# Chapter 6. Other dementias

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## Introduction

- "Dementias" or Major Neurocognitive Disorders (major NCDs) refer to primarily disorders of cognition that are severe enough to limit the functional independence of an individual and can affect any of the cognitive domains, including complex attention, memory and learning, speech and language, visuospatial, executive, and social cognitive functions. See Chapter 2 ("Bedside Cognitive Assessment") and Chapter 5 ("Alzheimer's and Vascular Dementias") for more information.
- The major NCDs are usually progressive (as in Alzheimer's and Vascular Dementia) but may be static or reversible (partially or completely). Examples of static or reversible NCDs include HIV-associated NCD (see Chapter 3 "HIV Mental Health") and traumatic brain injury or TBI (see Chapter 14).
- Another way to consider NCDs is based on their respective prevalence in the population. In this way, it is sometimes helpful to consider NCDs that are common in older vs younger persons. The commonest major NCDs of old age are the Alzheimer's and Vascular types. In addition to HIV (in high prevalence settings), TBI and alcohol-related NCDs are common in younger persons. See Chapter 13 for "Alcohol and the brain".
- When a major NCD does not fall in the category of Alzheimer's or Vascular dementia in an older person or when HIV-, alcohol-, and TBI-related NCDs have been ruled out in a younger person, the clinician must consider "another cause of dementia".
- These may be considered under a commonly used diagnostic categorisation- See Table 1 below.

**Table 1. Pathological Classification of Other Dementia's / MNCDs**

| Category | Type |
|---|---|
| Degenerative | Parkinsons MNCD- see Chapter 12 |
| | Huntington's MNCD- see Chapter 12 |
| | *Fronto-temporal Dementia* |
| | *Dementia with Lewy Bodies* |
| Structural | *Normal Pressure Hydrocephalus* |
| | Multiple Sclerosis- see Chapter 15 |
| Nutritional | *Vitamin B12 Deficiency* |
| | *Vitamin B1 Deficiency (thiamine)* |
| Toxin | Mercury and Lead poisoning |
| | Carbon Monoxide / Anoxic States |
| Auto-immune | SLE- see Chapter 9 |
| | Auto-immune encephalitis |
| Infectious | COVID- see Chapter 4 |
| | Prion Diseases |

### (i) Frontotemporal dementia (FTD)

#### Introduction

Frontotemporal dementia (FTD) is a clinical concept to describe a group of syndromes caused by frontotemporal lobar degeneration (FTLD). The clinical syndromes of FTLD are heterogenous, including FTD, progressive supranuclear palsy, and corticobasal syndrome; the regional distribution of pathology determines the presentation. FTD is one of the most common causes of early-onset dementia.

#### Two main variants

I. Behavioural variant (bvFTD)
II. Primary progressive aphasia (PPA)

a. Non-fluent agrammatic (nfvPPA)
b. Semantic variant (svPPA)

**Behavioural variant FTD (BvFTD)**

This type accounts for over 50% of all FTD. The mean age of onset is 58 years. BvFTD is highly heritable, and about 50% of patients have a positive family history of the disorder. Close to half of BvFTD is attributed to abnormal protein tau processing, and a similar proportion of the abnormal protein pathology is TDP-43. The patient usually presents with what the family may describe as a "midlife crisis", mood disorder, or psychosis. There are six groups of major behavioural symptoms in patients with BvFTD, and at least three need to be present for a diagnosis:

I. ***Lack of insight*** – often early and present in most patients
II. ***Early apathy*** – apathy is common and pervasive. It presents as general passivity and lack of spontaneity and can be seen in the lack of motivation to pursue previously rewarding activities or hobbies
III. ***Early behavioural disinhibition*** – such as offensive jokes/sexual remarks, new criminal/illegal activities, intrusive, impulsive behaviour (gambling/overspending), or lack of social etiquette
IV. ***Early loss of empathy or sympathy*** – the loss of ability to recognize and respond to emotional expression/needs of others. Patients are often reported as cold, distant, and indifferent. Generally, a deficit of the theory of mind (ToM).
V. ***Early perseverative or compulsive behaviour***: it could be ritualistic behaviours such as counting rituals, hoarding objects, and wandering fixed routes.
VI. ***Hyperorality or appetite changes*** such as altered food preferences, commonly craving sweets or carbohydrates or expressing rigid preferences for particular foods.

