Evidence-Based Nutritional Interventions for Pediatric Brain Health

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References

1. Suskind DL, et al. Nutritional deficiencies during normal growth. *Pediatr Clin North Am.* 2009 Oct;56(5):1035-53.

2. Kaganov B, et al. Suboptimal Micronutrient Intake among Children in Europe. *Nutrients*. 2015 May 13;7(5):3524-35.

3. Corbo MD, Lam J. Zinc deficiency and its management in the pediatric population: a literature review and proposed etiologic classification. *J Am Acad Dermatol*. 2013 Oct;69(4):616-624.e1.

4. Bird JK, et al. Risk of Deficiency in Multiple Concurrent Micronutrients in Children and Adults in the United States. *Nutrients*. 2017 Jun 24;9(7).

5. Fanjiang G, Kleinman RE. Nutrition and performance in children. *Curr Opin Clin Nutr Metab Care*. 2007;10(3):342-7.

6. Sha'ari N, et al. Nutritional status and feeding problems in pediatric attention deficit-hyperactivity disorder. *Pediatr Int*. 2017 Apr;59(4):408-415.

7. Konofal E, et al. Iron deficiency in children with attention-deficit/hyperactivity disorder. *Arch Pediatr Adolesc Med*. 2004 Dec;158(12):1113-5.

8. Wang Y, et al. Iron Status in Attention-Deficit/Hyperactivity Disorder: A Systematic Review and Meta-Analysis. *PLoS One*. 2017 Jan 3;12(1):e0169145.

9. Velasco I, et al. Iodine as Essential Nutrient during the First 1000 Days of Life. *Nutrients*. 2018 Mar 1;10(3).

10. Puig-Domingo M, Vila L. The implications of iodine and its supplementation during pregnancy in fetal brain development. *Curr Clin Pharmacol*. 2013 May;8(2):97-109.

11. Zimmermann MB. Iodine deficiency. *Endocr Rev*. 2009 Jun;30(4):376-408.

12. Kanık Yüksek S, et al. Evaluation of iodine deficiency in children with attention deficit/hyperactivity disorder. *J Clin Res Pediatr Endocrinol*. 2016;8(1):61-6.

13. Vermiglio F, et al. Attention deficit and hyperactivity disorders in the offspring of mothers exposed to mild-moderate iodine deficiency: a possible novel iodine deficiency disorder in developed countries. *J Clin Endocrinol Metab*. 2004 Dec;89(12):6054-60.

14. Kamal M, et al. Is high prevalence of vitamin D deficiency a correlate for attention deficit hyperactivity disorder? *Atten Defic Hyperact Disord*. 2014 Jun;6(2):73-8.

References

15. Khoshbakht Y, et al. Vitamin D Status and Attention Deficit Hyperactivity Disorder: A Systematic Review and Meta-Analysis of Observational Studies. *Adv Nutr*. 2018 Jan 1;9(1):9-20.

16. Kozielec T, Starobrat-Hermelin B. Assessment of magnesium levels in children with attention deficit hyperactivity disorder (ADHD). *Magnes Res*. 1997 Jun;10(2):143-8.

17. Elbaz F, Zahra S, Hanafy H. Magnesium, zinc and copper estimation in children with attention deficit hyperactivity disorder (ADHD). *Egyptian J Med Human Genetics*. 2017;18(2):153-63.

18. El-Bakry A, et al. Zinc deficiency in children with attention-deficit hyperactivity disorder. *Egyptian J Psych*. 2019 May 1;40(2):95.

19. Effatpanah M, et al. Magnesium status and attention deficit hyperactivity disorder (ADHD): A meta-analysis. *Psychiatry Res*. 2019 Apr;274:228-234.

20. Huang YH, et al. Significantly lower serum and hair magnesium levels in children with attention deficit hyperactivity disorder than controls: A systematic review and meta-analysis. *Prog Neuropsychopharmacol Biol Psychiatry*. 2019 Mar 2;90:134-141.

21. Sun GX, et al. [Relationship between serum zinc levels and attention deficit hyperactivity disorder in children]. *Zhongguo Dang Dai Er Ke Za Zhi*. 2015 Sep;17(9):980-3.

22. Hawkey E, Nigg JT. Omega-3 fatty acid and ADHD: blood level analysis and meta-analytic extension of supplementation trials. *Clin Psychol Rev*. 2014 Aug;34(6):496-505.

23. Joseph N, et al. Oxidative Stress and ADHD: A Meta-Analysis. *J Atten Disord*. 2015 Nov;19(11):915-24.

24. Montgomery P, et al. Low blood long chain omega-3 fatty acids in UK children are associated with poor cognitive performance and behavior: a cross-sectional analysis from the DOLAB study. *PLoS One*. 2013 Jun 24;8(6):e66697.

