NUTRITION, LIFESTYLE AND BRAIN HEALTH: A LIFE COURSE APPROACH

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DISCLOSURE

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BRAIN HEALTH

- **Brain health refers to how well a person's brain functions in the domains of cognitive health involving motor, emotional and tactile functions**

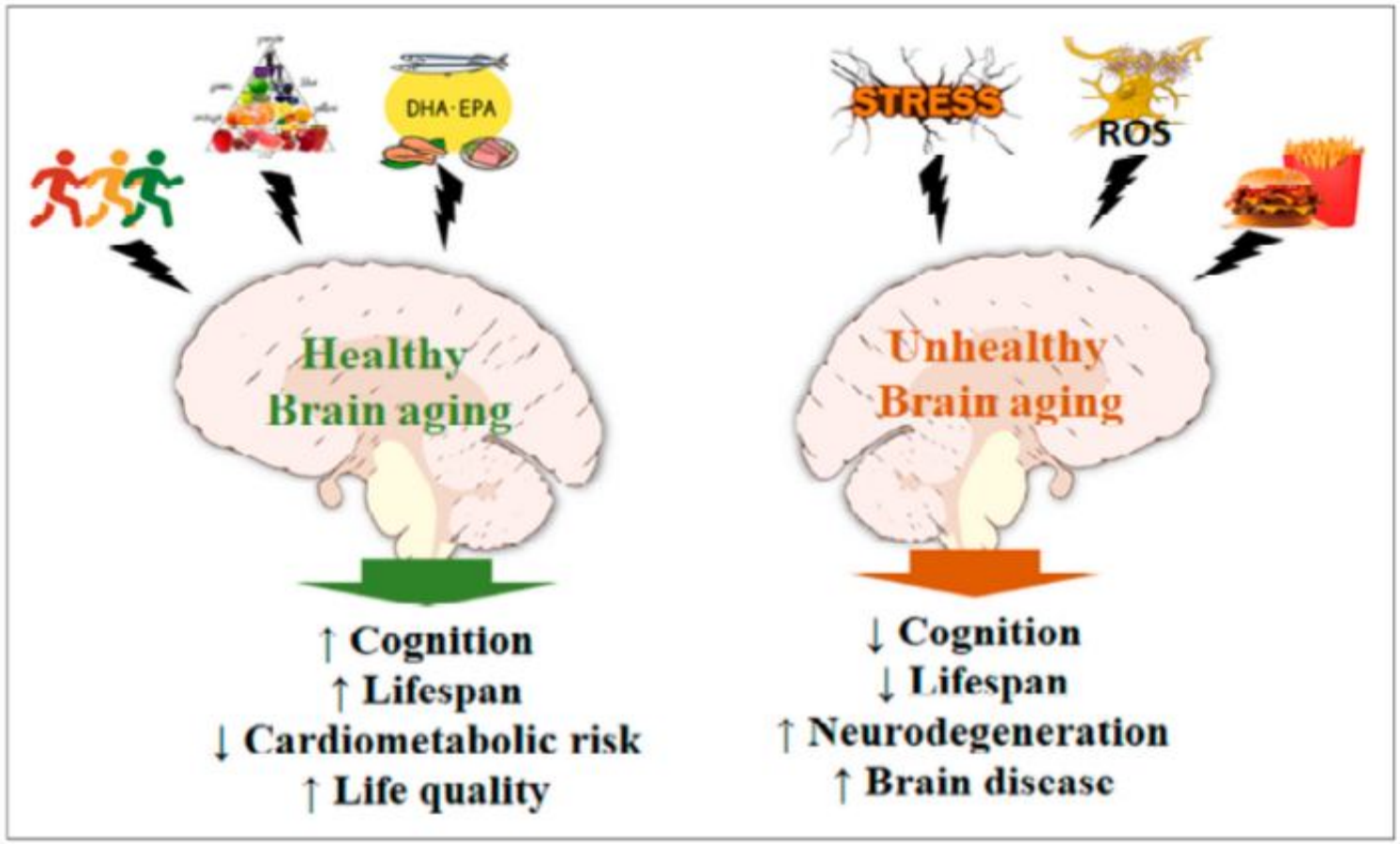
- **According to Hendrie et al (2006)- "Cognitive health is the development and preservation of the multidimensional cognitive structure that allows older people to maintain social connectedness, an ongoing sense of purpose and the abilities to function independently, to permit functional recovery from illness or injury, and to cope with residual functional deficits"**

