Nutrition and Brain Health for People with Intellectual and Developmental Disabilities

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Nutrition and Brain Health

- **What is brain health?** And how do we promote it?
  Youth: Brain maturation and development and academic achievement.
  Older adults: Dementia and cognitive impairment; and
  Across the lifespan: Cognition, anxiety and depression, quality of life, and sleep.

Learning Objectives

At the completion of this webinar, participants will be able to
1. Name several risk factors for Alzheimer’s disease and related
dementia (ADRD).
2. Identify nutrients that promote brain health and their rich food
sources.
3. Explain the characteristics of a healthy diet that can help reduce risk
for chronic diseases associated with ADRD.
4. Explain the benefits of physical activity, sleep, and social
interactions. State ways for improving these factors.
5. Use goal setting as a technique for achieving healthy eating goals.
6. Explain why cultural factors should be considered in providing
nutrition care.
7. Summary
Topics

1. Pillars of brain health
   Factors affecting brain health-Life span perspectives Why nutrition?
2. Common health concerns in people with IDD contributing to poor nutrition.
3. What is a healthy diet? A variety of dietary patterns. What is the best diet for reducing risks for AD and ADRD?
   General applications to obesity, diabetes, heart health and high blood pressure “A healthy heart is good for the brain.”
4. Selected nutrients and their functions related to brain health
5. Physical activity, sleep, and socialization; ways for improving these factors.
6. Cultural influences on food choices. Communications
7. Knowledge to action
8. Summary
The Brain: Pillars of Brain Health

- Stay active
- Eat well
- Sleep well
- Exercise your brain
- Connect with friends and family
- Relax and reduce stress
- Control risk factors (diabetes, hypertension, obesity, depression)

(Source: Acti-v8 Your Brain, Global Alzheimer’s Platform)

National Institute on Aging, 2019
Table 1. Risk factors for dementia

<table>
<thead>
<tr>
<th>Non-modifiable Risk Factors</th>
<th>Cardiovascular Disease Risk Factors</th>
<th>Lifestyle Risk Factors</th>
<th>Other Risk Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advancing age</td>
<td>Atherosclerosis</td>
<td>Alcohol use – Heavy use</td>
<td>Education - Low level</td>
</tr>
<tr>
<td>Genetics</td>
<td>Diabetes - Poorly controlled</td>
<td>Current smoking</td>
<td>Cognitive and social engagement – Lack of engagement</td>
</tr>
<tr>
<td>Family History</td>
<td>Hypertension</td>
<td>Diet</td>
<td>Mental illness - Depression</td>
</tr>
<tr>
<td>Down Syndrome</td>
<td>Midlife Obesity</td>
<td></td>
<td>Traumatic brain injury</td>
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<tr>
<td></td>
<td>Physical Inactivity</td>
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</table>

Alzheimer’s Association 2021
Why Nutrition?

• “Nutrition can influence our risk of developing dementia and our chances of ‘living well with dementia’ if we develop the disease...Maintaining an adequate diet is challenging for people with dementia, leading to ...undernutrition. All people with dementia should have their weight monitored and nutritional status assessed regularly.” (ADI, 2014).

• Immediate and intensive intervention should be provided for people with confirmed undernutrition (ADI, 2014).

(ADI: Alzheimer’s Association International)
Individuals with IDD: Health Issues

- Epilepsy
- Obesity
- Cardiovascular diseases
- Diabetes
- Sensory impairments
- Osteoporosis
- Gastrointestinal issues (GERD, constipation)
- Hypothyroidism
- Metabolic syndrome
- Malnutrition
- Immobility

Bent woman: En-wikipedia images
Other photos: Public Health Image Library
https://phil.cdc.gov/phil/details.asp
Nutrition: A Life Course Approach

- Nutrition in early life affects nutrition in old age. From womb to the tomb.

Photos: From CDC.gov
Key Principles

Many factors affect health. Health has many dimensions.

Diet and Nutrition are a strong determinant of health.

People need the same nutrients but the amount will vary according to individual needs.

Total diet quality over time, and not individual food or nutrient is key.

In addition to diet, other factors affect brain health and Alzheimer’s disease and related dementias. See table 1.