Clinical assessment:

- **Cognitive features:** testing reveals executive function deficits (poor lexical generation and task shifting). However, this could be secondary to the lack of adherence to test rules and poor social etiquette that is common in BvFTD patients.
- **Neurological features:** patients often have gait disturbances, frontal release signs, eye movement abnormalities, or evidence of motor neuron disease. Parkinsonism is also observed in some patients.
- **Cerebrospinal fluid examination:** not routinely used - total tau increased, and beta-amyloid 42 decreased (like in AD). Still, the ratio of tau/amyloid is lower in frontotemporal lobar degeneration than in AD.
- **Typical Imaging finding:** Anterior cingulate gyrus and the frontoinsular atrophy. The pathology is often more pronounced in the right than in the left

**Treatment**

There are no effective disease-modifying treatments for bvFTD. Clinicians typically review target symptoms and manage accordingly. Structural support and environmental and

behavioural strategies are often both effective and safest. The course of bvFTD is relentlessly progressive over 5-10 years.

**Primary progressive aphasia: Non-fluent agrammatic (nfPPA)**

This form accounts for up to 30% of all FTD. The mean age of onset is 63 years. The atrophy is primarily on the left frontal lobe and the majority of cases represent tauopathytauopathy and lesser cases with TDP-43-related disease. The patient often presents with a problem of struggling to find words, the speech is slow and laboured, and they also have slurred speech. The typical clinical feature is *language impairment is characterised by* nonfluent, prosodic, and agrammatic speech. The patient knows what they want to say but does not know how to say it. This is also called apraxia of speech. There is also associated dysexecutive function and episodic memory impairment.

**Primary progressive aphasia: Semantic variant (svPPA)**

Accounts for approximately 20% of all FTD. The mean age of onset of 60 years. There is no significant heritability, and the common abnormality is the TDP-43 affecting the temporal lobes primarily with left-sided predominance. The characteristic feature is the loss of semantics while speech fluency is retained. Also, patients display behavioural problems early on in the disease. As a result, it may be difficult to distinguish it from BvFTD because of its prominence, but the language impairment is not severe early on in BvFTD. The pathology in svPPA could predominantly be unilaterally leading to two phenotypes of svPPA (r-svPPA and l-svPPA). The right side tends to have more behavioural symptoms than left-sided pathology. The left-sided would have more language deficit, and the behavioural symptoms tend to occur much later in the disease.

**(ii) Dementia with Lewy bodies (DLB)**

*C*linical features that are suggestive of DLB include:

- Parkinsonism
- Visual hallucinations
- Neurocognitive impairment

He also has one of the clinical biomarkers of DLB or disorders of Lewy bodies which is the Rapid eye movement (REM) sleep behaviour disorder. Click for further details on REM https://www.frontiersin.org/articles/10.3389/fneur.2020.00610/full

**Introduction**

DLB is the 3rd commonest dementia due to neurodegenerative disease after Alzheimer's disease and dementia with Lewy bodies. It accounts for about 5% of all dementias.

**Core Clinical features**

These are clinical features that differentiate DLB from dementias such as AD.

- **Fluctuations:** Typically delirium-like. Spontaneous alterations in cognition: attention and arousal; They take the form of waxing and waning episodes of behavioural inconsistency, incoherent speech, variable awareness, and staring or zoning out
- **Visual hallucinations (VH):** Complex VH is seen in 80% of DLB. Well-formed people, children. Insight may be retained regarding the VH
- **Parkinsonism:** Spontaneous – unrelated to the use of anti DA medication or other causes (e.g., vascular). The typical features are bradykinesia, a resting tremor, and rigidity
- **REM sleep behavioural disorder:** A parasomnia that manifests with recurrent dream enactment behaviours. Movements mimic the dream. The patient may kick and thrash at the bed partner.

**Supportive clinical features**

These are symptoms that are often present in people with DLB. They may occur early and may persist:

- **Hypersomnia:** Excessive daytime sleepiness
- **Severe antipsychotic sensitivity**

**What is the typical neurocognitive impairment in DLB?**

This is a specific subcortical type of dementia. Attention, concentration, executive function, and information processing speed are primarily affected relative to the nearly preserved memory and language function. There are also severe spatial and perceptual difficulties early on in DLB.

