 52 (57.14%) children living with their parents, 28 (30.77%) lived with relatives and 11 (12.09%) of them were working as house helps to other families. The reasons given for being anxious were poor self-image, fear of death, repeated physical and sexual abuses by their caregivers and other adults. Learning disability was the major associated co morbid disorder (18.68%). Other co-morbidities include poor sleep hygiene, epilepsy. Generalised anxiety was the most common type of anxiety disorder identified (32.97%). The study concluded that anxiety disorders are debilitating chronic conditions and significantly to poor academic performance.

Other Childhood Neurodevelopmental/ Behavioural Disorders

Other Childhood Neurodevelopmental/ Behavioural Disorders worthy of mention include the following: -

Oppositional Defiant Disorder (ODD)

Oppositional Defiant Disorder (ODD is a condition in which a child displays an ongoing pattern of anger or irritable mood, defiant or argumentative behaviour, and vindictiveness toward people. The child's behaviour often disrupts normal daily activities, including activities in the family and school. They may express their defiance by arguing, disobeying, or talking back to their parents, teachers, or other adults. When this behavior lasts

longer than six months and is excessive compared to what is usual for the child's age, it may mean that the child has oppositional defiant disorder. Estimates suggest that 2%-16% of children have ODD. In younger children, it is more common in boys, while in older children, it occurs equally in boys and girls.

Symptoms of Oppositional Defiant Disorder

- Excessively arguing with adults, especially those with authority and parents
- Actively refusing to comply with requests and rules
- Deliberately trying to annoy or upset others
- Throwing repeated temper tantrums
- Blaming others for their mistakes
- Having frequent outbursts of anger and resentment
- Being spiteful and seeking revenge
- Swearing or using obscene language

Causes of Oppositional Defiant Disorder

The exact cause is not known, but it is believed that a combination of biological, genetic, and environmental factors contribute to ODD. They are explained below:

Biological: Studies suggest defects in fronto-temporal lobes of the brain. In addition, ODD has been linked to abnormal functioning of certain types of brain chemicals, or neurotransmitters.

Genetics: Many children with ODD have close family members with mental illnesses, including mood disorders, anxiety disorders, and personality disorders. This suggests that vulnerability to develop ODD may be inherited.

Survival and sequelae: Outlook for children with ODD is challenging. They experience rejection by classmates and other peers. In addition, a child with ODD has a greater chance of developing a more serious behavioural disorder like conduct disorder. Children with ODD are moody, easily frustrated, and have low self-esteem, they abuse illicit drugs and alcohol.

Learning Disabilities

A learning disability affects how a child receives and processes information. Learning disabilities are common[87]. It is said that about 8% to 10% of children may have some type of learning disability. The disorder has nothing to do with how smart a person is. Rather, a person with a learning disability sees, hears, and understands things differently. This makes everyday tasks, like studying for a test or staying focused in class, much more difficult[88].

Table IV: Types of Learning Disorders

Types of learning Disabilities

Dyslexia	Difficulty reading	Problems reading, writing, spelling, speaking
Dyscalculia	Difficulty with math	Problems doing math problems, understanding time, using money
Dysgraphia	Difficulty with writing	Problems with handwriting, spelling, organizing ideas
Dyspraxia (Sensory Integration Disorder)	Difficulty with fine motor skills	Problems with hand–eye coordination, balance, manual dexterity
Dysphasia/Aphasia	Difficulty with language	Problems understanding spoken language, poor reading comprehension
Auditory Processing Disorder	Difficulty hearing differences between sounds	Problems with reading, comprehension, language
Visual Processing Disorder	Difficulty interpreting visual information	Problems with reading, math, maps, charts, symbols, pictures

How do we recognise children with learning disability?

Learning disabilities can be difficult to diagnose, because there is no definitive list of symptoms that fits every child. Also, many children try to hide the problem.[89,90] Obvious and frequent complaints about inability to do homework or a child who doesn't want to go to school are clues.

Other symptoms include the following:

- Lack of enthusiasm for reading or writing

- Difficulty memorising things
- Working at a slow pace
- Trouble following directions
- Trouble staying focused on a task
- Difficulty understanding abstract ideas
- Lack of attention to detail, or too much attention to detail
- Poor social skills
- Disruptiveness.