- **Age related cognitive decline is now among the main causes of lost DALYs in people over 65 years of age**

According to the ARDSI India Dementia Report (2020), 5.3 million people in India above the age of 60 have dementia

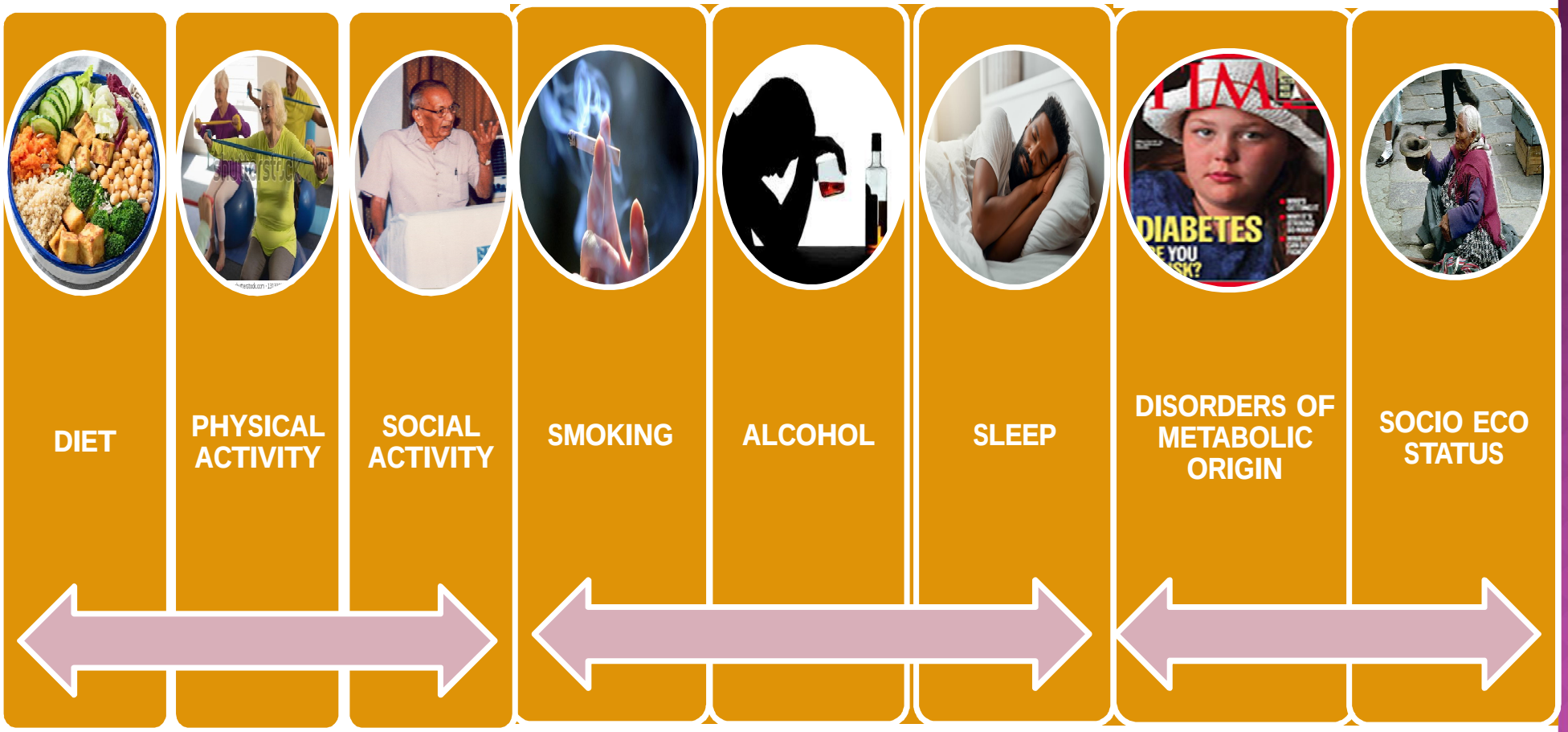
Addressing age related decline in neural function is a key to preserving the autonomy and well-being of older people

