NEURODEGENERATIVE DISORDERS IN SUBSAHARAN AFRICA

DIFFERENCES AND SPECIFICS

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Disclosures

No relevant disclosures
Objectives

- Describe the epidemiology of NDD in SSA
  - Highlight specific characteristics of NDD in SSA
  - Highlight differences observed in NDD in SSA
  - Highlight ‘peculiar’ challenges
Outline

- Background: definition, aetiology, classification
- Epidemiology of NDD in SSA
- Specifics and differences of NDD in SSA
- Future directions
Progressive loss of structure or function of neurons, including death of neurons
Definition

- Disorders characterized by **gradual, progressive loss of function** of part or parts of the nervous system due to progressive degeneration and/or death of nerve cells

- Large group of neurological disorders with **heterogeneous clinical and pathological expressions** affecting **specific subsets of neurons** in **specific functional anatomic systems**
Shared characteristics

- Predilection
- Selectivity
- Progressiveness
- Irreversibility (typically)
- Molecular mechanisms
Aetiology

- Sporadic
- Genetic (mutations/genetic predisposition)
- Aging**
- Environmental toxins
Mechanisms

- aggregation of misfolded proteins
- cell membrane damage
- mitochondrial dysfunction
- DNA damage (reactive oxygen species)
- impaired axonal transport
- programmed cell death and autophagy
Classification

Clinical syndrome

Anatomical origin

Molecular pathology
Clinical spectrum (syndromes)

- Progressive dementia: e.g. Alzheimer, Frontotemporal, DLB
- Movement disorder: e.g. Parkinson, Huntington, MSA
- Muscle paralysis and atrophy: e.g. ALS, other MND
- Progressive ataxia (incoordination of movement): e.g. Friedreich, SCAs
- Progressive neuropathies: e.g. Hereditary sensory neuropathies
- Progressive blindness, ophthalmoplegia, or deafness: e.g. Ret P, Mit D
Pathological features in selected neurodegenerative diseases

Bertram L, Tanzi RE. J Clin Invest DOI: 10.1172/JCI24761
Epidemiology – Global

- Alzheimer disease is the most common: affects >25 million
  - global prevalence dementia: 3.9% >60yrs (most have AD)
  - Incidence: about 5 million new cases annually

- Parkinson disease is the second commonest
  - Affects 0.3% of general population (1% of elderly)
  - Incidence: 4.5 – 10.7/100,000 per year
  - >6 million affected worldwide
Epidemiology – Sub Saharan Africa

Population at risk

- ~49 million elderly ≥60 in 2017
- ~157 million elderly ≥ by 2050

UN World Population Ageing Report 2013
Epidemiology – Sub Saharan Africa ii

- Hospital-based study (Kegne et al. 2006; Yaoundé, Cameroon)
  - 3.9% of neurologic consultations at 2 teaching hospitals
  - PD (48.8%), dementia (19%), ALS (12%), chorea (20.2%).
  - Male preponderance: 73.8%; Age range: 9 to 84 (mean 54.2yrs)

- Community-based study (Tekle-Haimanot et al. 1990; Ethiopia)
  - 1986-1988 door to door survey in rural community
  - prevalence/100,000 for parkinsonism (7), MND (5)
AD and related dementias

- Prevalence (population-based) of dementia: <1% - 10.1%
- Hospital frequency of dementia: <1% - 47.8%
- Most common form – Alzheimer disease (57.4 – 89.4%)
- Incidence of dementia: 8.7 – 21.8 per 1000 per year
- Incidence of Alzheimer disease: 9.5 – 11.5 per 1000 per year
- Strongly associated risk factors: age (esp. >75), female sex, low level of education (<6 years), rural residence, family history

Lekoubou et al. BMC Public Health 2014;14:653
# Incidence of dementia in SSA
Ibadan-Indianapolis Dementia Study: 1992 - 1998

<table>
<thead>
<tr>
<th>Disorder</th>
<th>Ibadan, Nigeria</th>
<th>Indianapolis, USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dementia</td>
<td>1.35% (1.13 – 1.56)</td>
<td>3.24% (2.11 – 4.38)</td>
</tr>
<tr>
<td>Alzheimer’s disease</td>
<td>1.15% (0.96 – 1.35)</td>
<td>2.52% (1.60 – 3.66)</td>
</tr>
</tbody>
</table>