Challenges, Outcome and Sequelae

The affected children have academic failure, drop out of school, involve in truancy, stealing, drug and substance abuse. Some go into depressive illness and suicidal attempts.

Special education is the intervention for learning disorders. Under the Individuals With Disabilities Education Act (IDEA), all U.S. children with learning disorders are entitled to receive special education services for free in public schools, which does not exist in Nigeria. After an evaluation to pinpoint where a child is having problem, a team of special educators will create an individualized education program (IEP) for the child. Resources which are available outside the public school system, include: Private schools that specialise in treating children with learning disabilities; After-school programmes designed for children with learning disabilities and At-home tutoring and therapy services. However, many of our parents who have children with this disability and are not able to afford them.

EATING DISORDERS IN CHILDREN

Eating disorders are characterised by extremes in eating behaviour—either too much or too little or feelings of extreme distress and concern about body weight or shape. Females are more likely than males to develop an eating disorder. Eating disorders in children cause serious changes in eating habits that

can lead to major life threatening health problems. The disorders often go hand-in-hand with other problems such as anxiety disorders, depression and substance abuse.

The three main types of eating disorders are:

- ***Anorexia,*** a condition in which a child refuses to eat adequate calories out of an intense and irrational fear of becoming fat
- ***Bulimia,*** a condition in which a child grossly overeats (binging) and then purges the food by vomiting or using laxatives to prevent weight gain
- ***Binge eating***, a condition in which a child may gorge rapidly on food without purging

Anorexia in children and adolescents: Children with anorexia have a distorted body image. People with anorexia view themselves as fat, even when they are dangerously skinny. They are obsessed with being thin and refuse to maintain even a minimally normal weight. Symptoms of anorexia include:

- anxiety, depression, perfectionism, or being highly self-critical
- dieting even when one is thin or emaciated
- excessive or compulsive exercising
- intense fear of becoming fat, even when one is underweight
- rapid weight loss, which the person may try to conceal with loose clothing
- strange eating habits, such as avoiding meals, eating in secret, monitoring every bite of food, or eating only certain foods in small amounts

Anorexia leads to several serious health problems which include: damage to major organs, especially the brain, heart and kidneys, irregular heartbeat, lowered blood pressure, pulse, body temperature, and breathing rates, sensitivity to cold and thinning of bones. Anorexia is fatal in about one out of every 10 cases. The

most common causes of death include cardiac arrest, electrolyte imbalance, and suicide.

Bulimia in children and teens

Bulimic children fear weight gain and feel extremely unhappy with their bodies. They repeatedly eat too much food in a short amount of time. Often the child or teen senses a loss of control, feeling disgusted and ashamed after overeating. They prevent weight gain by inducing vomiting or using laxatives, diet pills, diuretics, or enemas. After purging the food, they feel relieved. The Symptoms of bulimia include: Eating uncontrollably, followed by purging, hoarding or stealing food, vomiting or abusing laxatives or diuretics to try to lose weight, preoccupation with body weight, depression and mood swings, etc.

Binge eating in children and teens

Binge eating is similar to bulimia. It includes chronic, out-of-control eating of large amounts in a short time, even to the point of discomfort. However, binge eaters do not purge the food through vomiting or other means. As a result, they tend to become overweight or obese. These children struggle to handle their emotions. Anger, worry, stress, sadness, or boredom may trigger a binge.

Often, binge eaters are upset about overeating and may become depressed. The excess weight puts them at risk of health challenges including diabetes mellitus, obesity and hypertension.

Obsessive-Compulsive Disorder

Obsessive-Compulsive Disorder (OCD) is characterised by recurrent, unwanted thoughts and/or repetitive behaviors. Children with obsessive-compulsive disorder (OCD) have unwanted thoughts, and behaviours, which frequently interfere

with their activities, or make them very upset. The thoughts are called obsessions. The behaviours are called compulsions. Repetitive behaviours (hand washing, counting, checking, or cleaning wearing a favorite piece of clothing) are often performed with the hope of preventing obsessive thoughts or making them go away. For example, they might worry about having bad luck if they don't perform a task. Performing these so-called "rituals," however, provides only temporary relief, and not performing them markedly increases anxiety. For some children, the thoughts and the urge to perform certain actions persist, even if they try to ignore them or make them go away.

