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Vital Role Of Vitamins In Neurological Disorder

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❖ **Abstract**

Vitamins are very important for keeping the brain and nervous system healthy. They help the body produce energy, repair nerve cells, and send messages between the brain and other parts of the body. A lack of vitamins such as B1, B6, B12, folate, vitamin D, and vitamin E can cause problems like memory loss, nerve pain, depression, and other brain disorders.

Getting enough vitamins through food or supplements can help prevent or reduce the risk of diseases like Alzheimer's disease, Parkinson's disease, and neuropathy. This study explains how vitamins support brain health and how their deficiency can lead to neurological problems.

❖ **Keywords:** Vitamins, Brain health, Neurological disorders, Deficiency ,Nervous system

❖ **Introduction :**

This review's objective is to present a thorough summary of what is known about the function of micronutrients in a few different neurological conditions. Trace elements and vitamins make up this category of micronutrients. Although the amount of micronutrients in the human body is relatively little (trace elements up to 50 mg/kg; trace element and vitamin plasma levels range from µmol/L to mg/L), the organism needs them for a number of vital processes.(1)

In response to these issues, national governments and international groups have started a number of initiatives aimed at improving knowledge and halting or slowing the progression of neurodegenerative diseases. One prominent example of such initiatives is the EU Joint Programme—Neurodegenerative Disease Research (JPND), a cooperative research program created to coordinate the research efforts of EU member states and related countries in the battle against neurodegenerative disorders [2].

Numerous studies that have been extensively discussed in the literature show that food is essential for both supportive therapy and prevention. By lowering oxidative stress, reducing inflammation, and promoting neuroplasticity, proper nutrition can provide preventive effects and potentially halt the progression of disease. Nutrients such as proteins, lipids, carbs, vitamins, and minerals are found in different amounts in

the human diet. A number of vitamins have been linked to the prevention, treatment, and possible slowing of neurodegenerative illnesses (Figure 1) [6,7,8]. Vitamins are important for maintaining the health of the brain and nervous system.(3,4,5).

1.Vital Role of Vitamins in Neurological Disorder

Vitamins play essential biochemical and neuroprotective roles within the central and peripheral nervous systems. Deficiencies or imbalances in many vitamins can contribute to neuropathies, cognitive impairment, mood disorders, and neurodegenerative diseases. Adequate intake and therapeutic supplementation of vitamins can therefore support neuronal health, enhance neurotransmitter function, and reduce oxidative and inflammatory damage.

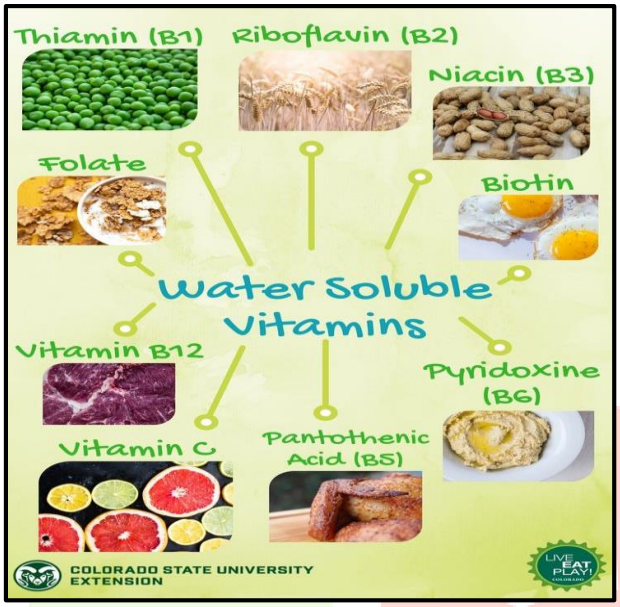

Figure 1. Water Soluble Vitamins.