* Based on 5 year follow up

Alzheimer disease in sub Saharan Africa

- Higher incidence in older women (＞80 years)
- Increased risk for mortality
  - Yoruba, Nigeria: relative ratio=2.83
  - African Americans: relative ratio=2.05
- Genetics: APOE e4 – homozygosity increases risk of incident AD in Yoruba (Hendrie et al 2014; Int Psychogeriatr;26(6):977-85)
Epidemiologic evidence
- Prevalence >60y: 6.38%
- 2.13 million (2015)>3.48 mill (2030)
- Mortality (2 fold increase)
- Consistent RF: age and female sex
- Modifiable RF: vascular risk factors

Beliefs, Perceptions and Experiences
- Beliefs (causality, understanding)
- Experiences (stigma, impact)
- Responses (help-seeking)
- Unmet needs (support, services)
Parkinson disease in sub Saharan Africa

- **Worldwide prevalence of PD:**
  - 0.3% in the general population (300 per 100,000)
  - 1% in people over 60 years of age.

- **Sub Saharan Africa (per 100,000):** 10 – 235 per 100,000
  - Nigeria 50 – 90 per 100,000
  - Tanzania 20 – 40 per 100,000
  - Ethiopia 7 per 100,000
Clinical profile of PD at presentation in Nigerians (1996 to 2006)

<table>
<thead>
<tr>
<th>Clinical characteristic (N=98)</th>
<th>Mean (SD)</th>
<th>Median</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at onset of PD in men, yrs</td>
<td>60.3 (10.4)</td>
<td>62.0</td>
<td>37 - 77</td>
</tr>
<tr>
<td>Age at onset of PD in women, yrs</td>
<td>65.2 (7.9)</td>
<td>68.0</td>
<td>41 - 74</td>
</tr>
<tr>
<td>Interval from onset to diagnosis, mo</td>
<td>24.6 (26.1)</td>
<td>12.0</td>
<td>4 - 156</td>
</tr>
<tr>
<td>Hoehn &amp; Yahr stage</td>
<td>2.3 (0.8)</td>
<td>2.0</td>
<td>1 - 4</td>
</tr>
</tbody>
</table>

Modified from Okubadejo et al. BMC Neurology 2010
A Nationwide Survey of Parkinson’s Disease Medicines Availability and Affordability in Nigeria

- 123 pharmacies (62 private and 61 public sector)
- Most available: dopamine receptor agonists; anticholinergics, LD/CD 250/25
- Affordability: Only 2 (trihexyphenidyl tablets and biperidien injection)
- Average day’s minimum wages for 30-day supply of PD meds: 41.3 days
Amyotrophic lateral sclerosis in SSA

- **Prevalence:** 5 – 15 per 100,000 population
- **Hospital frequency:** 0.2 – 8 per 1000 neuro consults
- **Male preponderance:** 57.6 – 100%
- **Age at clinical onset:** 12 – 71 years

Lekoubou et al. BMC Public Health 2014;14:653
## Amyotrophic lateral sclerosis in SSA

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>North Africa</th>
<th>West Africa</th>
<th>South Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>185</td>
<td>114</td>
<td>41</td>
<td>30</td>
</tr>
<tr>
<td>Male: Female</td>
<td>2.9</td>
<td>2.6</td>
<td>3.5</td>
<td>4.0</td>
</tr>
<tr>
<td>Median age onset*</td>
<td>53</td>
<td>54</td>
<td>47</td>
<td>59.5</td>
</tr>
<tr>
<td>Spinal onset</td>
<td>77.3%</td>
<td>77.2%</td>
<td>68.3%</td>
<td>90.0%</td>
</tr>
<tr>
<td>Bulbar onset</td>
<td>22.7%</td>
<td>22.8%</td>
<td>31.7%</td>
<td>10.0%</td>
</tr>
<tr>
<td>Median survival (mo)</td>
<td>14</td>
<td>19</td>
<td>4</td>
<td>11</td>
</tr>
</tbody>
</table>

TROPALES Study (9 centres, 8 countries) 2005 - 2017
AFRICAN DISTINCTIVENESS

Methodology of case ascertainment

Selection bias in hospital-based reports

Environmental exposures

Genetic diversity

Paucity of population-based studies
Diagnostic challenges

- Educate HCP in Africa
- Improve quality of care delivery
- Improve outcomes
Physician density per 10,000 population

Global Distribution of Physicians per 10,000 population.
<http://chartsbin.com/view/gcu>
Cultural barriers

Perceptions
(lucrativeness; priorities)

Manpower limitations

Financial/economic difficulties

Infrastructural challenges

ETC…
Future directions

- Epidemiological studies
- Hospital-based multicenter, multinational studies
- Case reports and case series – less commonly described NDD
- Disease registries
- Bridge information gap: barriers, genetics, outcomes, diagnosis
- Improve access