BRAIN DYNAMICS IN HEALTHY AND UNHEALTHY AGING



Source: Freitas et al, 2017

LIFESTYLE RISK FACTORS



GUT AND BRAIN HEALTH

- **Gut microbiome is highly sensitive to lifestyle aspects- diet, sleep deprivation, circadian rhythm disturbance, chronic noise, sedentary behaviour - important risk factors for development of Alzheimer‘s**

- **Several researches show the effects of intestinal dysbiosis, caused by changes in diet, antibiotics, NSAIDs and pathogenic microorganisms, on cognitive functions**

- **Evidence for the beneficial effects of dietary fibres and probiotics through management of gut microbes is strongly emerging**

DIET & DIETARY PATTERNS

- The 'whole diet approach' theory i.e. a balanced diet, as a whole, rather than single nutrients is beneficial for brain health
- Specific dietary patterns may prove more valuable than consuming individual food/food groups
- Consumption of refined cereals and grains were associated with worse cognitive function and decline
- Better attention, visual, episodic verbal and working memory and executive function in adults and elderly who consumed fish but worse cognitive and executive function was reported on consumption of red meat
- High-fat milk consumption was associated with worse cognitive function and cognitive decline, while no association was seen with cheese and ice-cream intake

(Hosking et al., 2019;Shakersain et al., 2018; Bajerska et al., 2014)

DIET & DIETARY PATTERNS

- **Better cognitive function and less cognitive decline were seen in subjects who consumed:**
  - **avocados**
  - **berries**
  - **plant-based foods**
  - **extra-virgin olive oil**
  - **legumes**
  - **walnuts**
- **Fruits, potatoes and vegetable consumption were not associated with better cognitive function**

(Hosking et al., 2019; Klimova et al., 2019; Bhushan et al., 2018; Whyte et al., 2018; Scott et al., 2017;Anastasiou et al., 2017; Trichopoulou et al., 2015; Galbete et al., 2015; Bajerska et al., 2014;Wengreen et al., 2013)

DIET & DIETARY PATTERNS

Mediterranean diet

- **Crusty breads, rice, legumes & beans, seeds, fishes & seafood, goats cheese & yoghurt, vegetables & fruits, herbs, olive oil, red wine**

- **Low in saturated fat & animal protein, high in MUFAs, carbohydrates & fibre, antioxidants & phytochemicals**

- **This diet is linked with better cognitive function, a low risk of cognitive decline and reduced risk of dementia including Alzheimer's**

Solfrizzi and Panza, 2014; Woodside et al, 2014, Lourida et al,2013

DIET & DIETARY PATTERNS

- **The Nordic Diet** is based on the types of food consumed in Scandinavian countries. The emphasis is on non-animal based nutrients such as fruits and vegetables and the consumption of fish, canola oil, and several types of meat

- **Subjects who followed the Nordic Diet had increased levels of cognitive functioning compared to baseline**

- **Asian plant-based dietary patterns** are based on foods like green leafy and other vegetables, soy, whole grains, green tea, mushrooms, and seaweed
- **Associated with reduced risk of cognitive impairment, slower rate of cognitive decline, better scores on logical memory**

(Rajaram et al, 2019; Männikkö et al., 2015)

DIET & DIETARY PATTERNS

Mediterranean-DASH (Dietary Approaches to Stop Hypertension) Intervention for Neurodegenerative Delay (MIND diet)

- **At least 3 serving of whole grains, salad, GLVs, a glass of wine, and nuts everyday; beans every other day, poultry and berries twice a week and fish once a week**

- **Significant associations between MIND diet and slower cognitive decline**
- **Strict compliance - approx 53% lower risk of Alzheimer's Moderate compliance - 35% lower risk**

- **Another study reported improved verbal memory score over six years, but no associations were obtained on the cognitive decline**

Berendsen et al, 2018; Morris et al, 2015

Breakfast

- **Breakfast may be the most important meal of the day, especially in terms of maintaining good cognitive health**

- **Skipping breakfast increases the risk of cognitive decline in middle-to-old age, while maintaining a temporal distribution of energy intake during a day helps maintain cognitive health**

Protein

- **No significant associations between protein intake and global cognition in old age (Coelho-Junior et al., 2021)**

- **Memory and protein intake were positively correlated in 3 studies**

- **A dose–response meta-analysis showed that an increment of 100 g per week of fish intake was associated with an 11% lower risk of AD**