The Symptoms of OCD are those of obsessions, compulsions, or both. Examples of obsessive or compulsive behaviours include:

- Having unwanted thoughts, impulses, or images that occur over and over and which cause anxiety or distress.
- Having to think about or say something over and over (for example, counting, or repeating words over and over silently or aloud)
- Having to do a thing over and over (e.g., hand washing, placing things in a specific order, or checking the same things over and over, like whether a door is locked)

It is not known exactly why some children develop OCD. There are some studies that suggest that disorders of brain formation during pregnancy and chemical imbalance in the brain.

There is no cure for this challenging disorder. Affected children may have sequelae including learning disorder, depression and develop other antisocial behaviours.

Behavioural Disorders In Children

Behavioural disorders are not the result of personal weakness, lack of character, or poor upbringing. Most children diagnosed with serious neurological illnesses can experience relief from their symptoms by actively participating in an individual treatment plan.

Treatment is **multifaceted and multidisciplinary** and depends on the particular disorder and factors contributing to it. The options include the following:-

1. Psychosocial Treatments for Neurodevelopmental Disorder include:

a. **Cognitive behavioral therapy**. The goal of CBT is to train children in altering their dysfunctional (aggressive) behaviour. The cognitive interventions teach children to recognize their problems and develop coping strategies. The behavioral interventions include relaxation training, modeling behaviors, and graded exposure to anxiety-provoking stimuli.

b. **Problem-solving skills therapy (PSST)**. PSST is an individual-based intervention that focus on changing the way children interact with the significant others in their lives.

c. **Multisystem therapy**. This is a comprehensive intervention targeting disruptive behaviors. It is a highly intensive therapy based on the use of different types of therapies deemed appropriate by individual therapists.

d. **Parental education**- teaching parents communication and management skills.

e. **Family therapy** – the entire family is taught communication and problem-solving skills.

f. **Social training** – the child is taught important social skills, such as how to have a conversation or play cooperatively with others.

g. **Anger management** – the child is taught to recognize the signs of their growing frustration and given a range of coping skills designed to defuse their anger and aggressive behaviour.
h. Support for associated problems –a child with a learning difficulty will benefit from professional support and special education. Encouraging the child to excel in their particular talents (such as sport) can help build self-esteem.
i. Physiotherapy and use of assistive devices.

2. Medications

- Antipsychotics: Use of pharmacotherapy can assist in the treatment of some of the disorders particularly for short term.
- Stimulant medications: for reducing behavioral problems and improving the attention and educational performance of children with ADHD.
- Folic acid and Vitamin B12**:** Its deficiency causes neural tube defects. Use of periconceptional folic acid decreases NTD recurrence by 50%–70%. Low Vitamin B12 levels during pregnancy independently increases the risk for NTD.

MY ACTIVITIES IN THE CENTRE FOR CHILDREN DEVELOPMENTAL AND COMMUNICATION DISORDERS (CCDCD)

The University of Port Harcourt has blazed the trail in setting up the Centre for Children Developmental and Communication Disorder (CCDCD) in Nigeria which will lead research into these neurological deficits, thus providing local references that will be cited globally. The Centre was established in November 2011. It is a multidisciplinary and interdisciplinary educational, interactive, therapeutic/treatment and research Centre devoted to provide appropriate compassionate, specialised services for children with developmental and communication disorders; to

enable them grow, develop, and evolve to their full potential, giving them a happy childhood, a life of quality filled with dignity and integrity that lasts forever.

The pioneer and first Director of the Centre was Prof. Shirley Yul-Ifode from the Department of Linguistics and Communication Studies. Her tenure ran through 2011 to August 24th 2014. I served as the Assistant Director for the Centre during the period. On the 25th of August 2014, I was appointed as the Director. The Centre within this period has organised several public lectures, seminars, and conferences to educate the public. Some of these are as follows:

- The University of Port Harcourt Disability Week the 22nd to 25th May 2012. There were seminars, workshops and clinical evaluation. These sensitised our university community and catchment communities on Disorders and disabilities in Children.