Older adults and individuals with IDD are a nutritionally vulnerable group. Why?
Nutrients Nourish the Brain

- The brain – Active metabolism
- Needs sufficient calories and nutrients for health.
- Foods deliver these.
- Carbohydrates (glucose for the brain) & fiber, proteins, lipids/fats, vitamins, minerals and water/fluid
- Malnutrition affects brain structure and function throughout the life course

(Dauncey, 2012; Morris, 2012)

Photos Courtesy of USDA ARS.Snaped.fns.USDA
## Carbohydrates, Proteins, and Lipids/Fats

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>Percent (%)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrate</td>
<td>45-65</td>
<td>Supplies large proportion. The range offers flexibility.</td>
</tr>
<tr>
<td>Protein</td>
<td>10-35</td>
<td>The range offers flexibility.</td>
</tr>
<tr>
<td>Fat/Lipid</td>
<td>20-35</td>
<td>Most concentrated source of calories. Has a place in healthy diets. The range offers flexibility.</td>
</tr>
</tbody>
</table>

(IOM, DRI, 2005)
Vitamins

Do not yield energy, but help in many body functions and processes.

Examples:
• Growth, maintenance and repair of tissues
• Energy production
• Bone formation
• Red blood cell formation
• Maintenance of vision
• Blood clotting

(Callahan 2020)

Vitamins are divided according to their solubility:
Fat-soluble: Vitamins A, D, E, and K
Water-Soluble: (See the links for details) Some examples
B1-Thiamine
B2-Riboflavin
B3-Niacin
B12-Cyanocobalamin
B9- Folate (Folic acid) (Medline Plus, 2021)
Minerals

Do not yield energy but some help in energy production.
Regulate body functions and processes
Examples
• Growth, maintenance & repair of tissues
• Bone formation
• Red blood cell formation
• Fluid & electrolyte balance
• Nerve transmission
• See the link for complete list.

Examples:
• Calcium
• Iron
• Iodine
• Phosphorus
• Magnesium
• Sodium
• Potassium
• Zinc

https://www.accessdata.fda.gov/nutritionfactslabel/assets/images/MineralsChart_March2020.png
Water

- People live longer without food that they do without water.
- Water maintains cell volume.
- Acts as a solvent.
- Transports nutrients and other substances in the circulation.
- Excretes waste products of metabolism.
- Regulates body temperature, and maintains normal fluid and electrolyte balance (Armstrong, 2010).
- Aids in maintaining normal blood pressure and cardiac and renal function (Roumelioti et al., 2018).

- Dehydration disrupts cognitive and physical performance and causes fatigue and delirium (Popkin, D’Anci & Rosenberg, 2010).
Nutritional Factors and Dementia Risk Reduction

B Vitamins: Water-soluble
Folate (vitamin B-9) and vitamin B-12 (Cobalamin)
• Have interrelated roles in human health
• Affect neurological health
• Folate – preventive for neural tube defect (such as spina bifida and anencephaly)
(Morris, 2012)

CDC used in
https://upload.wikimedia.org/wikipedia/commons/7/7e/Spina-bifida.jpg
https://ods.od.nih.gov/factsheets/Folate-HealthProfessional/
B Vitamins, continued

Folate or vitamin B-6 or vitamin B-12 deficiency

→ Insufficient evidence for association with cognitive decline or dementia

**Folate deficiency:** Raises homocysteine blood level. A risk factor for cardiovascular disease (CVD)

CVD is a risk factor for Alzheimer’s disease and related dementia (Alz Assoc 2020).

Consistent evidence for Elevated homocysteine level: Associated with cognitive decline

• **Conclusion:** Insufficient evidence to support an association between either folate or vitamin B12 deficiency

Deficiency may contribute to amyloid and tau protein → Neuron death (Mielech et al, 2020)

(Alzheimer’s Disease International, 2014)
B Vitamins, Continued

Folate and vitamin B-12: Functions

- DNA and red blood cell and protein/tissue formation
- Deficiency of vitamin B-12
  - Peripheral neuropathy
  - Megaloblastic anemia (large, immature red blood cells)
  - Fatigue
  - Cognitive impairment

(Morris, 2012)
Vitamin B-12

- Naturally found only in animal products
  - Vitamin B-12 deficiency:
    - More likely due to malabsorption (rather than dietary deficiency).
- Lack of factors in the stomach that promote B-12 absorption
  - Intrinsic factor
  - Hydrochloric acid
- Atrophic gastritis in older adults
  - Up to 30% of older adults
- Helicobacter H pylori infections in the stomach

RDA for VITAMIN B-12

• 14-18 years old: 2.4 micrograms per day

• 19 and older: 2.4 micrograms per day

Advice for older adults

• Meet the RDA by use of
  ◦ Synthetic vit B-12 supplement
  ◦ Vitamin B-12 -fortified foods

http://ods.od.nih.gov/factsheets/VitaminB12-HealthProfessional/
Niacin

**Niacin**: Water-soluble vitamin

- Functions in energy metabolism and production
- The body can form it from tryptophan, an essential amino acid
- The RDA: Expressed in niacin equivalent