NUTRIENTS

FATS

- **High-fat diet increases the risk of obesity, diabetes, development of cognitive deficits and Alzheimer's disease**
- **High SFAs associated with worse cognitive and verbal memory trajectories; higher MUFA intake related to better trajectories**
- **PUFAs help maintain cognitive function and prevent dementia due to their anti-thrombotic and anti-inflammatory properties**
- **The omega-3 FA modify neurotransmission, reduce neuro-inflammation and promote neuronal survival and neurogenesis. Low dietary intake of omega-3 PUFAs can contribute to memory loss**
- **A high omega-6 FA intake adversely impacts cognition by depleting DHA**
- **A low omega- 6/3 ratio predicts better cognitive function in healthy older people**

Andruchow et al, 2017; Spencer et al., 2017; Wu et al, 2015; Bazinet and Layé, 2014; Francis and Stevenson,2013; Sheppard and Cheatham, 2013; Gillette-Guyonnet et al., 2013;Okereke et al,2012

NUTRIENTS AND CONSTITUENTS

Vitamin D

- Low vitamin D levels increase AD risk 7 years later (Annweiler et al., 2011)
- Serum 25(OH)D levels are lower in those with impaired cognitive function and AD than healthy controls (Goodwill and Szoeke, 2017)

Antioxidant vitamins (E and C)

- While many studies show a reduced risk of cognitive decline, with intake of antioxidant vitamins (E & C), mixed results have been reported (Basambombo et al., 2016; Beydoun et al., 2016;Nooyens et al., 2015)

B group vitamins

- Studies assessing the association of B vitamins and cognition in the elderly were inconclusive (Agnew-Blais et al., 2015; Dangour et al., 2015; Doets et al., 2013)

Polyphenols, caffeine, isoflavones – inconclusive results

PHYSICAL ACTIVITY/ EXERCISE

- **Low fitness in early adulthood is associated with increased risk for early onset dementia later in life**
- **RCTs have shown that even acute bouts of exercise can provide small benefits to cognition**
- **Recent meta-analyses have indicated that longer duration exercise interventions can enhance cognition in healthy people>50 years and individuals at risk of/diagnosed with AD**
- **Higher aerobic fitness level was related to higher hippocampal volume and better memory performance**

Northey et al, 2018; Panza et al, 2018; Morris et al, 2017; Nyberg et al, 2014; Wendell et al, 2014; Benedict et al, 2013; Chang et al, 2012

Physical exercise - widely available and cost-effective approach to reduce age related cognitive decline at a large scale

- **Aerobic exercise**
- **Resistance training**
- **Multicomponent training**
- **Tai-chi**

Duration: **45-60 min of moderate/ vigorous intensity of any frequency or length is beneficial**

Frequency: **A frequency of 2 sessions week can benefit cognition**

Northey et al, 2018; Maass et al, 2015; Fiatarone et al, 2014; Vaughan et al, 2014; Nagamatsu et al

YOGA AND MEDITATION

- Yoga practice can affect the brain structure including changes in hippocampal volume. The hippocampus is involved in learning and memory processes
- While the nature of yoga's relationship with brain function seems less straightforward than it does with structure, the evidence still points toward yoga exerting a beneficial effect on brain function

- Researchers compared brain images from 50 adults who meditate and 50 adults who don't meditate. People who practiced meditation for many years have more folds in the outer layer of the brain. This process (gyrification) may increase the brain's ability to process information

- A 2013 review of three studies suggests that meditation may slow, stall, or even reverse changes that take place in the brain due to normal aging

KEEPING MENTALLY ACTIVE

- **Cognitively stimulating activities** are mentally engaging activities or exercises that challenge a person's ability to think and process information
- Mind-teaser games, educational activities, intellectual inquiries, solving puzzles, playing board games and mental challenges - **may help memory**
- Those who regularly play games such as chess and bingo are more likely to have maintained their thinking skills
- **No specific "brain game" or "brain exercise" has shown to be effective on brain health**

Deary, 2019; Mintzer et al, 2019; Pillai et al, 2011

SOCIAL ACTIVITY

- **Social isolation and subjective loneliness are risk factors for cognitive impairment and dementia among older people**
- **Active social engagement, including contact with family and friends and positive social support and engagement in leisure activities are beneficial**
- **Conversation time was an important predictive factor for MMSE score and longer durations of conversation time (more than 321.1min) had a negative effect on cognitive function among older people (related to low activity)**
- **The cognitive-reserve hypothesis suggests that participation in intellectual, social and physical activities stimulates brain function, resulting in the prevention of dementia**