- First Alex Ibru Legacy Lectures Series by Professor Godini Gabriel Darah at the Ebitimi Banigo Hall on the topic: *Natural Resources and the Quest for Justice: the Future of the Niger Delta Children*.

- Conference lecture in collaboration with Association of Child Developmental and Communication Disorders, Nigeria (ACDCDN) and different departments of the University on the subject: Early Childhood: What can go wrong?

- Congress Lecture on "Unblocking Potentials for Total Childhood Development: A Guaranteed Future." May 2014, delivered by Prof. Alice Nte.

My achievements as the Director

a. I hit the ground running immediately I took over as a director and negotiated for the establishment of Postgraduate Diploma Studies in Disability Studies and Communication Therapy. The programme is well packaged; courses are so diverse and rich, so at the end of the study, the graduates will use the experiences acquired to handle children with disabilities and Communication Disorders at any level in the society. The first batch of students was admitted in April 4th 2016. The second batch produced distinction candidate. The programme is still running.

b. In October 2019, Master of Science (M.Sc.) Programme in the following areas of study were also approved for the CCDCD

   1. M.Sc. in Human Communication Therapy
   2. M.Sc. in Disability Studies and Management
   3. M.Sc. in Early Childhood and Special Needs Education

Launching of the Postgraduate Diploma Studies in Disability Studies and Communication Therapy.

c. STAFFING.

When I assumed office as Director, we had no staff attached to our Centre. In my tenure the Vice Chancellor has graciously enlarged our coast with Administrative staff, Confidential Secretary and a cleaner. The members of the Academic staff were drawn from the different Faculties that collaborate with us-Faculties of Humanities, Education, Social Sciences and College of Health Science.

IMPACT OF THE POSTGRADUATE TRAINING PROGRAMMES OFFERED BY THE CENTRE

The graduates from our programme have gained sufficient knowledge to afford them the opportunity to be employed in any Government and Nongovernmental Organisations, Religious Bodies, Special Educational Institutions and in special care-giving homes. The pioneer graduates are presently employed in different institutions.

Recommendations On Interventions For Children With Neurodevelopmental Disorders And Their Sequelae

1. Need for Government Intervention

The **United Nations Convention on the Rights of the Child** is an important agreement by countries who have promised to protect children's rights. Article ***23. Talks about Children with disabilities and states:*** **'Every child with a disability should enjoy the best possible life in society. Governments should remove all obstacles for children with disabilities to become independent and to participate actively in the community'**

The Government should implement the various instruments available to address disability in order to mitigate the challenges these children face.

a. **Ensure legislation**: The Disabled Persons and the Mental Health Act, Child Right's Act are some of the legislature that have been signed into law. However, the benefits are not accessible to the majority of the children living with disability. Advocacy must be enforced to implement these instruments.
b. **Availability of special programmes:** In other climes, general financial or in-kind assistance are available from Supplemental Security Income program or from need-based programmes such as Temporary Assistance to Needy Families, the Federal Food Stamps program, public housing, and the Supplemental Nutrition Programme for Women, Infants, and Children. Programs such as the Special Olympics provide opportunities for children with special needs to get exercise and socialise. Resources that assist family members directly include **respite care, counseling, parent and sibling groups, and support groups** surrounding specific types of diagnoses, as well as national clearing houses (often provided by foundations focusing on specific diseases) for information about available resources.

Our government and non-governmental associations can emulate all of these.

c. Educational interventions: Ninety per cent of children with disabilities in developing countries do not attend school, says United Nations Educational, Scientific and Cultural Organisation (UNESCO). A child whose disability or developmental delay is identified at an early stage will have a much better chance of reaching her or his full capacity. Early childhood education, whether it is public, private or provided by the community, should be designed to respond to the child's individual needs. Early childhood is important precisely because approximately 80 per cent of the brain's capacity develops before the age of 3 and because the period between birth and primary school provides opportunities to tailor developmental education to the child's needs. Studies suggest that the children who are at greatest disadvantage stand to benefit the most. There is need for educational awareness via different fora, whether print or electronic media so that the society treat them as normal human beings. Inclusive education should be available so that the cultural and traditional beliefs do not adversely affect them. Special schools at both rural and urban settings need to be constructed so that they have a fair chance of accessing education. These children should be encouraged to reach the highest level of education of which they are capable.