**Biomarkers of DLB**

The direct biomarker for DLB would be identifying the Lewy bodies from the brain. However, this is not done in clinical practice. **Indirect biomarkers of DLB include:**

- **SPECT or PET DAT uptake scan in the basal ganglia:** The dopamine transporter (DAT) is the primary transporter of DA in the synaptic cleft. A reduction in the DAT uptake in DLB is a distinguishing feature of DLB from AD, with a sensitivity of 78% and specificity of 90%

- **$^{123}$Iodine-MIBG myocardial scintigraphy:** A test used to quantify the uptake of metaiodobenzylguanidine (MIB) in the postganglionic sympathetic cardiac innervation. In DLB, the uptake of this product is reduced.
- **Polysomnography confirmation of REM sleep without atonia:** This happens in REM behavioural sleep disorder.

**Management of DLB**

The management of DLB is not straightforward and requires a multifaceted approach.
A thorough evaluation is necessary to ensure that the diagnosis is correct. A multidisciplinary approach is essential. A combination of non-pharmacological and pharmacological strategies is advised.

- **Non-pharmacological:** Given that the medication that helps with one symptom may worsen the other, it is essential to incorporate these strategies as part of the treatment. **Exercise** can be helpful for motor and cognitive symptoms. **Cognitive training includes caregiver-oriented** education to assist in managing psychiatric symptoms, including psychosis and agitation. Prevention of falls is critical.
- **Pharmacological treatment includes the management of Cognitive symptoms** using cholinesterase inhibitors (CHEIs), which have robust evidence for use in DLB (Class 1). Neuropsychiatric symptoms may also respond to CHEIs**. Antipsychotics are problematic.** There is increased sensitivity to dopamine blockade in DLB. A low dose of quetiapine may be relatively safe. Clozapine is also an option (there is evidence for use in idiopathic PD). For **Mood symptoms,** SSRIs and Mirtazapine may improve the symptoms of depression and apathy. Motor **symptoms may or may not respond to** Dopaminergic drugs and may perpetuate psychosis. A low dose of levodopa use often helpful when introduced slowly

**(iii) Idiopathic normal pressure hydrocephalus (NPH)**

**Introduction**

Idiopathic NPH is also called primary NPH. It is distinguished from others considered secondary such as meningitis and trauma. This is one of the potentially reversible forms of dementia. Prevalence increases with age and is as high as 3% in people >65 years.

**Clinical features**

A triad of gait, cognitive and urinary dysfunction

- **Gait symmetrical:** Patients have apraxia of gait. They have what is described as a magnetic gait – feet appear stuck on the floor, and the patient doesn't know how to lift them. Also, the gait is slow with small steps, often with a broad base, and has difficulty turning with an increased risk of falling when turning.
- **Cognitive dysfunction:** The cognitive fallout in NPH reflects the involvement of the prefrontal brain structure and occurs in the background of gait disturbance. The cognitive profile includes psychomotor slowing, impaired attention and concentration, executive dysfunction, and apathy.
- **Urinary dysfunction:** Urgency and frequency are the common symptoms of NPH. This may occur in the absence of incontinence.

The patient does not need to have all three core features to diagnose NPH, but a significant gait disturbance must be present for the diagnosis. The gait disturbance can be the only presenting feature of NPH, but the presence of the other two symptoms without a gait disturbance makes the diagnosis unlikely.

**Imaging**

MRI or CT scan of the brain is required to diagnose NPH. In NPH, CT and MRI show ventricular enlargement disproportionate to cerebral atrophy. There is an enlargement of the frontal horns, periventricular hyperintensities, thinning and elevation of the corpus callosum, and widening of temporal horns without evidence of hippocampal atrophy. See (Damasceno, 2015)

**Findings**

Lateral and third ventricles are enlarged, and no obstruction to CSF flow should be present.

**Quantifying the enlargement**

1. Evans ratio or index: ratio of the widest frontal horn span to the widest diameter of the internal skull (on the same axial image). Evans ratio of more than 0.3 indicates large ventricles, and a ratio of more than 0.33 indicates very large ventricles but is not specific for iNPH.
2. Acute callosal angle

**CSF tap test**

It has two roles: Confirms the diagnosis of INPH and also used to identify patients that will benefit from surgery. 20 – 50 ml of CSF through an LP is drawn then symptoms of INPH are re-examined.

**Treatment of INPH**

Shunting is the standard of care, but the decision to shunt is the role of combined neurosurgical and neurological decision-making. Factors associated with a good response to shunting include a predominant gait disorder, a shorter duration of symptoms (<6 months), or a significant response to a CSF tap test. Early onset cognitive impairment, moderate to severe dementia, dementia present for more than 2 years, or gait disturbance appearing after dementia are some factors predicting a poor response to shunting.