Kimura et al, 2019; Kuiper et al, 2015; Marioni et al, 2015; Stern, 2012; Fratiglioni et al, 2004

SOCIO-ECONOMIC STATUS (SES)

- **Continuous cognitive stimulation throughout life, including formal education, engagement in cognitively stimulating activities and occupation protects against age-related cognitive decline and reduces the risk of developing Alzheimer's disease**
- **Individuals with low educational level have accentuated decline in memory, verbal skills and functional level**
- **Occupation is related to reduced risk of developing cognitive impairment**
- **Higher lifetime educational level and occupation (e.g. manager, professional, technician) were associated with a reduced dementia risk, in contrast to lower educational level and occupation (e.g. unskilled, semiskilled skilled trade, clerical/office worker)**
- **Occupation, representing an indicator of social class and socioeconomic inequalities, could be a better long-term predictor of cognitive decline than education**

Baldivia et al, 2008;Cook et al, 2008, Weinreb et al, 2002; Stern et al (1999)

SMOKING AND ALCOHOL

- Smokers have 30% increased likelihood to develop dementia
- Chronic smoking in adults is associated with accelerated age-related brain volume loss
- Prolonged alcohol exposure can result in a wide range of adaptive responses of neurons, changes in brain function, and significant brain damage
- A cohort study revealed participants who did not drink alcohol and those who drank alcohol frequently at midlife were twice as likely to have MCI more than those who drank alcohol infrequently
- However, no significant association was found between alcohol intake and the incidence of MCI in another 2 cohort studies

Hui et al, 2019; Shokri-Kojori et al 2017; Durazzo et al 2017; Zhong et al, 2015; Sutherland et al, 2014; Sabia et al, 2012

POLLUTION

- In elderly, exposure to higher levels of fine air pollutants may cause decline in memory which leads to Alzheimer's-disease like brain damage
- Fine particles i.e. PM 2.5 which come from traffic exhaust, smoke and dust remain airborne for long periods, get inside buildings, be inhaled easily, and reach and accumulate in the brain
- With an increase of 2.81 ug/m3 of PM2.5, the annual memory decline rate was accelerated by 19.3%

Fine particle pollution is associated with asthma, cardiovascular disease, lung disease and premature death (Petkus,2019)

SLEEP

- Sleep is important for brain plasticity and memory consolidation
- Sleep disturbance is a common problem for older people as well as patients with MCI and dementia
- Longer sleep duration may increase the risk of dementia, function as an early symptom of dementia, or be associated with sleep disorder-related breathing and smoking habits

Spira et al, 2017; da Silva, 2015; Benito-León et al, 2014; Abel et al, 2013

DISORDERS OF METABOLIC ORIGIN

- Insulin resistance and type 2 diabetes predict the development of aging-related diseases and a preserved insulin action is strongly associated with longevity
- AD development and symptoms are closely related to an insulin-resistant brain state, and type 2 diabetes mellitus is a risk factor for dementia and AD
- Intranasal insulin therapy in patients with AD or mild cognitive impairment has been associated with improvement in cognitive function

Craft et al, 2017; Bertram et al, 2016; Claxton et al, 2015; Akintola and van Heemst, 2015

Preventing dementia throughout life

Source: Barnett et al, 2013

PREVENTION

- Strategies to promote brain health throughout the lifespan should target individuals at each phase of life to adopt a healthy lifestyle, be engaged in cognitively stimulating activities and be socially active
- Strategies should include the optimizing of diet through the life course, reducing behaviors such as smoking and early detection and treatment of reversible causes of cognitive impairment throughout life
- Preventive approaches are required for 40-50 year olds, before they develop dementia
- Given the potential burden of dementia on society, it should be a public health priority to educate both clinicians and the population to understand that risk for dementia is driven by lifestyle choices as well as genetic predisposition
- The commonality of dementia risk with cardiovascular and diabetes risk suggests that dementia be added to present non-communicable disease management and broader public health programs


thank you
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謝謝
ngiyabonga
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gracias
спасибо
Баярлалаа
dank je
tapadh leat
bedankt
dziękuję
obrigado
sukriya
kop khun krap
go raibh maith agat
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merci
terima kasih
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