**Deficiency disease - Pellagra**

**Dermatitis, diarrhea, and dementia**

- A study, with 3718 participants (65 yrs. and older), in 1993-2002 results: Higher dietary intake of niacin was associated with slower annual rate of cognitive decline. Dietary niacin may protect people from Alzheimer’s dementia and age-related decline

(Morris et al 2004)
Oxidative Stress and Inflammation

Theory

• Brain: Prone to oxidative stress and damage to neuronal tissue
• Oxidative damage and neuron inflammation
• Underlying cause of neurodegenerative diseases (AD and Parkinson’s disease)

Other theories: Mitochondrial dysfunction, production of neurotransmitters

• Anti-oxidants may help prevent damage. (Morris, 2012), (Mielech et al, 2020)
• (Next are the antioxidant nutrients)
# Selected Antioxidant Nutrients: RDA

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>RDA (Per Day Basis)</th>
<th>Select Food Sources</th>
</tr>
</thead>
</table>
| Vitamin C | Adults: Men 90 mg  
Women: 75 mg | Citrus fruits, red and green  
peppers, kiwi,  
Other fruits and vegetables:  
Broccoli, strawberries |
| Vitamin E | Adults 15 mg | Vegetable oils: Wheat germ,  
sunflower, and safflower oils  
Nuts: Peanuts, hazelnuts, and,  
especially, almonds) and seeds |

Source: https://ods.od.nih.gov/factsheets/list-all/

Callahan et al. 2020
N-3 Fatty Acids (Omega-3) and the Brain

- Long-chain polyunsaturated fatty acids
- Alpha-linolenic (ALA)
- Eicosapentaenoic acid/EPA
  - Predominant fat in the brain
- Docosahexaenoic acid/DHA

National Institute on Aging, 2019
How do omega-3s work in cardiovascular health?

Fish and omega-3 fatty acids

• Lower blood pressure
• Reduce blood triglyceride level
• Omega 3 may reduce inflammation

• 1.6 g a day for men; 1.1 g a day for women
• Conclusion: Evidence on beneficial effect is conflicting. Protective role does not exist.

(Morris, 2012)
Heart and Brain Connection

http://tuftsjournal.tufts.edu/2008/07/briefs/03/

http://www.firstaidcafe.co.uk/clipart/clipartlib/pages/heartAnatomy_jpg.htm
Diet Review by the American Diabetes Association for Medical Nutrition Therapy of Diabetes

**Outcome measures:**
- Weight loss,
- AIC,
- Lowered Blood pressure,
- Increased HDL, and
- and lowered triglyceride

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- DASH Style
  (Dietary Approach to Stop Hypertension)
- Mediterranean Style Diet
- Vegetarian style or vegan
- Paleo diet

<table>
<thead>
<tr>
<th>Low fat. Fat 30% of total calories and saturated fat intake 10%.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very low fat: 70–77% carbohydrate (including 30–60 g fiber), 10% fat, 13–20% protein</td>
</tr>
<tr>
<td>Low-carbohydrate diet: Carbohydrate 26–45% of total calories</td>
</tr>
<tr>
<td>Very low carbohydrate diet: Less than 26% of the calories as carbohydrate. 20-50 g of non-fiber carbohydrate (MIND Diet: Not reviewed)</td>
</tr>
</tbody>
</table>
Nutrition: From Nutrients to Foods

Maintaining general health and wellness

- Provide a balanced diet with a variety of foods.
  - Offer vegetables, fruits, whole grains, low-fat or fat-free dairy and dairy products and lean protein foods, and adequate fluid.

- Choose foods low in saturated or fat, cholesterol, and added sugar.
  - Some fat is essential for health — but not all fats are equal.
    - Limit fats that are unhealthy for heart health, such as butter, solid shortening, lard, and fatty cuts of meats.

- Good nutrition helps the brain
What's MyPlate All About?

Source: US Dietary Guidelines, 2020-25
Benefits of Physical Activity for Adults and Older Adults

- Lower risk of all-cause mortality
- Lower risk of cardiovascular disease mortality
- Lower risk of cardiovascular disease (including heart disease and stroke)
- Lower risk of hypertension
- Lower risk of type 2 diabetes
- Lower risk of adverse blood lipid profile
- Lower risk of cancers of the bladder,* breast, colon, endometrium,* esophagus,* kidney,* lung,* and stomach*
- Improved cognition*
- Reduced risk of dementia (including Alzheimer’s disease)*

- Improved quality of life
- Reduced anxiety
- Reduced risk of depression
- Improved sleep
- Slowed or reduced weight gain
- Weight loss, particularly when combined with reduced calorie intake
- Prevention of weight regain following initial weight loss
- Improved bone health
- Improved physical function
- Lower risk of falls (older adults)
- Lower risk of fall-related injuries (older adults)*

Sleep

• **Glymphatic system**
  
  • Sleep helps brain health. It serves as a garbage disposal for the brain. Sleeping – a garbage collector that comes during the night and removes the waste product left by the brain. This allows the brain to function normally the next day when one wakes up.