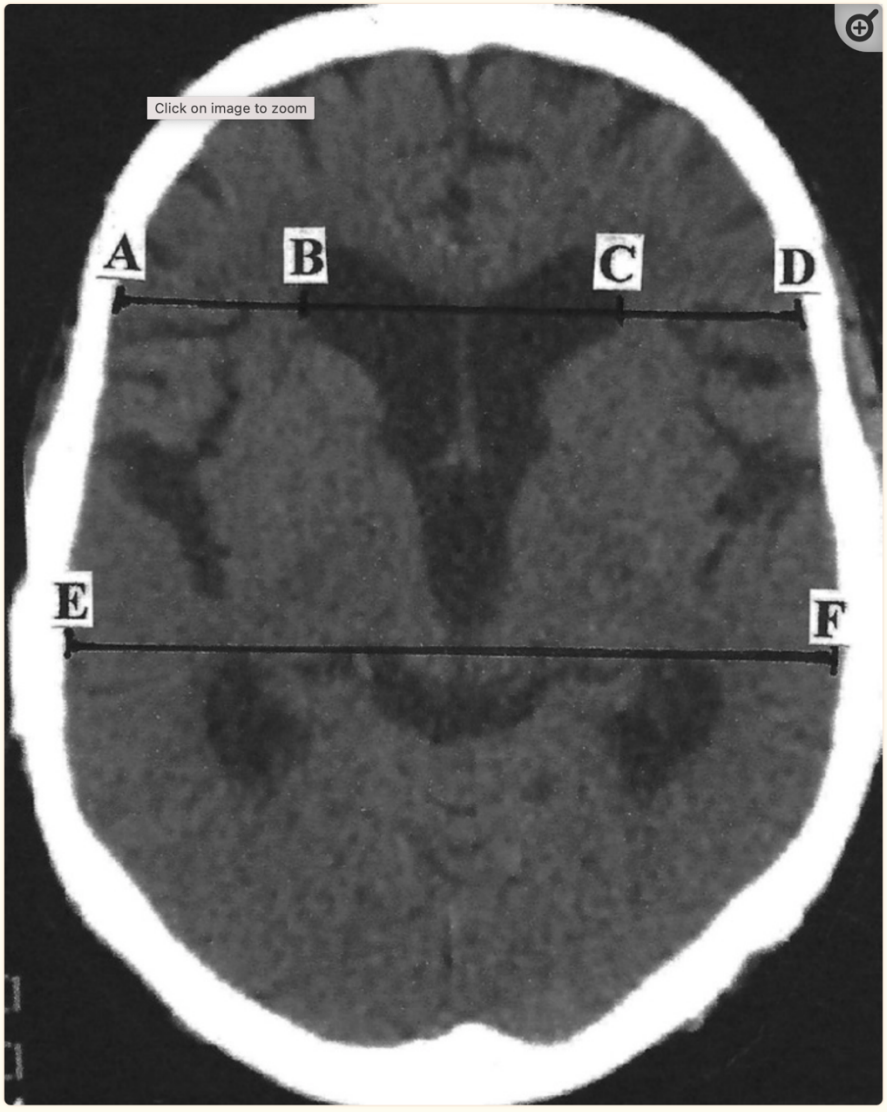


Figure 1

Axial CT slice of the brain in a patient with NPH. The Evans index can be measured by dividing the maximal width of the frontal horns [B-C] by the maximal width of the inner table of the cranium at the level of the frontal horns [A-D]; or by an equivalent measure, such as by dividing the diameter of the frontal horns [B-C] by the widest brain diameter [E-F].

**NCD due to Nutritional Deficiency**

**(iv) Cognitive Effects of Vitamin B12 Deficiency**

**Diagnostic criteria of Vitamin B12 deficiency?:**

- serum cobalamin <148 pmol/l (200 ng/l) in the presence of signs and symptoms and haematological indices of vitamin B12 deficiency (depends on the lab and essay that is used).
- or a serum cobalamin <148 pmol/l in conjunction with elevated serum homocysteine or methylmalonic acid (MMA)
-

The prevalence varies according to the age group

- 20 – 30 years = 3%
- 40 – 59 years = 4%
- > 60 years = 6%

Vitamin B12 is n essential vitamin (obtained from dietary such as animal products). It is water-soluble and absorbed in the ileum. Requires an intrinsic factor for absorption. Requires low pH for the vitamin to be released from food. Thus, high pH impairs the absorption of B12. The liver stores a high amount of B12; therefore, reduction in intake may be delayed by up to 10 years.