25. Sever Y, et al. Iron treatment in children with attention deficit hyperactivity disorder. A preliminary report. *Neuropsychobiology*. 1997;35(4):178-80.

References

26. Konofal E, et al. Effects of iron supplementation on attention deficit hyperactivity disorder in children. *Pediatr Neurol*. 2008 Jan;38(1):20-6.

27. Bruner AB, et al. Randomised study of cognitive effects of iron supplementation in non-anaemic iron-deficient adolescent girls. *Lancet*. 1996 Oct 12;348(9033):992-6.

28. Thompson J, et al. Effects of daily iron supplementation in 2- to 5-year-old children: systematic review and meta-analysis. *Pediatrics*. 2013 Apr;131(4):739-53.

29. Falkingham M, et al. The effects of oral iron supplementation on cognition in older children and adults: a systematic review and meta-analysis. *Nutr J*. 2010 Jan 25;9:4.

30. Szajewska H, et al. Effects of iron supplementation in nonanemic pregnant women, infants, and young children on the mental performance and psychomotor development of children: a systematic review of randomized controlled trials. *Am J Clin Nutr*. 2010 Jun;91(6):1684-90.

31. Melse-Boonstra A, Jaiswal N. Iodine deficiency in pregnancy, infancy and childhood and its consequences for brain development. *Best Pract Res Clin Endocrinol Metab*. 2010 Feb;24(1):29-38.

32. van den Briel T, et al. Improved iodine status is associated with improved mental performance of schoolchildren in Benin. *Am J Clin Nutr*. 2000 Nov;72(5):1179-85.

33. Zimmermann MB, et al. Iodine supplementation improves cognition in iodine-deficient schoolchildren in Albania: a randomized, controlled, double-blind study. *Am J Clin Nutr*. 2006 Jan;83(1):108-14.

34. Shrestha RM. The effect of iodine and iron supplementation on physical, psychomotor and mental development in primary school children in Malawi. PhD thesis. Division of Human Nutrition, Wageningen University: the Netherlands; 1994.

35. Winichagoon P, et al. A multimicronutrient-fortified seasoning powder enhances the hemoglobin, zinc, and iodine status of primary school children in North East Thailand: a randomized controlled trial of efficacy. *J Nutr*. 2006 Jun;136(6):1617-23.

36. Spedding S. Vitamin D and depression: a systematic review and meta-analysis comparing studies with and without biological flaws. *Nutrients*. 2014 Apr 11;6(4):1501-18.

37. Gracious BL, et al. Vitamin D deficiency and psychotic features in mentally ill adolescents: a cross-sectional study. *BMC Psychiatry*. 2012 May 9;12:38.

38. American Academy of Pediatrics. Fighting Vitamin D Deficiency [Internet]. Itasca (IL): American Academy of Pediatrics; 2018 (cited 2020 Mar 17). Available from: https://www.aap.org/en-us/about-the-aap/aap-press-room/aap-press-room-media-center/Pages/Fighting-Vitamin-D-Deficiency.aspx

39. Linus Pauling Institute. Micronutrient Information Center. Vitamin D. Available at: https://lpi.oregonstate.edu/mic/vitamins/vitamin-D#RDA. Accessed March 27, 2020.

40. Elshorbagy HH, et al. Impact of Vitamin D Supplementation on Attention-Deficit Hyperactivity Disorder in Children. *Ann Pharmacother*. 2018 Jul;52(7):623-631.

References

41. Dehbokri N, et al. Effect of vitamin D treatment in children with attention-deficit hyperactivity disorder. *World J Pediatr*. 2019 Feb;15(1):78-84.

42. Mohammadpour N, et al. Effect of vitamin D supplementation as adjunctive therapy to methylphenidate on ADHD symptoms: A randomized, double blind, placebo-controlled trial. *Nutr Neurosci*. 2018 Apr;21(3):202-209.

43. Hemamy M, et al. Effect of Vitamin D and Magnesium Supplementation on Behavior Problems in Children with Attention-Deficit Hyperactivity Disorder. *Int J Prev Med*. 2020 Jan 24;11:4.

44. Mauskop A, et al. Intravenous magnesium sulfate rapidly alleviates headaches of various types. *Headache*. 1996 Mar;36(3):154-60.

45. Boyle NB, et al. The Effects of Magnesium Supplementation on Subjective Anxiety and Stress-A Systematic Review. *Nutrients*. 2017 Apr 26;9(5). pii: E429.

46. Kovacevic G, et al. A 6-month follow-up of disability, quality of life, and depressive and anxiety symptoms in pediatric migraine with magnesium prophylaxis. *Magnes Res*. 2017 Nov 1;30(4):133-141.

47. Starobrat-Hermelin B, Kozielec T. The effects of magnesium physiological supplementation on hyperactivity in children with attention deficit hyperactivity disorder (ADHD). Positive response to magnesium oral loading test. *Magnes Res*. 1997 Jun;10(2):149-56.