2.Vitamins B

Neurodegenerative Diseases and Vitamins 3.1 Vitamins Soluble in Water 3.1.1. Vitamins B B vitamins, including B1 (thiamine), B2 (riboflavin), B3 (niacin), B6 (pyridoxine), B7 (biotin), B9

(folate), and B12 (cobalamin), are vital for preserving brain function and averting neurodegenerative illnesses.(6,7)

When vitamin B1 is taken with food or dietary supplements, no negative effects have been documented. This vitamin's absorption is decreased and the excess is eliminated in the urine when consumption surpasses 5 mg (8)

Water-soluble vitamin B1 is essential for healthy energy metabolism and neurological system operation. In turn, its

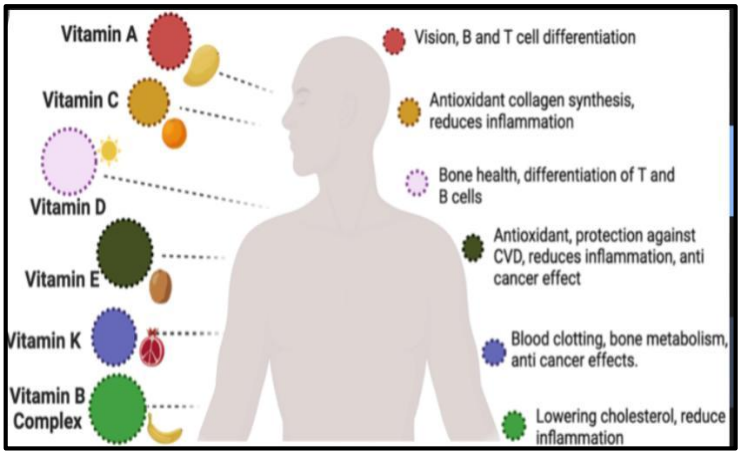

Fig no2 . Vitamins with beneficial effects on the human brain.

function in nerve impulse conduction, phosphorylation, and activation of chloride channels in neuronal membranes is essential for brain energy production and neuronal health maintenance. Additionally, thiamine contributes to the synthesis of acetylcholine, a neurotransmitter essential for learning and memory.(9)

3.Chemistry, Metabolism, Mechanisms of Action, and Suggested Daily Consumption of Vitamin D

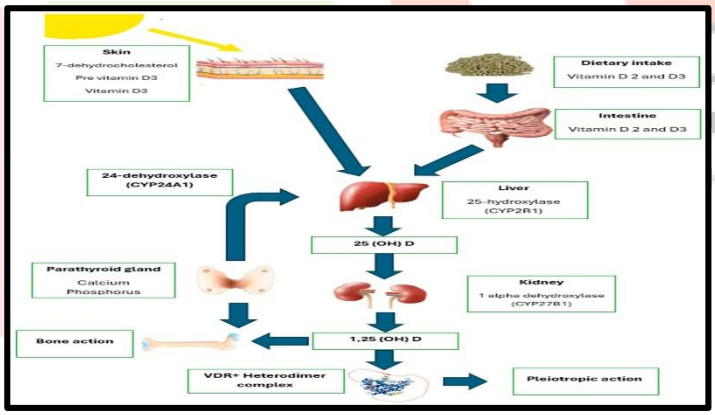

Fig no 3. Vitamin D Metabolism and Chemistry

At the the start of the nineteenth century, Sir Edward Mellanby noticed that rickets was highly common in the United Kingdom, particularly in Scotland at the time. This study led to the discovery of vitamin D [6]. After conducting some investigation, McCollum recognized rickets as a nutritional deficiency disorder and identified “vitamin D” as the element that could cure the condition (10).

Vitamin D’s Function in Gene Transcription and Immune Response Nutrigenomics is the study of how lifestyle, food consumption, and diet quality affect how the genome is expressed.(11)The following years saw the determination of the structure of vitamin D. In 1932, Askew and associates extracted vitamin D2; in 1935, Windaus and Bock discovered 7-dehydrocholesterol (7-DHC); and in 1937, Windaus and Bock explained the composition of vitamin D3.(12)

- **Vitamins Soluble in Fats**

Fat-soluble vitamins (FSVs) dissolve in fats and oils, as the name suggests. In the intestine, FSVs A, D, E, and K are absorbed.(13,14)

Other names for vitamin A include retinol or all-trans-retinol. This vitamin's molecular weight is 286.5 g/mol, and its chemical formula is C20H30O. In addition to being necessary for appropriate eye function, this vitamin also plays a role in immune function modulation. This enzyme also mediates the functioning of reproductive organs.