d. Assistive Devices: In order to address the physical challenges that they endure, the Government has to erect ramps to enable accessibility. It should also procure various appliances to enable mobility and improve visual and hearing impairment. All buildings that are to be constructed should be built keeping them in mind.

e. Counseling centres: Free psychological counseling facilities need to be opened up at various centers in both urban and

rural settings. This will bring confidence and enhance their quality of life with a good outcome in quality adjusted life years (QALYs).

2. 5. Health Care Platform Interventions

Children with "accident of nature" have the right to good quality health care, the best health care possible. They are entitled to safe drinking water, nutritious food, clean and safe environment, and information to help them stay healthy. The government should ensure there is universal health coverage.

a. Screening and Community Rehabilitation for Developmental Disorders

Providing early interventions to children with developmental disorders will optimise their developmental outcomes. Screening is necessary to identify children in need of these resource-intensive interventions. Screening instruments need to be culturally acceptable and have sound psychometric properties that have been validated in the local context

b. Parenting Skills Training

Parenting skills training aims to enhance or support the parental role through education and training, thereby improving emotional and behavioral outcomes for children. Increasing positive parent-child interactions, teaching parents how to communicate emotionally with their children, teaching parents the use of time out as a means of discipline, and supporting parents to consistently respond to their children's behaviours.

c. Maternal Health Interventions

Poor maternal health is a risk factor for children's physical, cognitive, and socio-emotional development. Interventions that target maternal mental health problems, especially in the perinatal period and early infancy, are important for child mental health and need to be incorporated into primary care. It is important to have quality antenatal care services, early

diagnosis and treatment of complicated difficult deliveries, Furthermore, prenatal screening and genetic counseling should be available.

3. Community Platform Interventions
Early Child Development
Community- and primary care–based services can be developed in communities. This includes community based psychosocial stimulation intervention where mothers could be taught the importance of play for children's development so as to improve their cognitive and motor development.
Home visits by health workers improves overall well being of these children.

4. School-Based Interventions
Schools have a profound influence on children, families, and communities. School-based health services have the potential to bridge the gap between need and utilization by reaching children who would otherwise not have access to these services. These settings could provide an ideal environment in which programs for child health can be integrated in a cost-effective, culturally acceptable, and non-stigmatising manner.

These are effective and feasible in reducing behavioral problems in young children.

Different approaches to reducing bullying behavior have to beput in place. Whole-of-school approaches have been found to be effective; these approaches use a multidisciplinary approach that includes combinations of school rules and sanctions, classroom curriculum, teacher training, individual counseling, and conflict resolution training.

4. Voluntary Sector Programmes

Agencies in the voluntary sector (those that are nongovernment and not for-profit) have traditionally played an important role in raising awareness of the issues faced by children with disability and their families, as well as reducing the associated stigma. In some countries, the voluntary sector provides the bulk of child health services.

Moving Forward

We need an action plan for reducing the burden through infrastructure investment in neurological research and enhanced clinical management of neurological disorders. Specifics include:

- Acceleration of translational research in preventative and disease-modifying therapy;
- Enhanced outcome and comparative effectiveness research;
- Comprehensive data basing and tracking of neurological disease; and
- Taking advocacy to the next level, coordinating efforts at the individual, neurology association, and local, state and federal government levels to make funding these initiatives a priority.

Conclusion

The brain lies at the centre of our personal universe. It transforms a chaotic world of hurling particles into the perception of sense and stability. In addition to creating a sensory representation of reality, the brain allows us to be aware of others and ourselves. Every nervous system process can be deconstructed into sensation, movement, emotion, memory, and communication. The brain allows humans to create, explore, interact, and yearn for something better. It contains our greatest dreams and hopes, as well as our fears and nightmares. It is where life and religion originate.

It is where the ability to decide good and evil resides. It is where life ends.

Therefore, ‘Accidents of Nature’ which prevent the nervous system from functioning optimally require urgent attention.