**Vitamin B12 deficiency and effects on neurons**

Vit B12 is the catalyst of methionine synthase, which converts homocysteine to methionine. The conversion of **homocysteine** to methionine reduces the levels of homocysteine. Homocysteine is a neurotoxic substance: that inhibits neurogenesis, causes myelin damage, impairs DNA methylation and blood-brain barrier integrity, and reduces GABA synthesis. This manifest as a result of subacute combined degeneration of the cord (affecting mainly the posterior dorsal columns); therefore, the patient will have impaired proprioception, ataxia, pain, and loss of vibration sensation. It may include subcortical dementia due to the Loss of myelin (leukoencephalopathy)

**Causes of deficiency**

- Autoimmune disorder as seen in pernicious anaemia
- Poor absorption: damage to the GIT, gastric bypass
- Nutritional

- Medications such as metformin, proton pump inhibitors

**Neuropsychiatric manifestations of B12 deficiency**

**Neurological:** Common findings include symmetric paraesthesias, numbness, and gait disturbances. The symmetric neuropathy commonly affects the legs than the arms. The classic finding is subacute combined degeneration of the spinal cord, which presents with progressive weakness, ataxia, and paresthesias that may progress to spasticity and paraplegia

**Psychiatric:** Psychiatric disturbances such as depression, irritability, insomnia, or psychosis are not uncommon in patients with B12 deficiency.

**Neurocognitive:** B12 deficiency is associated with neurodegenerative disorders such as AD, with a higher prevalence of B12 deficiency in AD than those without AD, but replacement of B12 does not lead to linear improvement of cognitive function. In general, those with B12 deficiency perform worse than those with normal B12 in neuropsychological tests. But a neurocognitive disorder due to B12 is not clearly defined in the literature.

**Investigations**

FBC, B12 serum levels. Sometimes it is necessary to perform autoimmune assays for anti-parietal cell antibodies. Others: GIT scope and MRI Brain (may show white matter disease and atrophy). For further reading, see (Briani et al., 2013)

**Treatment of vitamin B12 deficiency**

Treatment of B12 deficiency is achieved by restoring or correcting the deficiency.

*For Neurological (neurocognitive fallout) manifestation/ severe complications.*

**Intramuscular hydroxocobalamin 1mg**

Week 1 = 1mg daily

Week 2 – 5 = 1mg weekly

Maintenance = 1mg monthly until complete recovery and normal B12

When to repeat levels= every six months

**Oral**

Oral treatment is also effective but requires high doses in a range of > 100mg. Only 1% is absorbed.

**(v) The Neuropsychiatry of Thiamine deficiency**

**Thiamine deficiency**

Thiamine is also called vitamin B1 and is an essential vitamin water-soluble. Sources: animal products and grains. The primary causes of thiamine deficiency are poor nutrition, alcoholism, and chronic illnesses. Highly metabolic brain areas particularly vulnerable to low levels of thiamine include the periaqueductal grey matter, medial thalami, and mammillary bodies.

There various causes of thiamine deficiency include poor intake (e.g., chronic alcohol intake), poor absorption (e.g., malnutrition, gastric bypass surgery or malabsorption syndrome), increased loss (e.g., diarrhoea or hyperemesis gravidarum), increased utilisation (e.g., pregnancy, lactation, hyperthyroidism, or feeding syndrome), and drug-related (e.g., furosemide).

**Neurocognitive effects of B1 deficiency – including Korsakof syndrome (or psychosis)**

A neuropsychiatric syndrome is often seen in chronic alcohol use—the spectrum of Wernicke's encephalopathy (acute encephalopathy: ophthalmoplegia, confusion, and ataxia).

**Clinical features of KS**

Lost in one's memories (episodic memory) and lying unwittingly (confabulations)

**Episodic memor**y: The core cognitive impairment in KS is amnesia. There is a combination of anterograde and retrogade amnesia. Severe impairment of recalling incidents or events from a person's past, such that they can 'travel back mentally in time (this may extend as far as 30 years – retrograde amnesia). There is a 'temporal gradient' such that older memories are recalled better than more recent ones.