48. El Baza F, et al. Magnesium supplementation in children with attention deficit hyperactivity disorder. *Egyptian J Med Human Genetics*. 2016;17(1):63-70.

49. Mousain-Bosc M, et al. Improvement of neurobehavioral disorders in children supplemented with magnesium-vitamin B6. *Mag Res*. 2006 Mar 1;19(1):46-52.

50. Bhatnagar S, Taneja S. Zinc and cognitive development. *Br J Nutr*. 2001 May;85 Suppl 2:S139-45.

51. Cope EC, Levenson CW. Role of zinc in the development and treatment of mood disorders. *Curr Opin Clin Nutr Metab Care.* 2010 Nov;13(6):685-9.

52. Maret W, Sandstead HH. Zinc requirements and the risks and benefits of zinc supplementation. *J Trace Elem Med Biol*. 2006;20(1):3-18.

53. Bilici M, et al. Double-blind, placebo-controlled study of zinc sulfate in the treatment of attention deficit hyperactivity disorder. *Prog Neuropsychopharmacol Biol Psychiatry*. 2004 Jan;28(1):181-90.

54. Akhondzadeh S, et al. Zinc sulfate as an adjunct to methylphenidate for the treatment of attention deficit hyperactivity disorder in children: a double blind and randomized trial [ISRCTN64132371]. *BMC Psychiatry*. 2004 Apr 8;4:9.

55. Shi Z, et al. Fish Oil Prevents Lipopolysaccharide-Induced Depressive-Like Behavior by Inhibiting Neuroinflammation. *Mol Neurobiol*. 2017 Nov;54(9):7327-7334.

References

56. Kidd PM. Omega-3 DHA and EPA for cognition, behavior, and mood: clinical findings and structural-functional synergies with cell membrane phospholipids. *Altern Med Rev*. 2007 Sep;12(3):207-27.

57. Tanaka K, et al. Effects of docosahexaenoic acid on neurotransmission. *Biomol Ther* (Seoul). 2012 Mar;20(2):152-7.

58. Jasani B, et al. Long chain polyunsaturated fatty acid supplementation in infants born at term. *Cochrane Database Syst Rev*. 2017 Mar 10;3:CD000376.

59. Bohnert H, et al. Efficacy of a long-term home parenteral nutrition regimen containing fish oil-derived n-3 polyunsaturated fatty acids: a single-centre, randomized, double blind study. *Nutr J*. 2018 Nov 30;17(1):113.

60. Chang JP, et al. Omega-3 Polyunsaturated Fatty Acids in Youths with Attention Deficit Hyperactivity Disorder: a Systematic Review and Meta-Analysis of Clinical Trials and Biological Studies. *Neuropsychopharmacology*. 2018 Feb;43(3):534-545.

61. Cooper RE, et al. Omega-3 polyunsaturated fatty acid supplementation and cognition: A systematic review and meta-analysis. *J Psychopharmacol*. 2015 Jul;29(7):753-63.

62. Barragán E, et al. Efficacy and Safety of Omega-3/6 Fatty Acids, Methylphenidate, and a Combined Treatment in Children With ADHD. *J Atten Disord*. 2017 Mar;21(5):433-441.

63. Trebatická J, et al. Omega-3 fatty-acids modulate symptoms of depressive disorder, serum levels of omega-3 fatty acids and omega-6/omega-3 ratio in children. A randomized, double-blind and controlled trial. *Psychiatry Res*. 2020 May;287:112911.

64. Trebatická J, et al. Emulsified omega-3 fatty-acids modulate the symptoms of depressive disorder in children and adolescents: a pilot study. *Child Adolesc Psychiatry Ment Health*. 2017 Jul 5;11:30.

65. Nemets H, et al. Omega-3 treatment of childhood depression: a controlled, double-blind pilot study. *Am J Psychiatry*. 2006 Jun;163(6):1098-100.

66. Lam LF, Lawlis TR. Feeding the brain - The effects of micronutrient interventions on cognitive performance among school-aged children: A systematic review of randomized controlled trials. *Clin Nutr*. 2017 Aug;36(4):1007-1014.

67. Herbison CE, et al. Low intake of B-vitamins is associated with poor adolescent mental health and behaviour. *Prev Med.* 2012 Dec;55(6):634-8.

68. Black LJ, et al. Low dietary intake of magnesium is associated with increased externalising behaviours in adolescents. *Public Health Nutr*. 2015 Jul;18(10):1824-30.

69. Smith DJ, et al. Adjunctive low-dose docosahexaenoic acid (DHA) for major depression: An open-label pilot trial. *Nutritional Neuroscience*. 2018 Mar 16;21(3):224-8.

70. Högberg G, et al. Depressed adolescents in a case-series were low in vitamin D and depression was ameliorated by vitamin D supplementation. *Acta Paediatrica.* 2012 Jul;101(7):779-83.