Childhood developmental disorders globally account for a significant health and societal burden. The evidence base for interventions to prevent and treat developmental disorders is limited. Future implementation of programmes to address childhood neurological and developmental disorders should be evaluated. Administrative hurdles, redundancies, inconsistencies, and frustrations experienced with policies have to be overcome. Successfully navigating the idiosyncratic and shifting landscape of disability benefits requires our collective efforts. Thus, as we seek to attain the sustainable development goals, in the spirit of universal health coverage, all affected Children should be supported to improve their Quality of Life.

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Prof. Angela Ine Frank-Briggs (nee Dateme) was born into the family of Chief & Mrs Honest Bibi Dateme in Abonnema, Akuku-Toru Local Government Area of Rives State. She started elementary school at the prestigious Bishop Crowther Memorial State School, Abonnema in 1974 but completed it at Ireti Primary School, Ikoyi, Lagos, where she obtained the First School Leaving certificate in 1980. Her excellent performance at the National common entrance examination the same year, earned her an admission on merit to Queen's College, Yaba, Lagos. Always a very pretty girl, she was selected to partake in a beauty pageant traditionally held as part of the social activities to welcome new students. She was the first runner up. Gifted with a remarkable combination of beauty and brains, she also excelled in academics, finishing with outstanding grades in the West African School Certificate Examination and a very good score in the Universities Tertiary

Matriculation Examination. She gained admission into the University of Jos to study Medicine and Surgery as a result and obtained the MBBCh in October 1992.

She did her internship at the University of Port Harcourt Teaching Hospital where she distinguished herself as a very dutiful, diligent, hardworking, jovial and very respectful young doctor, thus, after her National Youth Service at the Police Staff Clinic in Maiduguri, Borno State between 1993 and 1994 she was unsurprisingly employed as a Resident Doctor in the Department of Paediatrics at the University of Port Harcourt Teaching Hospital. She completed Residency in record time and became a Consultant Paediatric Neurologist and Fellow of the National Postgraduate Medical College. She was employed into the Department of Paediatrics and Child Health in 2005 as a Lecturer I and rose to become a Professor of Paediatric Neurology and Neurodevelopmental Disorders in the year 2015.

She has served and is still serving the University and Teaching hospital in various capacities such as Head of Department, Deputy Director and presently as the Director of the Centre for Children Developmental and Communication Disorders, Deputy Provost of the College of Health Sciences, University of Port Harcourt. She has also served in several committees in both institutions.

Ine, as very close family and friends fondly call her, is a born-again Christian since her days in Queens College. She was very active in the Corper's Fellowship, participated in community outreaches and evangelism and has been a chorister for many years.

She has published widely and extensively in local and international peer-reviewed journals, is widely cited for her works in Paediatric Neurology, has several awards and honours

and has attended and presented papers in several countries. She is a member of many professional bodies including: the Society of Nigerian doctors for the welfare of mankind, affiliated to the International Physicians for the Prevention of Nuclear War (IPPNW), the International Child Neurology Association (ICNA), Child Neurology Society of Nigeria (CNSN), the Nigerian Society of Neurological sciences (NSNS), Society of Neuroscientists of Africa (SONA) and the Paediatric Association of Nigeria (PAN). She is an external examiner in Paediatrics to many universities in Nigeria, a reviewer for a number local and international medical journals, and supervisor of dissertations for the Post Graduate Medical Colleges of Nigeria.

A humble and amiable professional, Ine loves children, travelling, writing, cooking, reading and making new friends. A Pastor in the Redeemed Christian Church of God and an Alumnus of Haggai Institute, Maui, Hawaii, USA, she is married to her heartthrob, Dr. Ibanibo Frank-Briggs and they are blessed with three children: Soibifaa, Otokini, Tamunotonte.

Vice Chancellor, ladies and gentlemen, I present to give the 171st Inaugural lecture, the first in Paediatric Neurology and Developmental Disorders in our unique university, the first female Neurologist in Rivers State; a preacher's wife, a brilliant paediatric neurologist, a woman who genuinely loves children, a selfless and truly likeable individual and a woman of God, Professor Angela Ine Frank-Briggs.

Professor Owunari A. Georgewill
Vice-Chancellor