4.Parkinson's Disease Vitamins

• Clinical Research on Parkinson's Disease

Using Vitamins High levels of VitA and its derivatives were found in the human post-mortem frontal lobe brain, according to one study . This clinical investigation evaluated the therapeutic effects of vitamin A in the frontal lobe cortex using biomarkers. Compared to the occipital cortex, the frontal lobe cortex exhibited an age-related decrease in retinol and its derivatives. To investigate and contrast different brain regions for a comparable kind of activity, more research will be required. Furthermore, a Chinese cohort research conducted in Singapore revealed no association between the incidence of Parkinson's disease (PD) and dietary antioxidants such carotenoids and vitamins A, C, and E.**(16)**

- **Animal and plant sources of vitamin A (Retinoic acid). Vitamin A shows potent antioxidant activity. Gene regulation and neural differentiation are affected by vitamin A supplementation.**

Neuropathology Consequences

Damage to peripheral nerves (demyelination or axonal damage), damage to the central nervous system, and a unique type of myeloneuropathy (injury to both the peripheral and central nervous systems) are all consequences of the dysregulation of micronutrients .Individual micronutrient deficiencies can result in "nutritional" neuropathies and pathological alterations in the nervous system's development. For the majority of neurodegenerative processes (Alzheimer's disease, Parkinson's disease, Huntington's disease, and amyotrophic lateral sclerosis), the possible impact of micronutrient imbalance and subsequent supplementation on patient outcome has received less attention.(17)

Neuropathology, Neuroimaging, and Fluid Biomarkers in Alzheimer's Disease

Vitamin B12 directly affects tau proteins by preventing their fibrilization. AD and other forms of cognitive decline may be prevented by vitamin B3, or niacin. Although the effectiveness of long-term vitamin E treatment for AD is still unknown, it is thought to be advantageous. Amyloid-β plaque is prevented from forming by vitamin A. Hypovitaminosis of vitamin D is recognised as a risk factor for AD. Vitamin D's neuroprotective and anti-inflammatory properties are vital, but its pathogenic and therapeutic consequences are still unclear. For people with AD, it was suggested as a possible treatment option.(18,19)

5.The Approved Health Claims Concerning Vitamins and Neurodegenerative Conditions

Health claims are presented on food goods and nutritional supplements in order to properly educate customers about the qualities of vitamins, their beneficial effects on health, and their possible roles in preventing and supporting therapy for neurodegenerative disorders. Examining the health claims that are approved for use in the European Union, which has a particularly extensive food law regulatory structure, is helpful in promoting the use of vitamins in relation to neurodegenerative health. "Any claim that states,

suggests, or implies that a relationship exists between a food category, a food, or one of its constituents and health" is what EU food legislation defines as a health claim (Art. 2 (1)(5) of Regulation 1924/2006).(20)

❖ Conclusion

Vitamins play a vital role in maintaining the health of the nervous system. They support nerve growth, protect neurons from damage, and ensure smooth communication between brain and body. Deficiencies in vitamins—especially B12, B1, B6, folate, and vitamin D—can lead to serious neurological disorders. Adequate nutrition, early diagnosis, and proper supplementation are the key steps to preserving brain and nerve function throughout life.

❖ Reference:

1.Berger, M.M.; Shenkin, A.; Schweinlin, A.; Amrein, K.; Augsburger, M.; Biesalski, H.K.; Bischoff, S.C.; Casaer, M.P.; Gundogan, K.; Lepp, H.L.; et al. ESPEN micronutrient guideline. Clin. Nutr. 2022, 41, 1357–1424. [Google Scholar] [CrossRef] [PubMed]

2.Available online: https://neurodegenerationresearch.eu/ (accessed on 27 November 2024).

3.Bianchi, V.E.; Herrera, P.F.; Laura, R. Effect of Nutrition on Neurodegenerative Diseases. A Systematic Review. Nutr. Neurosci. 2021, 24, 810–834. [Google Scholar] [CrossRef]

4.Bakulski, K.M.; Seo, Y.A.; Hickman, R.C.; Brandt, D.; Vadari, H.S.; Hu, H.; Park, S.K. Heavy Metals Exposure and Alzheimer's Disease and Related Dementias. J. Alzheimers Dis. 2020, 76, 1215–1242. [Google Scholar] [CrossRef]

5.Kumar, R.R.; Singh, L.; Thakur, A.; Singh, S.; Kumar, B. Role of Vitamins in Neurodegenerative Diseases: A Review. CNS Neurol. Disord. Drug Targets 2022, 21, 766–773. [Google Scholar] [CrossRef]

6.Kumar, R.R.; Singh, L.; Thakur, A.; Singh, S.; Kumar, B. Role of Vitamins in Neurodegenerative Diseases: A Review. CNS Neurol. Disord. Drug Targets 2022, 21, 766–773. [Google Scholar] [CrossRef]

7.Helberger, N.; Forms Matter: Informing Consumers Effectively. BEUC 2013. Available online: http://www.beuc.eu/publications/x2013_089_upa_form_matters_september_2013.pdf (accessed on 27 November 2024).