**Anterograde memory is the main feature**: The most impaired memory.

**Retrograde memory is also affected**. Memories of events in the more remote past are often retained, but commonly in chronological disarray.

***Implicit' aspects of memory,*** *including the response to priming and perceptuomotor (procedural) memory, are preserved in the Korsakoff syndrome.*

***Confabulations***

Spontaneous vs provoked confabulations.

Provoked confabulation in response to questions: the fleeting intrusion of memory errors or distortions. Provoked confabulation is everyday in chronic Korsakoff syndrome,

Spontaneous confabulation is rare beyond the acute stages. When regular, they are often indicative of concomitant damage to the frontal lobes (the ventromedial and orbitofrontal regions). See (Kopelman, 2002) for further information.

**Detecting impairment in KS**

KS is best assessed with collateral history. Additionally, ask about general events such as news, sports, family, or personal circumstances. A formal neuropsychological examination can help identify areas of neurocognitive impairment.

**Special Investigations**

In some cases, MRI can be beneficial. In classic cases, pathology exists within the diencephalic structure (thalami), mammillary bodies, and periaqueductal grey matter. See (Ota et al., 2020)

**Management**

Prevention of KS can be achieved by aggressive treatment of persons at risk of developing a thiamine deficiency. High doses of thiamine intravenously in persons with WKS prevent chronic neuropsychiatric sequelae.

Day 1 – 2 = 500mg 8 hourly intravenously for two days (should be given before IVI glucose)

Day 3 – 8 (5 days) = 500mg IVI or IMI daily.

*Maintenance dose: 100mg until no longer at risk of deficiency.*

*Chronic alcohol-induced deficiency*

- 100mg orally lifelong.

**Treatment of KS**

**Cognitive rehabilitation and cognitive training.**

Restorative cognitive rehabilitation is one example. Patients with KS have severe learning deficits. However, by using errorless learning strategies, these patients may be able to learn new information..

**Environmental accommodation: dementia-friendly** environment

- Clear signs, good lighting, and easily visible clocks.

**Pharmacological strategies**

The evidence is not robust regarding the efficacy of cognitive enhancers in KS. However, these drugs may have a place in the treatment of KS.

- Memantine (NMDA antagonist) may reduce neurotoxicity, providing neuroprotection.
- Donepezil- Thiamine deficiency can result in acetylcholine deficiency; therefore, donepezil may help treat KS.Prognosis

The course is variable.

For alcoholic KS: 25% recover; 50% show some evidence of improvement; 25% remain unchanged

(vi) **Lead and Mercury Poisoning**

**Lead (Pb)**

Exposure can occur via ingesting contaminated water or food and inhaling Pb aerosols. Products that contain Pb: Cosmetics, Paint, Fuel. Lead pipes continue to supply drinking water in some countries (responsible for at least half of all Pb exposure in humans). Acid batteries (one found in the car)

Highest saturation of lead in kidneys, liver, brain and heart. Absorbed Pb accumulates in the tissues and, over time, may become toxic. Doses above 10mcg of Pb are toxic. Lead that gets in the bones has a half-life of about 30 years. Conditions that increase bone turnover may lead to serum elevation (e.g. increased calcium requirements during lactation)

The toxic effects of lead are more severe in children. Children tend to have severe impairments vs adults because of impaired neurodevelopment.

**Mechanism of Lead neurotoxicity**

The two pathological mechanisms include pharmacological and morphological changes:
**Morphological changes associated with Pb:** Neurodevelopment - disruption of neuronal migration and differentiation, and premature glial maturation.
**Pharmacological**: Lead inhibits various cations such as calcium and, to a lesser extent, zinc, magnesium, copper, and iron, all critical molecules of signalling. These metals are also essential co-factors of various enzymes and vital components of some proteins.
Lead also leads to impairment in the neurotransmitters and disrupts the function of GABA, dopamine, and cholinergic systems.
It also inhibits the NMDA ion channels during the critical neurodevelopmental period.

**Lead and Neurocognitive disorder**s

The effects of Pb appear to be more overwhelming in the developing brain. As a result, lead poisoning in children is associated with intellectual disability, behavioural problems, poor school performance, or developmental delays. For instance, lower intellectual scores are commonly noted in children following exposure, e.g., 3-point decrement in IQ for blood levels 5 – 20mcg/Dl and 5.3 points to 50mcg/dL. Global neurocognitive impairment is not uncommon, especially following chronic exposure.