• Aim for 7-8 hours of sleep.

• Set a schedule – go to bed and wake up at the same time each day.

• Create a room for sleep – avoid bright lights and loud sounds, keep the room at a comfortable temperature, and don’t watch TV or have a computer in your bedroom.

• Brain basics. [https://www.ninds.nih.gov/Disorders/Patient-Caregiver-Education/Understanding-Sleep](https://www.ninds.nih.gov/Disorders/Patient-Caregiver-Education/Understanding-Sleep)
Social Relationships

- “...influences of social relationships on the risk of death are comparable with well-established risk factors for mortality such as smoking and alcohol consumption and exceed the influence of other risk factors such as physical inactivity and obesity.”
  (Holt-Lunstad et al, 2010)
- Improve the ability to cope with stressful situations
- Alleviate the effects of emotional distress
- Promote lifelong good mental health
- Enhance self-esteem
- Lower cardiovascular risks, such as lowering blood pressure
- Promote healthy lifestyle behaviors
- Encourage adherence to a treatment plan (Mayo Clinic, n.d.)

How to get involved?
Culture, Food, and Communications

• What is culture?
  • “Most simply, it is the learned and shared behavior of a community of interacting human beings” (Useem & Useem, 1963).

• Culture also encompasses language, communication styles, social values, and religious behaviors. Shapes how people view the world, their attitudes about health (University of Massachusetts, 2003)

Interactions with others.

Non-confrontational; assertive style

• Expression of emotions. Indirect or direct.

• Disclosure of information. Willingness to disclose personal or family information to a stranger.

• Volume of speech. Tone of voice
• Silence. Use of silence
Some tips for communicating with cultural groups

- **Eye contact.** Looking people straight in the eye or indirect
- **Physical space.** Physical distance from each other
- **Body movements.** Use of body language
- **Gender roles.** Traditional role expectations based on gender
  Others are more flexible about gender roles.
- **Perception of time.** Time orientation
- **High Context and low context**

- Avoid misinterpretation of your words or intention.
- Avoid using slang, metaphors, and other expressions that may be hard to understand.
- Use plain language. Listen more and talk less.
- Instead of judgments about behaviors, make observations
From Knowledge to Action

• Learning theories have been used to better teach and motivate people to achieve desired behavior changes.

• Examples:
  • Self-Efficacy
  • Social learning theory
  • Cognitive behavioral theory
  • Goal-setting: A helpful tool for achieving desired behaviors (such as in eating)

(Four theories of learning https://www.iedunote.com/learning-theories)
Goal Setting

• Goals should be clear and achievable. They are written using the SMART guidelines.
• **S** = Specific
• **M** = Measurable: The goal includes an outcome that can be observed and assessed.
• **A** = Attainable/Achievable.
The goal has an outcome that is realistic given the participant’s current social, economic, or cultural resources and time available
• **R** = Realistic
Start small; with what the participant can and will do and let the participant experience the joys of meeting their goal
• **T** = Time Bound
The goal has timeframe for the goal: for next week, in three months, by six months. Setting an end point for the goal gives the participant a clear target to achieve
Goal setting, continued

I will increase my fiber intake by eating one more serving of vegetables in one meal each day.

- The goal is specific.

- It has an outcome measure (eating one more serving) that can be assessed.

- It is achievable. (If it is based on assessment of a person’s ability and resources.)

- It is realistic (If it is based on assessment of a person’s ability and resources.)

- It is time-bound (each day).

How can you improve these goals?

- I will increase my fiber intake.

- I will drink less sugar-sweetened beverages.
Summary

- Brain health has several pillars. Healthy eating is one of them. Good nutrition is good for the brain.
- No one diet fits all. The menu should be individualized to each person’s needs and preferences.
- Nutrients are interrelated in working together in the body. No one single food or nutrient can deliver the benefits of the whole.
- The total dietary pattern overtime that includes foods that taste and look good is key.
Summary, Continued

While we are waiting for the “cure”, meanwhile we can change our modifiable lifestyle and risk factors.

• Healthy eating/nutrition
• Physical activity
• Smoking cessation
• Alcohol use/abuse
• Rest and sleep
• Controlling risks for diabetes, obesity, heart disease

Social relationships and active engagement of the brain in intellectual stimulation can also help

(Hu et al, 2013, Baumgart, 2015)

Autonomy as much as possible and supported decision-making by the individual.
Questions

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