8.Bettendorff, L. Thiamin. In Present Knowledge in Nutrition, 10th ed.; Erdman, J.W., Macdonald, I.A., Zeisel, S.H., Eds.; Wiley-Blackwell: Washington, DC, USA, 2012; pp. 261–279. [Google Scholar]

9.Gibson, G.E.; Hirsch, J.A.; Fonzetti, P.; Jordan, B.D.; Cirio, R.T.; Elder, J. Vitamin B1 (thiamine) and dementia. Ann. N. Y. Acad. Sci. 2016, 1367, 21–30. [Google Scholar] [CrossRef]

10.McCollum, E.V.; Simmonds, N.; Becker, J.E.; Shipley, P.G. The effect of additions of fluorine to the diet of the rat on the quality of the teeth. 1925. Studies on experimental rickets. XXI. An experimental demonstration of the existence of a vitamin which promotes calcium deposition. 1922. The effect of additions of fluorine to the diet of the rat on the quality of the teeth. 1925. J. Biol. Chem. 2002, 277, E8. [Google Scholar]

11.Brumbaugh, P.F.; Haussler, M.R. 1 Alpha,25-Dihydroxycholecalciferol Receptors in Intestine. I. Association of 1 Alpha,25-Dihydroxycholecalciferol with Intestinal Mucosa Chromatin. J. Biol. Chem. 1974, 249, 1251–1257. [Google Scholar] [CrossRef] [PubMed]

12.DeLuca, H.F. History of the Discovery of Vitamin D and Its Active Metabolites. BoneKEy Rep. 2014, 3, 479. [Google Scholar] [CrossRef]

13.Albahrani, A.A.; Greaves, R.F. Fat-soluble vitamins: Clinical indications and current challenges for chromatographic measurement. Clin. Biochem. Rev. 2016, 37, 27. [Google Scholar] [PubMed]

14.Goncalves, A.; Roi, S.; Nowicki, M.; Dhaussy, A.; Huertas, A.; Amiot, M.J.; Reboul, E. Fat-soluble vitamin intestinal absorption: Absorption sites in the intestine and interactions for absorption. Food Chem. 2015, 172, 155–160. [Google Scholar] [CrossRef]

15.National Center for Biotechnology Information. PubChem Compound Summary for CID 445354, Retinol. Available online: https://pubchem.ncbi.nlm.nih.gov/compound/Retinol (accessed on 17 September 2021).

16.Ying, A.F.; Khan, S.; Wu, Y.; Jin, A.; Wong, A.S.Y.; Tan, E.K.; Yuan, J.M.; Koh, W.P.; Tan, L.C.S. Dietary Antioxidants and Risk of Parkinson's Disease in the Singapore Chinese Health Study. Mov. Disord. 2020, 35, 1765–1773. [Google Scholar] [CrossRef] [PubMed]

17.Zhang, S.M.; Hernán, M.A.; Chen, H.; Spiegelman, D.; Willett, W.C.; Ascherio, A. Intakes of vitamins E and C, carotenoids, vitamin supplements, and PD risk. Neurology 2002, 59, 1161–1169. [Google Scholar] [CrossRef]

18.Gillette-Guyonnet, S.; Secher, M.; Vellas, B. Nutrition and neurodegeneration: Epidemiological evidence and challenges for future research. Br. J. Clin. Pharmacol. 2013, 75, 738–755. [Google Scholar] [CrossRef] [PubMed]

19Murdaca, G.; Banchero, S.; Tonacci, A.; Nencioni, A.; Monacelli, F.; Gangemi, S. Vitamin D and Folate as Predictors of MMSE in Alzheimer's Disease: A Machine Learning Analysis. Diagnostics 2021, 11, 940. [Google Scholar] [CrossRef]

20.Kang, J.; Park, M.; Lee, E.; Jung, J.; Kim, T. The Role of Vitamin D in Alzheimer's Disease: A Transcriptional Regulator of Amyloidopathy and Gliopathy. Biomedicines 2022, 10, 1824. [Google Scholar] [CrossRef]