**Neurorehabilitation and treatment**

The initial step is removing continued exposure to the contamination

Reducing circulating lead in the system is the next step, even though most of the Pb is stored in bones.

Temporal measures include giving calcium lactate and high milk diet.

Chelation therapy uses agents that bind to lead and facilitate its excretion. The chelation is regarded as lifesaving during encephalopathy

**Outcome and course**

The risk of permanent intellectual disability is common in people who don't die from toxicity. Children may develop cerebral palsy, fits, and blindness (due to optic atrophy).

**Mercury (Hg) poisoning**

**Hg the silver liquid**

This unique metal occurs in a liquid form at room temperature.

They are used in thermometers and dental procedures.

Other sources of Hg exposure include a diet high in seafood.

**Hg= inorganic, and the organic forms**

- **Inorganic** – is further divided into elemental and salts. The elemental form is the one that is used in thermometers- this in its liquid form is not readily absorbed by the body; however, the vapours are absorbed with ease. The salt form is seen in batteries and some laxatives.
- **Organic Hg** is used in pesticides and fungicides (agriculture), similar to the one found in seafood- this is associated with severe neuropsychiatric disorders.

**Exposure and absorption**

Hg is absorbed via GIT, lungs, and skin. The organic Hg is the leading cause of chronic neurotoxicity, which is often delayed. Hg inhibits the function of various enzymes such as choline acetyltransferase, and catechol O-methyltransferase which can lead to acetylcholine deficiency.

Organic Hg deposits in the CNS and causes neurotoxicity with subsequent atrophy.

**Neurocognitive and neurological aspects of Hg toxicity**

- **Acute:** Acute exposure or toxicity is often seen in industrial settings from inhaling the vapour of elemental Hg, which can cause hypoxia, permanent lung damage, and death (The

effects are usually reversible once the metal is excreted). Clinical: tremors, paresthesia, memory loss, reduced reflexes and hyper excited stated, GIT ( nausea, vomiting, or diarrhoea), skin (dermatitis and conjunctivitis).

- **Chronic: Neurological findings include** coarse tremors that may affect the hands, face, and tongue (described as hatter shakes). Peripheral neuropathy affects both sensory and motor function. Visual impairment: visual field constriction. **Cognitive and mental symptoms include** a constellation of signs called erethism manifests as anxiety, timidness, shyness, blushes, and becoming readily embarrassed in social situations. The individual may quarrel, be irritable at times, and may give up work. There are often associated neurological impairments such as ataxia, tremors, and lassitude
- **Cognitive deficits:** High levels above15mcg/L are associated with cognitive dysfunction. Global neurocognitive fallout. Children born to mothers who had high levels of Hg have reduced performance in neurological and cognitive assessments (slow reaction time, attention, and motor speed )

**Diagnosis**

Blood levels are helpful. However, because of the mercury compartment, there may be normal levels after three days, but the compartment CNS Hg may persist for 1-3 months.
X-ray: In an acute setting, Hg deposits may be found in the lungs and stomach.
Urine: 24-hour urine Hg levels are the gold standard marker of the Hg in chronic toxicity.

**Management**

Remove the source of exposure. Supportive measures oxygen hydration, bronchodilators, Chelation: facilitation of Hg excretion via the urine can be achieved by using thiol-based agents. such as dimercaprol, penicillamine, and succiner.

**Course**

The cognitive deficits persist for many years

**Reference List**

Briani, C., Dalla Torre, C., Citton, V., Manara, R., Pompanin, S., Binotto, G., & Adami, F. (2013). Cobalamin deficiency: clinical picture and radiological findings. *Nutrients*, *5*(11), 4521–4539. http://doi.org/10.3390/nu5114521

Damasceno, B. P. (2015). Neuroimaging in normal pressure hydrocephalus. *Dementia & Neuropsychologia*, *9*(4), 350–355. http://doi.org/10.1590/1980-57642015DN94000350

Kopelman, M. D. (2002). Disorders of memory. *Brain : a Journal of Neurology*, *125*(Pt 10), 2152–2190. http://doi.org/10.1093/brain/awf229

Ota, Y., Capizzano, A. A., Moritani, T., Naganawa, S., Kurokawa, R., & Srinivasan, A. (2020). Comprehensive review of Wernicke encephalopathy: pathophysiology, clinical symptoms and imaging findings. *Japanese Journal of Radiology*, *38*(9), 809–820. http://doi.org/10.1007/s11604-020-00989-3